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ТЕМАТИЧЕСКИЙ РЕФЕРАТИВНЫЙ СБОРНИК № 33-2/1

“Radiowave Propagation”
(«Распространение радиоволн»)

Публикации в трудах конференций

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"Multipath modeling using canonical scatterers"

Multipath modeling is presented using infinitely long cylinders. It is shown that the known stochastic fading models, Rayleigh and Rician, can be obtained by treating multipath deterministically, that is, by solving the electromagnetic scattering problem. [C1]

"RF channel modeling of a WSN testbed for industrial environment"

Industrial applications of wireless sensor networks often involve radio-harsh environments. These industrial settings typically include an abundance of metallic structures which obstruct, reflect, refract and scatter signals. As a result, RF channel modeling for these environments becomes necessary and important. In this paper, a WSN testbed emulating realistic industrial environments was constructed and developed. With it, RF channel propagation properties were measured and analyzed in 2.4GHz and 5.8GHz ISM bands using vector network analyzer. [C2]

"Vehicular safety communication at intersections: Buildings, Non-Line-Of-Sight and representative scenarios"

Vehicular Dedicated Short Range Communication (DSRC) promises to reduce accidents by enabling assistance systems such as cross-traffic assistance. This application needs movement information from vehicles that are potentially in Non-Line-Of-Sight (NLOS) due to buildings at intersection corners. The amount of NLOS is determined by the placements of buildings. From another point of view, buildings influence the DSRC wireless channel by creating radio signal reflections and diffraction. Here, existing NLOS path-loss models for cellular communication with below roof-top base stations hint that the spatial placement of buildings has influence on the NLOS reception quality. This paper analyzes building positioning in the City of Munich with respect to DSRC. In a first step, it is investigated how much the line-of-sight is blocked by buildings. In a second step, the location of buildings is abstracted and the resulting data clustered to find a set of representative buildingposition scenarios. The presented scenario knowledge can be used in future research to configure meaningful simulations that investigate the radio channel at intersections under load and to select representative intersections for radio propagation field tests. [C3]

"Hybrid Indoor Positioning Approaches Based on WSN and RFID"

Nowadays indoor positioning applications have received great attentions among short range wireless communication systems. In particular, Wireless Sensor Network (WSN) is the most widely used technology for indoor localization as it is cheap and easy to deploy. However, location accuracy is limited by the harsh propagation of the Radio Frequency (RF) signals in indoor environments, for instance, caused by the presence of obstacles between wireless nodes, multi-paths, interference, etc. To overcome these effects and improve positioning accuracy, Radio Frequency Identification (RFID) technology is employed to assist the WSN based positioning. This paper proposes two hybrid positioning approaches based both on WSN and RFID. One solution uses an Extended Kalman Filter (EKF) algorithm while the other one uses a Particle Filter (PF) approach. Both methods are compared through Matlab simulations which demonstrate that in general the WSN/RFID hybrid approach is feasible and provides good positioning estimation capabilities even under harsh indoor conditions. [C4]

"Research of Wireless Sensor Networks Cross-layer Energy Optimization Based on Link Quality"

The function and structure and the architecture of sensor network based on ZigBee/802.15.4 standard for forest monitoring are designed in this paper. According to the features of forest monitoring, the sensor nodes based on CC2520 and low power consumption chip MSP430F5437 and the coordinator Combing with ARM are designed which realize the energy control in physical layer. With the wireless sensor network nodes based on ZigBee/802.15.4 standards and leading distribution into multidimensional scaling techniques, it improves the

location algorithm. By analyzing radio propagation path loss model and CC2520 chip character, it gets the relationship between transmission power, RSSI, LQI and the distance of the nodes using Piecewise linear approximation method. It also gets the relationship between transmission power, error rate and the distance of the nodes by further optimization. It establishes a cross-layer energy optimization algorithm based on the distance of nodes, RSSI and LQI for the situation of fewer communication and lower demands of hardware. [C5]

"IAA: Interference aware anticipatory algorithm for scheduling and routing periodic real-time streams in wireless sensor networks"

This paper provides a polynomial time heuristic for the real-time communication scheduling problem in multi-hop wireless sensor networks.Wireless networks add a new dimension to the real-time communication problem because of interference: a transmission cannot be scheduled on a radio link if another transmission is scheduled on any interfering link. The problem being NP-hard in nature, we propose a novel heuristic that comes into two parts: (1) a scheduler that uses a topological analysis of the network to anticipate the effects of radio interference in order to improve scheduling prioritization, (2) an iterative route update scheme that pushes apart interfering streams and spreads them out over the network to reduce interference and improve schedulability while meeting the deadline requirements. The whole algorithm runs in polynomial time of O(N3d), where N and d are the number of streams and maximum deadline respectively. We use a simulation-based study to demonstrate that this algorithm produces near-optimal schedules for approximately 10 packet streams in a 100 node network, where the optimal schedule can be computed. We also show that the overall algorithm is able to schedule as much as 47% more steams than simple heuristics that takes only deadline or interference into account. Of this improvement, 4%-26% contribution comes from the iterative route update scheme. [C6]

"A Novel Numerical Arithmetic of Calculating Bandwidth for a Giant T-Type VLF Antenna Array"

A novel numerical arithmetic of calculating the bandwidth for a high Q and very low frequency (VLF) antenna array was developed. Analyzed the electric current amplitude-frequency characteristic of a VLF T-type antenna array based on the input impedance calculated by Method of Moments (MOM) and interpolated method of Lagrange polynomial. Compared the 3dB bandwidth calculated in numerical arithmetic and classical method with the metrical value of a T-type antenna array. The exactness of the numerical method to calculate the bandwidth was verified. The affection of parameter variation of down lead wires and antenna height on the bandwidth of a T-type antenna was analyzed. Conclusions which can be used for engineering design are obtained. [C7]

"The atmosphere correction in SBAS D-InSAR land subsidence monitoring application: A case study in Jiaxing-Huzhou plain, China"

It is well know that atmospheric phase screen(APS) effect in Small Baseline Subset (SBAS) D-InSAR processing to obtain ground deformation in long time series leads to additional interferometry phase and the unreliable result. To solve the problem above, MODIS product provide a mean to stimulate atmospheric field of SAR data for reducing the APS effect in D-InSAR processing. In this paper, 12 ENVISAT ASAR images are used to process SBAS method and 6 MODIS MOD05_L2 products are used to process atmosphere correction. A case study in the Jiaxing-Huzhou plain in Zhejiang province, China shows successfully stimulate the atmospheric field of SAR data and analysis its effect on SBAS application. [C8]

"The algorithm of position related channel character extraction and match localization based on ray-tracing"

In this paper, an algorithm of position related channel character extraction and match localization based on ray-tracing is presented. Firstly the radio propagation of beacons is simulated and the time series for location is produced by using ray-tracing, and then wavelet transform and singular value decomposition are used for getting the character of location from the time series and build the character-location database. The characters of targets are measured to match the characters which are from the character-location database. Simulation results show that the character of location get from the algorithm has high stabilization, and when there are only 5 beacons, 90% location error is within 2 meters. As the density of beacon increasing, the accuracy becomes much better. [C9]

"Refractive index of drifting ionized plasma with variable electron collision frequency in the Earth's upper atmosphere"

The refractive index of an ionized medium in a magnetic field is complex. The formula for the refractive index is the cornerstone of the theory useful to establish the background study for radio wave propagation in uniform magneto-plasma. In the present paper, the expression for refractive index have been derived by considering

Ionosphere as an anisotropic media with a constant drift so that it could be applied to any type of irregularities observed in the ionosphere. The formula has been derived taking variation in electron collision frequency with electron speed in drifting plasma. This expression is useful and helps to study the propagation characteristics of drifting plasma. The relativistic drift velocities of the plasma, generally reached by astrophysical plasma, will change the refractive index of the plasma considerably for example during re-entry of space vehicle in earth's atmosphere, the creation of high density plasma medium affects the radiated signal from the space craft. The medium of upper atmosphere gets affected under this condition. [C10]

"IEEE 802.11 WLANs: A comparison on indoor coverage models"

In this paper, it is used analytical and measurement tools in order to compare five different indoor path loss propagation models: one-slope; dual-slope; partitioned; Cost-231 multi-wall model and average walls. The main objective is to use the receive signal strength indicator (RSSI) in order to set a simple and fast procedure, taking into account accuracy, complexity and scalability, to estimate the coverage of IEEE 802.11 wireless local area networks (WLANs). We have concluded that the average walls model propitiate a better path loss prediction among the selected models. [C11]

"On the propagation characteristics of ultra-wideband signal in aluminum"

The UWB reflected signal at 4.7 GHz is characterized and measured for the application of short-circuited reflection material analysis with aluminum backing the sample. The sub-pulse with 120-ps pulse width is used to characterize the UWB reflected wave propagation phenomenon in some aluminum plates with different thickness. It was found the normalized amplitude of principal sub-pulse that is generated by 24thderivative of a Gaussian pulse yields a linear relation with the thickness of aluminum ranged from 1 to 10 mm. The amplitude of these high order pulses shows that there is destructive interference when combining waves reflected from front and rear interfaces of aluminum. The pulse width of these sub-pulses is insensitive to the aluminum's thickness change in the experiment. [C12]

"Experimental Study of Mobile Propagation Loss Correction Formula for a Slope Terrain Area"

Service area upgrading and expanding is expected in current and future cellular systems. Since residential areas on a hilly and/or slope terrain are spreading in the outskirts of cities in Japan, the correction for the urban mobile propagation loss formula becomes one of the important issues in radio link and cell layout designs in those areas, especially within 1km distance from a base station. This paper introduces an example of correction formula for the slope terrain area based on an experimental study of mobile path loss prediction. The result shows the path loss at the objective point can be estimated by the urban mobile path loss and the correction value according to the factor expressed by the elevation angle from the base station antenna top. Although the average slope angle is only used as a parameter in the conventional correction for the slope terrain area with at least 5 to 10km length, the result means it is not enough for the correction to the area within 1km distance from a base station. [C13]

"Applicability of Game Engine for Ray Tracing Techniques in a Complex Urban Environment"

This work presents results for a new method of ray tracing in urban environments using game engine and graphic processing unit (GPU). First advantage obtained with this method is the simplicity for 3D modeling from raster digital elevation model (DEM). Second advantage is the ability to precisely obtain ray parameters and the multiple paths interacting between transmitter and receiver in urban environment for high and low base station. A third advantage is the reduction in computing time by using the GPU capacity. In this paper, we show simulation results and compare them with measurements, obtaining a good fit. [C14]

"Performance Evaluation of an L-Band Broadcast DAB/DMB System in Simulated Subway Tunnel Environment"

This paper examines radio wave propagation in underground and subway environments from the perspective of providing digital radio with multimedia and video enhanced services (DAB/DMB) as a continuity of the same services offered above ground. To this end, a preliminary simulation framework of a DAB/DMB transmission system inside a rectangular subway tunnel is proposed. First, the received power and path-loss along the tunnel are predicted with a reflection ray-based propagation model. Then, the wideband radio characteristics of the DAB/DMB signal (mean delay spread, impulse response and fading behavior) are modeled and simulated based on subway tunnel measurements reported in literature. In addition, the benefits of space diversity techniques such as Maximal Ratio Combining (MRC) and Cyclic Delay Diversity (CDD) on the performance of the DAB/DMB transmission system have been investigated under the flat fading degradation as exhibited by the subway tunnel propagation channel. [C15]

"Propagation Channel Characterization for Amplify-and-Forward MIMO-Relaying Systems"

In this contribution, we derive the spread function and power spectrum of the so-called "relay channel" along which electromagnetic waves propagate from a source station to a destination station via multiple amplify-and-forward (AF) relay stations. These results show analytically that the propagation over such a relay channel can be influenced by the propagation in individual "hops" and the responses of the relay stations. Furthermore, we find that the uncorrelated-scattering assumption is inapplicable for the AF-relay channels in the case where the relay stations receive and retransmit signals using mulitple antennas. We propose to simulate the relay channels by three steps: i) selecting channel models for individual "hops"; ii) defining the correlations of model parameters among the hops; and iii) constructing realizations of relay channels by taking into account the responses of relay stations, which are specified by considering the response of antennas and the relay mode according to system configurations. We also show in this contribution that the spreads of a multi-relay channel in delay, Doppler frequency and directions are lower-bounded by the weighted summation of the spreads of individual source-relay-destination channels. [C16]

"A Spatial Correlation Model for Shadow Fading in Indoor Multipath Propagation"

In this paper, shadow fading (SF) in an indoor multipath environment is measured and the spatial correlation of SF is modeled statistically. To effectively extract SF from the measured field strength, we use frequency averaging (FA) method instead of spatial averaging (SA) method which has generally been used. SF is modeled as a random variable with a log-normal distribution. The spatial correlation model for SF is expressed by an exponential decay function with convergence to non-zero value. [C17]

"On the impact of irregular radio propagation on coverage control and sleep scheduling in wireless sensor networks"

Research in the wireless sensor networks field has been plagued by difficulties in realistic simulations. These difficulties are often the result of non-realistic assumptions which need to be removed from the mathematical models. Especially, radio propagation models are often simplified and do not take into consideration irregularities such as fading, shadowing, and temporal non-stationarity. In this paper, we investigate the effect of radio temporal irregularities on sensor deployment and sleep scheduling. We show that existing scheduling algorithms suppose that the sensor coverage range does not vary according to time, which is not true because the available energy decreases. We analyze the impact of this shortcoming on the performance of sleep scheduling algorithms and propose an alternative scheme that guarantees a uniform density distribution despite of the presence of radio temporal irregularities. [C18]

"Longley-Rice and ITU-P.1546 Combined: A New International Terrain-Specific Propagation Model"

A new propagation model and software implementation combines the best of the NTIA-ITS Longley-Rice methodology and it's Irregular Terrain Methodology (ITM) software implementation, a set of deterministic approximation equations derived from the empirical data in ITU-R P.1546 and other ITU Recommendations, and Snell's Law and Beer's Law, to create the first truly point-to-point, terrain-specific international radio reception signal strength prediction model. This implementation utilizes 3-arc-second Satellite Radar Terrain data that is available internationally, making this a propagation model that can be implemented internationally. This new model more fully implements the original Longley-Rice Tech Note 101 methodology that does the ITM. The core software of this model, the equivalent of the ITM core, is the Irregular Terrain with Obstructions Model, the ITWOM. This model is specific and accurate enough to be used for the interference studies for which it was developed, has been in continuous development since 2005, and has been in use for two years by Givens & Bell to produce FM vehicular reception studies for analog and digital (IBOC) reception. Source code for a basic version of the ITWOM, designed for 3-arc-second database use and limited to the minimum range of the ITM and P.1546 recommendations, will be released. [C19]

"Cauchy Power Azimuth Spectrum for Clustered Radio Propagation MIMO Channel Model"

This paper presents a state-space based simulation model for multiple-input and multiple-output (MIMO) channels with spatio-temporal channel correlations due to clustered radio propagation. The scattering clusters are modeled as two-dimensional Cauchy (TDCA) clusters. This renders the joint probability density function (PDF) of angle of arrival (AOA) and angle of departure (AOD) that can be approximated as the product of two Cauchy angular power distributions. Thus, the spatio-temporal correlation can be approximated as the product of an autoregressive order one (AR1) model and the corresponding spatial antenna correlation. A state-space

model is employed to the temporal dynamics of the MIMO channels. The contribution of the cluster to each antenna is a state in this model. A correlated innovation process adjusts the correlation between antennas. This renders the appropriate spatio-temporal channel correlation in the simulated channels. [C20]

"Statistics analysis of the Sakagami model"

A new extension Statistical-Sakagami model is proposed by using the statistical method in the 4G prediction path loss multiple regression formula. It is assumed that the two main parameters: hB and db are not deterministic variables like those in theory propagation models, but statistical variables, and two parameters are varying at the same time in the simulation. The performance of the formula is studied by simulating the probability density functions, cumulative distribution functions, level cross rate and average fade duration. [C21]

"Analysis of measured outdoor-to-indoor MIMO channel matrix at 3.5 GHz"

This paper presents a deep analysis of an outdoor-to-indoor propagation channel and the related capacities. It is based on a measurement campaign carried out at 3.5 GHz to characterize the outdoor to indoor electromagnetic (EM) wave propagation penetration within buildings. Some relationships between the Weichselberger channel matrix shape and the channel capacity at each measured point are studied. The aim of this investigation is to provide to system level algorithms some exploitable performances from the propagation channel. [C22]

"A new ray-tracing acceleration technique for radio propagation"

A new ray-tracing acceleration technique called TROyA (ray TRacing based on Octree and AZB) has been presented. This technique combines the benefits of two space subdivision algorithms: AZB and octree techniques. With this new technique, the computation time to create the AZB matrix has decreased in 50% during the geometry preprocessing phase in comparison with the AZB technique. [C23]

"A direction-specific land use based path loss model for suburban/rural areas"

In this paper we propose a new Direction-specific Land use based Path loss model (DiLaP) that benefits from both approaches by utilizing the particular radio wave propagation characteristics of all land use segments that lay on the direct path between receiver and transmitter. It is intended for application to suburban/rural areas. [C24]

"Electric fields from RF tag interrogators underneath an urban rail train"

RF tag interrogation systems are used for position determination in the automatic control of urban rail trains. Such systems consist of a Tag Interrogator Unit (TIU) which is attached to an antenna mounted underneath the rail car and transmits interrogation pulses to tags installed between the rails. The TIU operates in a complex electromagnetic environment that contains some components which are highly conductive, such as the rail car itself, the wheel bogie sets, the rails and rail spikes into the ground. Other components have lower but still significant conductivities and permittivities different from that of free space, such as the ground, the ballast, and the sleepers (ties). In the design of a positioning system it is important to gain an understanding of the influence of these components on the RF field distribution underneath the rail car, especially in the plane where the tags are located. This paper discusses the use of a computer simulation, using the RF module of the COMSOL Multiphysics finite element software package, to model the situation and to predict the electric field distribution, most importantly in the plane of the tag. The results of the simulation can be used to better understand the response of the TIU and the train position can be better determined. [C25]

"A Survey of RF-Propagation Simulation Tools for Wireless Sensor Networks"

Wireless Sensor Networks are applied in new applications all the time. However, in many cases their performance in a particular application is not be evaluated until the deployment phase. This is often too late and causes extra work and iterations in the design of the network hardware or communication parameters. This can be reduced with careful study before the actual deployment using modeling and simulation tools for testing and optimizing the sensor network beforehand. In this paper we introduce three simulation tools for radio frequency (RF) propagation and estimate their suitability for modeling and simulation of sensor networks. According to the results, we see them as very efficient tools, but also suggest improvements for even more versatile results. [C26]

"Discovery of Configurations for Indoor Wireless Sensor Networks through Use of Simulation in Virtual Worlds"

Development of wireless sensor networks deals with several difficulties, including time, cost and complexity of

testing. In particular, indoor environment poses several specific constraints on radio wave propagation due to density of obstacles. This must be taken into account if we want to discover and validate network configurations and communication paths. We suggest the use of virtual worlds, exploiting their inherent features for modeling of 3D environment, to simulate wireless sensor networks in order to deal with this problem. We have created an initial version of one such tool, which supports discovery and testing of configurations and communication paths within indoor wireless sensor networks. Validity of our approach was confirmed through experiments performed in this tool, in parallel with real-world experiments in a similar setting. [C27]

"Modelling of path loss coefficient and loss due to roof for a indoor Wi-Fi system"

Nowadays, every one want to use cell phone and access internet from anywhere at home, office or public place due to rapid growth of Electronic and Telecommunication industry. Due to these demands the analysis of signal propagation inside and outside building is necessary. The outdoor propagation is simple as compared to indoor propagation. This paper models the path loss coefficient and general expression for loss due to roof for an indoor Wi-Fi system (Wi-Fi= Wireless Fidelity). It was concluded that the path loss coefficient depends on the objects inside the room and loss due to roof depends on the roof thickness. [C28]

"Characterization of RF transmission in human body"

An experimental methodology to characterize the RF transmission of human body has been presented. It is a great challenge to ensure that the antennas used in the measurement will not be affected by the presence of the human body tissues, which is the key factor in order to characterize the RF transmission accurately and reliably. The proposed methodology of using tissue-embedded antennas has been validated to offer the desired results. [C29]

"Underwater FDTD ELF simulation using dedicated hardware"

The 1-core CPU, 32-core CPU and Acceleware calculations were performed for the comparison. The results show that Acceleware approach is faster than the 1-core CPU calculation and twice as fast as the 32-core CPU calculation. [C30]

"Wave propagation in a random dielectric rod array"

There exists one important difference between a periodic water rod array and a real forest. In a real forest, trees are randomly distributed in tree trunk diameter, tree height and tree spacing. Therefore, it is desirable to understand how the randomness in these parameters would affect the resulting propagation mechanisms. In this paper, we investigate the effects of random spacing and random height on the wave propagation in a dielectric rod array. Measurement data are collected on a scaled model water rod array. The results are processed and compared to those from a uniform array, as well as to numerical simulations. [C31]

"Experimental investigation of a dual-band handset MIMO antenna using a spatial fading emulator"

An experimental investigation of handset MIMO antennas with dual-band operation was performed using the data from a radio propagation test in an urban area of Aalborg city in Denmark and an over-the-air test using a spatial fading emulator. It is concluded from the agreement between MIMO characteristics of the both measurements that the emulator is effective in evaluating handset MIMO arrays in the case of a multipath fading environment with one spatial cluster at 776 MHz and 2.35 GHz. [C32]

"Full-wave numerical study of wireless communication in boxes with metallic enclosure based on time-reversal ultra-wideband technique"

In this paper, TR-UWB communication in arbitrarily-shaped boxes with metallic enclosure is rigorously analyzed using full-wave simulations. To be specific, two Maxwell's equations solvers, one based on finite difference time domain (FDTD) and the other the method of moments (MoM), are developed to track electromagnetic wave propagation in the boxes. Impedance boundary condition (IBC) is exploited to model realistic metallic walls. In order to relieve high computational resources requirements, these two simulators are implemented on parallel cluster computers. Results from FDTD and MoM simulators match each other; and they show focusing in both space and time after time-reversal and round-trip propagation operations are carried out onto UWB impulses, which demonstrates the feasibility of TR-UWB communication in boxes with metallic enclosure. [C33]

"Bit error rate performance of wireless body area network system"

In this paper, in order to clarify the influence of the human body on the radio wave propagation of the wearable

device for on-body wireless communications, we have derived transmission coefficient analytically, and have evaluated the digital communication using the ISM band of 915 MHz and the UWB band in terms of BER. Due to the propagation characteristic of the wearable device attached to an arm, we have therefore approximated the arm as a dielectric circular cylinder. As a result, it has been shown that the existence of the dielectric circular cylinder improved the BER performance of the digital communications. [C34]

"An imputation technique for missing data in propagation measurements"

The authors presented a method to improve the distribution estimation and to reduce the impact of missing received signal strength values. This method could improve the robustness of RF propagation measurements and modeling. For example, the model could be useful to obtain accurate received signal fingerprint, in turn making more accurate localization possible. [C35]

"Simulation and measurement of near-ground wave propagation for indoor scenarios"

A Semi-analytic model for near-ground wave propagation in the presence of building walls that was proposed in [3] is extended to 3D multi-wall propagation scenarios. The extension to 3D and a method to take into account multiple reflections in the presence of multiple building walls is presented. Measurement results under laboratory conditions for validation using a single concrete wall and different transceiver arrangements is discussed. Field coverage comparison between the new semi-analytic method and an FDTD solver for various cases is also included. [C36]

"Optimizing Base Station Site Selection and Propagation Prediction for Railway Wireless Network"

In order to ensure the safety of the running train, wireless communication system for train communications and control must provide a network with high quality of service (QoS). And wireless network design will directly influence the performance of the whole network. In the process of the network design, choosing the appropriate prediction model, predicting the coverage, and determining base station site, are all related to the local environment. To improve the quality of the railway wireless network, the base station site selection for railway wireless network is optimized based on GIS (geographic information system). A new propagation model selection method based on GIS is also proposed. With the help of GIS, the accuracy of the prediction model and the efficiency of the base station site selection can be greatly improved. [C37]

"Analysis of the separability of the "on-body" cluster and the "off-body" clusters in the modeling of the UWB WBAN channels for various indoor scenarios"

The Wireless Body Area Networks technology is widely recognized as a promising candidate for various potential applications in the domains of health, surveillance, monitoring, sport, multimedia, entertainment, data transfer, etc. A central research topic in WBAN system optimization lies in getting an accurate knowledge of the propagation channel which plays a key role on the design of the PHY, MAC and Network layers. The explosive combinatory due to the numerous sources of variability and the diversity of the situations should be reduced to be reasonably analyzed. One way is to try to separate the "on-body" cluster (analyzable in an anechoic chamber) from the "off-body" clusters due to MPCs coming from the surrounding environment. This allows to analyze separately the proper sources of variability (population-gender, corpulence, size, age -, postures and movements, antennas-classes, distance from the body and polarization -, "micro-positioning" on the body, etc.) from the exogenous influence of the environment (type and size of rooms), reducing considerably the required experimental effort and simplifying the modeling process. [C38]

"Empirical propagation model for low elevation satellites"

This paper presents an empirical propagation model for low elevation satellites. Models have been obtained from a measurement campaign carried out using GPS L1 signals from satellites with elevation angles lower than 10°. The signals have been gathered by a narrow band High Sensitivity GNSS receiver in lightly wooded, heavily wooded, rural, suburban and urban environments. Measurements have been processed and statistical parameters regarding blockage probability, signal quality (C/N0), blockage time and time between blockages were obtained. [C39]

"Evaluation and optimization of robustness in the IEEE 802.15.4a standard"

In this paper, we introduce ways to improve the robustness by lowering the packet loss rates of transmissions using ultra-wideband impulse radio (UWB-IR). It has been shown that the packet loss rate caused by erroneous synchronization can be tremendously decreased compared to the preamble specified in the standard IEEE 802.15.4a by our approach. These improvements are particularly intended for low-power, low-complexity

transceivers operating in environments with harsh multi path propagation and high noise levels, such as industrial control. These improvements include novel ways for receiver implementation to reduce detection errors for low-power energy detection receivers with slow sampling rates. We also introduce a modified preamble that significantly reduces packet loss caused by failed preamble synchronizations We evaluate our improvements by simulation. Our approach to receiver implementation enables receiver to achieve the same packet loss rate at a signal-to-noise ratio (SNR) 10 dB lower than traditional receiver designs. [C40]

"Ultra-wideband based positioning system for applications in industrial environments"

This paper deals with the topic of indoor ultra-wideband (UWB) localization systems in industrial buildings. This kind of channel is mainly characterized by high concentration of metal objects, which cause reflections, leading to strong multipath propagation. The model of the assembly hall is created and used in deterministic 3D wave propagation simulation tool. During the simulation, the mobile beacon travels along predefined route. The signal reception is carried out by stationary infrastructure consisting of several antennas with known positions. By using the simulated signals and adopted direct solution methods, the accuracy limit of the system is assessed. [C41]

"Experimental evaluation of ultra wideband wireless transmission within a spacecraft for replacing wired interface buses"

Ultra wideband (UWB) transmission was evaluated within a small scientific spacecraft, with a view to partly replacing onboard data buses with wireless connections. Spatial distributions of UWB link throughput were derived from measurements. The results revealed that commercially-available UWB devices were capable of accommodating up to around 90-Mb/s data buses within spacecrafts. [C42]

"An UWB receiver based on a comb filter with shortened delay"

We propose a new concept for a comb filter based UWB receiver, where the delay of the analog delay element is shortened. The comb filter receiver can cope with the problems of low SNR, high interference levels, strong narrowband interference and multipath propagation in an excellent way. The main challenge for realization with real hardware is the analog delay element. With our new concept proposal, the delay can be shorter while the performance is maintained. Bit error rates for different scenarios with noise, interference and multipath propagation are discussed. [C43]

"Excitation and propagation of waves on human arm models"

This paper investigates scenarios of wireless transmission on human arm models. Two different arm models are considered: a PMMA pipe filled with muscle-tissue simulating liquid is used for both simulations and measurements, and a three-layer model whose geometry was obtained from a magnetic-resonance imaging (MRI) scan of a human arm is considered in simulations. Numerical simulations and measurements are carried out at a frequency of 4.1 GHz. Waves coupling transmitter and receiver are most efficiently excited by monopole-like radiators oriented perpendicularly to the surface. Efficient excitation is also possible by dipole-like radiators oriented parallel to the surface and aligned with the direction of wave propagation. Note that in this case, the dipole far-field pattern has a null in the direction of propagation. The worst excitation is obtained by dipoles parallel to the surface and oriented transversely to the propagation direction. All results support the finding that surface-wave like propagation occurs along and around the human arm, and efficient excitation of these waves can be achieved by antenna near-fields. [C44]

"A Precise 2-D Wireless Localization Technique Using Smart Antenna"

In recent years, localization using angle of arrival (AOA) has gathered more attention, due to the use of smart antenna techniques for performance improvement in mobile communications. In this paper, we propose a precise two dimensional (2-D) localization approach by using AOA measurements which considers the error due to multipath propagation as well as angle estimation error. Specifically, we propose to use three antenna arrays to provide a fix, each with a unique combination of another antenna array. Thus, three sets of antenna arrays are formed altogether. For each set, we first transform angle information into location coordinates by standard geometry and linearization method is used for getting the initial location estimates. Then the Final Position is estimated from the three initial location estimates by the Precision-Weighted Aggregation approach which considers the errors from measurement and multipath propagation. Finally, the performance of the proposed method is evaluated. [C45]

"Distributed selection of sensing nodes in cognitive radio networks"

The introduction of cognitive radio networks is dependent on the reliable sensing of higher priority emitters in

their geographic areas. A large number of sensors requires the exchange of a substantial amount of information; therefore a subset of secondary nodes must be selected that provides sufficient geographic coverage. In this paper, a new approach to select the reporting nodes is introduced based on the affinity propagation (AP) clustering algorithm. The AP algorithm operates in a distributed fashion and requires only link quality information between neighbouring nodes. Simulations incorporating pathloss and correlated shadow fading models show that the sensing reliability is significantly better than random node selection, and is comparable to a commonly-used centralized algorithm that requires knowledge of the positions of all nodes. [C46]

"A novel RF-based propagation model with tissue absorption for location of the GI tract"

In order to accurately estimate (build) the radio signal propagation attenuation model, especially inside the gastro-intestine (GI) tract of the human body, the Radio Frequency (RF) absorption characterization in human body is investigated. This characterization provides a criterion to design the Received Signal Strength (RSS) based localization system for the objective inside the human body. In this paper, the Specific Absorption Rate (SAR), E-field, H-field of the near and far field are investigated at frequencies of 434MHz, 868MHz, 1.2GHz and 2.4GHz respectively. Then, the numerical electromagnetic analysis with the finite-difference-time-domain (FDTD) is applied to model the in vivo radio propagation channels by using a dipole antenna. Finally, simulation experiments are carried out in homogenous and heterogeneous mediums. The results show that the electromagnetic (EM) propagation is not only distance and orientation dependent, but also tissue absorption dependent in human body. The proposed model is in agreement with measurements in the simulation experiments. [C47]

"Design of packet erasure mitigation technique using a digital fountain code for wearable wireless body area networks"

This paper presents a digital fountain code as a design criterion in order to mitigate packet erasure in wireless wearable body area networks (WBANs). First, we measure its radio propagation around the human body between two antennas attached to participants, and then analyze the measurement results from the standpoint of occurrence ratio of packet erasure. Then, we evaluate the application of digital fountain code into such WBANs where a rateless code is introduced as such code in order to provide a design criterion for the code. [C48]

"Simple estimation method of radio propagation by using CT images for implantable wireless body area networks"

The present paper describes an estimation method of signal attenuation between an implanted and out-body wireless devices by using computer tomography (CT) images. This estimation method is applicable into radio link accessment for implanted wireless body are network (WBAN). In order to evaluate its accuracy of the estimates, received signal strength (RSS) is measured when a signal generator is placed in esophagus and duodenum of a participant. As a result of a comparison between the measured RSS and estimates, the error of the estimation is less than 10 dB in 75% positions. [C49]

"Dual-band polarimetric coherent atmospheric transmission experiment for precipitation observation"

This paper presents the system design of a polarization agile coherent 35 GHz and 22.235 GHz atmospheric transmission experiment. A folded monostatic configuration using a 70 cm trihedral reflector is chosen to reduce the complexity and expenses of a coherent architecture. The system uses a pulsed transmitter and receiver stage to range gate and discriminate between unwanted early backscatter and the transmission component. Its sampling rate of 25 kHz will allow for first studies and correlation analysis of precipitation caused statistical fluctuations in both amplitude and phase for two frequencies and polarizations simultaneously. Several hydrological and meteorological measurements taken at the same site will support the analysis of the measured data. [C50]

"Experiments of UWB radio-wave diffraction in a building enhanced by a dielectric cylinder on the edge of an obstacle"

In this paper we show experimentally that a dielectric cylinder of an appropriate diameter attached to the edge of an obstacle can enhance the weak electric field in the deep geometrical shadow (GS) made by the obstacle in the amount of 20 dB over UWB including a frequency of 5.6 GHz of the wireless LAN. The experimental results are promising for an ad hoc network among mobile terminals in a room or in a building even in the deep GS. These results are experimental developments of our previous theoretically proposed idea of an effective enhancement of the knife-edge diffraction, which is described appropriately by the geometrical theory of

diffraction (GTD), by means of a novel dielectric-cylinder-edge diffraction, which should be described in terms of the wave optics. [C51]

"Active UHF antennas for demanding RFID applications"

The UHF RFID systems are used, on an everyday basis, for identification of millions of different items of goods. Yet there are identification tasks, where a correct and reliable identification is difficult to be accomplished. One of these applications concerns identification of goods equipped with TAGs, densely and randomly accommodated in a larger space. This refers e.g. to the identification of many TAGs fixed on clothes in large cartoon boxes. The TAGs can be located very close to each other, mutually coupled, screened, randomly oriented and placed in an environment with a wide range of wave propagation parameters. The identification of such a set of TAGs represents a difficult problem, because standard configurations are rather prone to fail. The presented paper describes one of the possible solutions. The identification system is equipped with active reader antennas that enable the illumination and the read-out of the TAGs from many different locations as well as angles, and with a wide range of illuminating power. The whole process can be accomplished very fast. In fact, many different scanning procedures can be performed. According to preliminary measurements, such conditions conduce to 100% correct and reliable identification even in case that the tested scenarios include several hundreds of TAGs. The designed RFID system is very likely to be able to work well even in more demanding identification tasks. [C52]

"Evaluation of bias errors in positioning a radio transmitter with a lot of interference waves"

It is frequently observed in positioning a radio transmitter that interference waves cause bias errors. Since interference depends on physical conditions of wavelength, errors have been discussed case by case. In this paper we introduce the worst interference wave in the class of power less than that of the signal. Analytical evaluation of the worst errors in positioning by the maximum likelihood estimation for arrays are presented and verified numerically. [C53]

"A scheduling algorithm for wireless networks with large propagation delays"

Underwater acoustic networks can have large propagation delays as compared to typical packet durations, as a result of the low speed of sound in water. The ill effects of large propagation delay on medium access control (MAC) are well known. Conventional MAC protocol design for such networks focuses on mitigation of the impact of propagation delay. Most proposed protocols to date achieve, at best, a throughput similar to that of the zero propagation delay scenario. We have explored the possibility that propagation delays can be exploited to make throughput far exceed that of networks without propagation delay and shown that the throughput of a N-node wireless network with propagation delay is upper bounded by N/2. In a small set of illustrative network geometries, we can manually determine transmission schedules that allow us to achieve this N/2 bound. However, for a given network, the problem of determining transmission schedules that maximize throughput is as yet unsolved. In this paper, we put forward an algorithm that generates transmission schedules with high throughput for arbitrary network geometries. [C54]

"Effects of multipath reception on GPS positioning performance"

GPS satellite broadcasting signals are subject to reflection and diffraction like any other type of electromagnetic waves. Multipath error results from interference between two radio waves which have travelled paths of different lengths between the transmitter and the receiver. GPS multipath is caused by the reception of signals arrived not only directly from satellites, but also reflected or diffracted from the local objects. Multipath results in an error in pseudorange measurements and thus affects the positioning accuracy, since the multipath signal takes a longer path than the direct signal. To verify the effects of multipath propagation on positioning performance, an experiment was conducted under controlled conditions. The specific location for the experiment was chosen, to allow controlled geometry of the reflective surface, antenna position and the critical satellite positions eventually causing multipath effects. During the 24 hour period, specific intervals were selected when multipath could be present, and the positioning performance was analyzed. The result of our experiment showed the degradation of positioning performance when multipath signals were present, causing shift of the calculated position. [C55]

"Progress in antennas and propagation for body area networks"

Research in antennas and propagation for body centric wireless communications continues to grow, in response to increasing demands for body area networks (BANs) for healthcare, defence and personal communications and entertainment. This paper will briefly review recent international work, and then report on advances in three UK BAN research centres, Birmingham, Queen Mary and Queens Belfast. The demand for greater security in BAN links could be met by the use of 60 GHz channels, and the likely channel characteristics will be discussed and

initial results given. New insights into surface wave excitation on the human body has enabled a novel low profile antenna to be designed that maximises link performance where very thin antennas are necessary. Finally advances in the numerical computation are reported, in which the importance of relating phantoms directly to patients to give subject specific simulations and to allow improved modelling of internal organs. [C56]

"Altitude estimation method using assumed altitude reliability based on multipath propagation model"

The problem of multipath propagation in the tracking low-altitude targets with a radar is addressed. It is well known that multipath fading causes bias errors to the target altitude over the sea. Since multipath propagation depends on the frequency of the radar waveform, the actual target altitude and range, estimation of the bias errors is difficult problem. In this paper, we propose an altitude estimation method using multipath propagation model. Our method uses the reliability of each assumed altitude hypothesis based on multipath propagation model to estimate the real altitude of targets. Through computer simulation trials, the validity of our method is confirmed. [C57]

"Radio Propagation Measurements and Modeling in Railway Viaduct Area"

A network with high quality of service (QoS) is required for railway wireless communication and control systems. Research on radio-wave propagation in railway environment has great significance for the design and optimization of the railway wireless network. In this paper, measurements are taken in railway viaduct area using track side base stations of the GSM-R network. Comparison between the measured path loss values and the estimated values by a few prediction models shows a large deviation. Thus a new path loss prediction model for viaduct area is derived from statistical analysis of the measurement results in this paper. The novel proposed model has proven to be accurate for the planning of the railway wireless network. [C58]

"Measurement System for Propagation Characteristics of Intra-Body Communication"

The propagation characteristics of body channel are the fundamental issue of intra-body communication system design. The measurements of the body channel cover the frequency range from 300 kHz to 5 MHz and the channel length of 30 cm, 90 cm and 150 cm. Individual difference and movement states are introduced as measurement parameters. A data processing method is created to offset the systematic error, which means calibration-free is realized. By analyzing the measurement results, the authors determine a suitable frequency range for intra-body communication. [C59]

"Indoor Energy Load-Balanced Wireless Sensor Networks Routing"

When wireless sensor network used in complex indoor environment, great propagation loss will be caused and difficult to optimize routing adaptively when environment changed. Based on these problems, we presented a protocol-Indoor Energy load-balanced Routing (IEBR). IEBR formulate the routing setup process as the typical multiple attribute decision making process, use objective and subjective weight method and mean square deviation method to adjust the weight coefficient. Nodes can choose an optimal node to relay the data by comprehensive consideration of the weight coefficient, the propagation loss and the energy of its neighbor nodes. Simulation results show that the IEBR make weight coefficient adaptive dynamically, lead to an appropriate allocation of the data. When used in indoor environment, sensor network could obtain a much more even energy distribution, accordingly the lifetime of the sensor network will be prolonged. [C60]

"UWB for low power, short range, in-body medical implants"

Medical implants are battery-powered, and have very stringent power consumption requirements. Devices like pacemakers consume few tens of microamps and last for well over 7-8 years. RF technologies are increasingly enabling communication and configuration of these medical implants. The Federal Communications Commission (FCC) has allocated a dedicated spectrum for operation of medical devices, the Medical Implant Communication System (MICS). This spectrum is in the range of 402-405 MHz and has suitable propagation characteristics through human tissues. Other narrow band low power standards (ZigBee) also exist and are used for on-body applications. The disadvantage of all these narrow-band standards is that their receivers require power hungry components like VCO, PLL and ADCs. Moreover, their power consumption does not scale down with data rates. Ultra wide band (UWB), in its simplest form, Impulse Radio (IR), is a promising low complexity standard. IR-UWB is the natural choice for low-power and low-data rate sensor nodes since for IR-UWB power scales down with low data rate. An UWB-IR transmitter is simple to design and power consumption and complexity are more on the receiver side. Hence, in applications like pacemakers and defibrillators, where the external base station has less stringent power requirements, UWB-IR becomes an option worth studying. Unfortunately, while UWB has been investigated for on-body medical implants no study has been done yet to show the feasibility of UWB for

in-body medical implants. We look at the feasibility of UWB signals when they propagate inside human body. We present a MATLAB model for the path loss inside human body tissues for different distances and frequencies in the UWB range, starting with the theoretical background and going on to the complete model. Our results show that despite significant attenuation inside human tissue, UWB signals can be a promising low power. [C61]

"A simple electromagnetic model for buried interface detection via THz holographic data"

This work presents a simple electromagnetic model to deal with the reflection from buried interfaces and to provide the basis of a reconstruction strategy whose data are given in terms of the intensity of the THz signal, which arises from the interference of a reference signal with the one reflected by the probed sample. [C62]

"Utilizing parallel plate waveguide modes for terahertz sensing"

Parallel-plate waveguide sensors are investigated by characterizing TM and TE modes when filled with inhomogeneous and homogeneous samples. Effects of multi-mode TE propagation within PPW and radiation patterns are investigated. Lactose detection is demonstrated by TDS and CW-VNA techniques. [C63]

"The Talbot effect in the terahertz spectral range"

The Talbot effect in the terahertz spectral range has been first observed and used in metrology applications: measurement of distance, determination of radiation wavelength, and real-time detection of wavefront distortion. [C64]

"Energy efficiency of QoS routing in multi-hop wireless networks"

The trend of adopting more and more wireless mobile computers and smartphones has changed our way of living. Those devices heavily rely on the underlying wireless network systems to provide adequate communication support. As streaming audio and video becomes norm, the requests for stringent maximum end-to-end latency and minimum bandwidth make the networking process more difficult. Quality of Service (QoS) routing is designed to fulfill such requirements. In this paper, we study the performance of QoS routing in multi-hop wireless networks from the perspective of energy efficiency. Since there are sophisticated relationships between wireless radio propagation and energy consumption, various QoS routing strategies produce significantly different results in terms of energy efficiency. Through extensive simulation experiments, the shortest path routing, minimum energy routing, minimum hop routing, and maximum throughput routing are compared. [C65]

"Approximation of creeping waves of circular PEC cylinders in shadow region"

In this paper the authors consider the radio propagation in the shadow region of a circular cylinder which is assumed a perfect electric conductor (PEC). A line source parallel to the cylinder is considered. Thus the problem is equivalently two-dimensional (2D) and the cylinder can be represented by a circle in the following discussions. The propagation mechanism involved is mainly creeping waves going around the cylinder surface and scattering in all directions. [C66]

"Double directional radio propagation measurements and radio channel modelling pertinent to mobile MIMO communications in microcells"

For simulating mobile MIMO performance, local area SNR variations can be reproduced if small-scale fading distributions are known, transmit bandwidths can be chosen appropriately if flat fading bandwidths are known, and, assuming plane waves, spatial covariance functions can be estimated if power-weighted histograms for angles of arrival (AOA) and angles of departure (AOD) are known. This paper reports the results of double directional sounding measurements made in downtown Ottawa to obtain the needed information. Narrowband small scale fading is modelled as Rayleigh or Rician, coherence bandwidths are reported, and an equation is given through which close approximations to experimentally-determined powerweighted AOA and AOD histograms can be reproduced. A recent literature search revealed that such results, all estimated from the same measurements, have not previously been reported. [C67]

"RF communications in underwater wireless sensor networks"

We investigate the propagation of radio waves underwater and between water and air to facilitate setting up hybrid wireless sensor networks with both surface and subsurface nodes. Our investigation includes signal attenuation, antenna radiation patterns, multipath due to reflections from the surface and substrate, noise, and reflection losses transmitting from one medium to another. [C68]

"Study on a Sea Radio-Wave Propagation Loss Model"

In mobile communication, the covering range and the interference is considered to be so important in each base station that it is necessary to know the regional transmission loss. Currently, there is a high margin of error in actual transmission loss model on the sea. This paper presents a propagation loss model. After doing many experiments, the results show that the error between the models predicted levels and measured levels of models is less than 3dB within the radio line of sight. Once over the radio line of sight, the model prediction accuracy will decrease, which is to be considered the Earth's curvature on the impact of propagation loss. [C69]

"A Novel 3D-Based Network Simulation Platform for ZigBee Networks"

In this paper, a novel 3D-based network simulation platform for ZigBee networks is proposed. The purpose of the platform is to improve the accuracy of radio propagation modelling and to offer designers a virtual workspace for testing their systems. Radio propagation models are investigated by performing path-loss calculations and Fresnel zone geometry estimation in a research laboratory environment. [C70]

"Notes on the tuning of a deterministic propagation model in the reverberation chamber"

This paper contains some observations on the application of a ray-launching based simulator for radio-wave propagation in reverberation chambers. The purpose of this article is to enumerate and emphasize how different factors assumed in simulations influence the achieved results. [C71]

"A Multi-polarized Antenna System for Combating Multipath Fading in UHF/RFID Frequency Band in Moving Vehicles"

This paper proposes a multi-polarized antenna system with UHF/RFID frequency band for combating multi-path fading in short-range radio propagation environments. The multi-polarized antenna system of the UHF/RFID for using moving vehicles is composed of multiple micro-strip antenna combinations connecting by the RF combiner and diversity unit. From the measurement results it can be seen that the multipath fading occurred in LOS (line-of-sight)/NLOS(non-line-of-sight) short-range radio wave propagation environment is markedly reduced by using the proposed multi-polarized antenna system. [C72]

"Slow Frequency Hopping for Mitigating Tidal Fading on Rural Long Distance Over-Water Wireless Links"

We consider the scenario where long-distance point-to-point wireless links are established over tidal estuaries to bring Internet access to rural communities living in coastal villages. Using real signal strength measurements from links in the Tegola network testbed in northwest Scotland, we highlight the significance of the tidal fading problem, which we reason using a simple geometric model and simulation using the well-known Pathloss radio link planning tool. We propose slow frequency hopping as a cost-effective, software- only alternative to the commonly used space- diversity approach for mitigating tidal fading, and demonstrate its effectiveness using Pathloss simulation. [C73]

"Optimum power transmission of wireless sensors embedded in concrete"

We present the feasibility and optimization of wireless powering of sensors embedded in concrete that relies on a plane wave propagation model. Transmission loss and propagation loss of RF wave penetrating into concrete at different humidity conditions are calculated for various frequencies. An optimum frequency range within 20-80 MHz is identified for the wireless power transmission and is validated through antenna coupling full-wave EM simulations. The effects of reinforced bars to the propagation of RF power are also analyzed. [C74]

"Fast prediction of scattering in mountainous terrain using commonly visible surfaces"

This paper discusses a computer program for deterministic prediction of radio wave scattering in hilly and mountainous terrain using a DTED terrain database. A fast and accurate visibility algorithm with a linear computational complexity and little RAM requirement is invented to find the terrain elements that are commonly visible to both ends of the communication links. Comparing with the vertical plane contribution predicted by the TIREM model, we find that in about 1/3 of the cases the terrain scattering contribution is more significant than the vertical plane contribution in a typical mountainous terrain. We also find milliseconds computation times per link can be achieved on a personal computer for large maps by pre-computing macro-visibility. Computation that finds visibility on-the-fly takes 6 times longer. [C75]

"Experimental characterization of electromagnetic propagation of a hospital from 55-1950MHz"

An examination of the electromagnetic environment and characteristics from 30MHz-7GHz in a hospital is discussed in this paper. Empirical propagation constants, building attenuation, floor height gain, and the CDF of the coverage, were calculated from 50-1950MHz. This is carried out to further understand the propagation of radio waves through hospitals. The understanding of wave propagation through hospitals will help advance the knowledge to control the electromagnetic environment of hospitals to decrease electromagnetic interference to medical devices. The understanding of the RF hospital environment is even more pressing given that many hospitals are implementing electronic medical records that would require the co-location and co-existence of many different types of RF emitters. The measurement parameters calculated are useful for propagation modelling. [C76]

"A new geometric approach to mobile position in wireless LAN reducing complex computations"

Positions estimation from Time of Arrival (TOA), Time Difference of Arrival (TDOA), and Angle of Arrival (AOA) measurements are the commonly used techniques. These approaches use the location parameters received from different sources and they are based on intersections of circles, hyperbolas, and lines, respectively. The location is determined using standard complex computation methods that are usually implemented in software and needed relatively long execution time. An important factor in achieving this is to minimize and simplify the instructions that the mobile station (MS) has to execute in the location determination process. Finding an effective location estimation technique to facilitate processing data is the main focuses in this paper. Therefore, in the wireless propagation environment the Received Signal Strength (RSS) information from three base stations (BSs) are recorded and processed and they can provide an overlapping coverage area of interest. Then an easy geometric technique is applied in order to effectively calculate the location of the desired MS. [C77]

"Generalizing FFR by Flexible Sub-Band Allocation in OFDMA Networks with Irregular Cell Layout"

Fractional Frequency Reuse (FFR) is one of the key concepts for enhancing cell-edge performance of OFDMA networks. Standard FFR allows one sub-band to be allocated for each cell. This limits the performance improvement of cell edge users, especially those bandwidth-sensitive users. With flexible sub-band allocation, cell edge can be allocated more than one sub-band, thereby performance can be improved largely. Furthermore, previous work on FFR has focused on networks of relatively small size and with standard hexagon- shaped cells.For real-life networks with a very irregular cell layout, these results are inadequate. In this paper, we present the idea of Flexible FFR (FFR-F) which allows more than one sub-band to be allocated to cell edges. Meanwhile, an optimization algorithm based on local search is present for FFR-F planning in large-scale networks with irregular cell layout. Sub-band allocation scheme which maximizes the cell-edge throughput can be found time efficiently. Results from networks with realistic radio propagation conditions show that FFR-F enables significant throughput improvement at cell edges. These results along with the analysis demonstrate the potential benefits of FFR-F and the proposed approach for planning of real-life OFDMA networks. [C78]

"Development of a WirelessHART compatible field device"

The use of wireless industrial field devices (sensors and actuators) is gradually increasing. The easy installation and repositioning of these devices are the greatest motivators of this tendency. On the other hand, wave propagation phenomena, radio frequency coexistence and energy consumption are inherent difficulties that must be taken into account. The applied wireless communication protocol must cope with these difficulties and avoid or minimize them. In this paper, the WirelessHART protocol is introduced as well as the development of a compatible field device. A data logger software and firmware are developed to test the system. The results are presented at the end and can be used to help in the development of new devices. [C79]

"Acceleration of wireless channel simulation using GPUs"

High-fidelity site-specific modeling of wireless communications channels has historically been too computationally intensive for casual implementation in network simulators. However, simulation cannot predict the behavior of wireless networks in real-world environments without modeling the physical channel to the degree needed to support the objectives of the simulation. The most commonly used models for studies of networking protocols do not directly model domain geometry, and use statistical models of path-loss. However, simulations of wireless indoors, or out in a domain that is cluttered with obstacles need more resolution in the description of the domain. Realistic models for these cases typically involve large amounts of floating point computation, to which modern GPUs are well suited. In this paper we demonstrate parallel radio propagation prediction in a single machine using multiple GPUs and CPU cores. We explore the tradeoffs between model accuracy and performance, and use techniques from graphical raytracing to improve the speed with which radio path loss can be computed. [C80]

"Radiated emission far-field propagation with multiple ground stitch locations within a printed circuit board"

Printed circuit boards (PCB) exhibit numerous properties related to the development of common-mode currents created by digital components. When multiple devices are switching simultaneously, a complex RF field will propagate into free space from package bond wires, the silicon die itself, via implementation, poor transmission line routing, the physical board edge, interconnects, and numerous other areas generally not recognized by the designer. The majority of electromagnetic interference (EMI) is associated with a poor power distribution network (PDN). Do we really know where the EMI is coming from with a fully populated assembly and what are the effects of increasing the number of ground stitch locations to chassis ground to disrupt propagating RF? Measurement of propagated field amplitude is easy related to regulatory compliance standards. Within a complex PCB, one generally does not know the source of the EMI based on only simulation, since many second and third order parasitics are unknown to the designer. This paper investigates overall effects of disrupting the dipole antenna structure of the power distribution network in the far field using numerous source stimuli versus a simple single source stimulus along with simple transmission line routing to a simple end termination. [C81]

"Effects of Diffracted Waves for Perfectly Conducting Wedges in Propagation Path of Wireless Communication"

In order to have an effective utilization of the radio wave resources, it is important to estimate propagation path in the urban area. In our previous work, we have examined the diffracted fields by two horizontal edges with an arbitrary angle which are in different and same heights, when a source is located lower than the height of the edges. In this paper, we compare the strength of the direct field, single and double diffracted fields, when the height of the source is varied. The numerical calculations are carried out for two wedges and a building-like double-wedge on perfect conductor. The results show that the higher the source is located, the stronger the diffracted fields become. [C82]

"Radio propagation path loss prediction of UMTS for an urban area"

In this paper, three path loss models were used to predict path loss for the UMTS, in Istanbul, Turkey. Used models are Advanced Okumura-Hata model and Algorithm 9999 from the empirical path loss model class and Advanced Walfisch-Ikegami model from the deterministic path loss model class. The study concentrates on comparative parametric analysis for propagation path loss in macro cell region using different models and contains comparative study with real measurements obtained from a WCDMA based wireless network. This study concluded that among three models, the Advanced Walfisch-Ikegami model gives the best result in the urban environment for Istanbul. [C83]

"OTA measurements of wireless stations in reverberation chamber versus anechoic chamber: from accuracy models to testing of MIMO systems"

The paper will describe the fundamental characteristics of different wave propagation environments (such as Rayleigh fading, Rice fading, and polarization balance; coherence bandwidth and time delay spread; and fading speed, coherence time and Doppler spread), and relate these characteristics to the Line-Of-Sight (LOS) emulated by good anechoic chambers, and the rich isotropic multipath environment emulated by good reverberation chambers. The conclusion is that the reverberation chambers mean the same to Over-The-Air (OTA) testing of antennas for use in multipath environments as anechoic chambers do to antennas for free-space-like environments. They enable a unique, objective and repeatable antenna characterization that cannot be achieved in other environments. Thereby, the reverberation chambers and anechoic chambers complement each other perfectly. The paper will also give examples showing that the performances of three different types of incremental antennas are very different and depend strongly on their orientation when they are located in a 2-D horizontal multipath environment with incoming waves only in the horizontal plane, whereas their performances are equal and invariant to orientation when they are located in a rich isotropic multipath environment as emulated by a reverberation chamber. The paper also summarizes how the reverberation chamber during the last ten years has been developed to an accurate tool to determine the performance characteristics of complete wireless terminals, stations and systems both for the transmitting case (total radiated power) and the receiving case (total isotropic sensitivity and average fading sensitivity), and when the stations are provided with antenna diversity and MIMO (Multiple Input Multiple Output) capability. [C84]

"Design and optimization of the electromagnetic front-end for wireless sensors floating in dissipative media"

The interest in the exploitation of wireless sensor networks in dissipative media (other than the free space) is

nowadays growing in importance, thanks to the identification of newer and newer fields of application. This paper introduces a methodology for the analysis of the geometrical parameters of the antenna. The proposed procedure takes into account the coupling mechanism with the surrounding medium, as well as the electromagnetic interaction with the electronic and metallic components of the sensor. In this way, the identification of the parameters can be carried out by an introduction of a simplified iterative pre-conditioned modeling procedure that avoids long running times typical of a complete full wave model. Results obtained for the analysis of mobile sensor networks floating in underground water conduits confirm the adequacy of the proposed method. [C85]

"Simulating Doppler components in the vehicle-to-vehicle communication channel"

Deep understanding of the Doppler spectrum components is an indispensable part to alleviate fading impairments in Vehicle Ad Hoc Networks (VANET). This paper presents a method to simulate the different Doppler components, incorporating vehicle speeds, environment and traffic. We hope this can serve as a building block for realistic simulation, and can be used to improve the reliability and robustness of wireless communications in VANET systems. [C86]

"An analysis of potential performance of passive TDOA systems with a short baseline"

Improving the effectiveness of passive systems, as shown in is associated with a decreasing of base distance between the receiver sites and therefore simultaneous increasing of accuracy of measurement of the differential time of the signal coming in these sites. One of the important parameters of passive TDOA systems with a short baseline, by which is made an assessment of their effectiveness is the coverage of system. The coverage of passive systems outlines the space inside of which the error estimates of the radio-frequency source location with given probability does not exceed the selected value. Based on the conditions of the use of radio-frequency sources on the land, sea and air locations the maximal coverage of the passive TDOA system is within the limits of Г‚Вїline of sightГ‚Вї. The report analyzes the various factors and their impact on the coverage of passive TDOA systems with a short baseline. These factors include conditions of radio-waves propagation, system power quality factor (Q-factor), the geometry of the location of receiver sites and the coherence degree. The report outlines the principles of the influence of external factors on the deformation of zone boundaries of the system coverage. Based on the analysis of measuring the value of errors of the differential time of signal arrival on the receiver sites, which are caused by the influence of various factors, the report provides the analysis of potential performance of the passive TDOA systems, and also the results of theoretical studies of the deformation of systems coverage which are predefined by the influence of signal specular reflection from the surface of two medium (Fig. 1). [C87]

"Results of mobile channel sounding measurements in the 4.9 GHz public safety band"

This paper describes a channel sounding system and a corresponding data processing method for the characterization of wireless channels in the 4.9 GHz public safety band. The equipment and subsequent processing enable high-resolution estimation of propagation delay, Doppler frequency shift, and direction-of-arrival (azimuth and elevation) associated with multipath signal components. Results are shown that verify the proper functioning of the equipment and parameter estimation method. [C88]

"Computing Radio Paths in an Urban Environment"

This work presents a new radio paths computation frame-work especially designed for complex indoor RF field prediction. We propose a new algorithm utilizing a geometric visibility graph of a building to traverse all possible bounded radio paths. These paths are needed to compute the signal strength as received at given receiver location. We have implemented the suggested algorithm and performed a set of experiments testing the radio paths over complex buildings. The main conclusion is that the new algorithm is both (i) Accurate: predicts the signal strength within complex buildings, (ii) Runtime efficient: can compute all relevant radio paths even on relatively complex structures comprised of thousands of walls in a matter of seconds. [C89]

"3D Mobile-to-Mobile wireless channel model"

A three-dimensional single-input single-output Mobile-to-Mobile wireless channel model is developed in this paper by considering the underlying physics of free space wave propagation. Based on this channel model, the temporal correlation function for a general three dimensional scattering environment is derived. The temporal correlation function is characterized by the joint angular power distribution at the transmitter and receiver antennas and the speed of transmitter and receiver antennas. Using a von Mises-Fisher distribution as the angular power distribution, the usefulness of the derived temporal correlation function is discussed. [C90]

"Effects of path visibility on channel capacity of urban MIMO systems"

Multiple-Input Multiple-Output (MIMO) wireless communication technology has been expected to improve the channel capacity with a limited bandwidth for the future networks. Since the propagation environment or the propagation channel becomes very complex, it is difficult to simply estimate the channel capacity in urban MIMO systems. Hence, we introduce the characteristics of channel capacity in urban MIMO system by using a ray-tracing method. The simulation by this method with variable parameters can estimate various urban propagation characteristics and discriminate the effects of the urban model and antenna configurations. Moreover, we introduce path visibility, which is defined as the probability that at least one of the antenna elements of the mobile terminal (MT) can receive the direct wave when considering the downlink scenario, in order to make a measure in urban MIMO systems. It is represented in this study that the characteristics of the channel capacity can be figured out directly from the path visibility by the ray-tracing simulation. It also gives the guidance that the appropriate range of the base station (BS) antenna height can be determined from the path visibility. [C91]

"Multibeam distribution of waves in the channel of radio contact of the systems transmissions given: Design and methods of improvement of indexes of the system"

That the environment of distribution brings in distortion in an ideal signal, radiated a transmitter, both as a result of addition of noises and by distortion of useful signal. Noises of radio channel include base-line noise of ether, parasite radiations of industrial electrical equipment and other extraneous radiations. [C92]

"Research on Channel Characteristics of Through-the-Earth Communication Based on FDTD Method"

The channel characteristic of through-the-earth communication is calculated and simulated by Finite Difference Time Domain (FDTD) method. The reflection and transmission coefficients are obtained based on the different electric parameters in the channel. And the propagating characteristics of the layered earth in a loop antenna are investigated. The result can be served as a helpful guideline to design the through-the-earth communication system. It has shown that the FDTD method is a very effective way to solve the transmission problem in complex mediums. [C93]

"A local Total Electron Content neural network model over Cyprus"

This paper presents the application of neural networks for the prediction of the Total Electron Content (TEC) over Cyprus. This ionospheric characteristic constitutes an important parameter in trans-ionospheric links since it is used to derive the signal delay imposed by the ionosphere. The model is based on TEC measurements obtained over a period of 11 years. [C94]

"A deconvolution method to remove distortion caused by antenna radiation pattern from measurement"

The influence of vegetation on radiowave signals has become an important aspect of the design of wireless communication links. In recent years the theory of Radiative Energy Transfer has been adopted as a reliable tool to predict the radiowave propagation through and near vegetation. However one major factor influencing accuracy of the measurement is the radiation pattern of the receiver antenna. The measured pattern will be the convolution product of the antenna radiation pattern and the phase function of the vegetation medium. The measured pattern therefore needs to undergo a deconvolution process before enable to provide reliable information. This paper presents a deconvolution method developed using optimum compensation filtering to remove the distortion caused by the receiver antenna radiation pattern. A pre-filtering technique using auto/cross-correlation is utilised to improve the deconvolution results, as well as an error function is deployed to determine the optimal parameter in the iterative filter. [C95]

"WiMAX performance at 4.9 GHz"

Worldwide Interoperability for Microwave Access (referred to as WiMAX) is a MAC and physical layer wireless communications technology for outdoor broadband wireless coverage. In collaboration with the Clemson University Police Department, we have deployed an 802.16d WiMAX network that operates at 4.9 GHz at Clemson University. In this paper, we present the results from a performance analysis we have conducted of the WiMAX network. To the best of our knowledge the work reported in this paper is the first academic study of an operational 4.9 GHz WiMAX in which controlled experiments could be conducted. While neither the 4.9 GHz spectrum nor the current WiMAX profiles settings might be optimal for space or lunar communications, a study of WiMAX at any frequency is of value to both the aerospace industry and the research community. The WiMAX

standard leaves key areas of the protocol, including packet scheduling, frame packing, and modulation/coding adaptation, unspecified. In order to accurately model and analyze WiMAX, realistic assumptions must be used. Because WiMAX systems have not been widely studied, there is a disconnect between theoretical WiMAX systems and real-world deployed systems. This motivates the research presented in this paper. Using knowledge of the equipment's implementation choices, we derive theoretical application throughput for both TCP and UDP protocols and correlate expected results with empirical results. We also summarize results from a coverage analysis of the system. The combined results lead to an important point: although equipment implementation choices contribute to the achieved performance of WiMAX, the physics surrounding 4.9 GHz RF propagation will likely have the most significant impact on system performance. [C96]

"About the time measurement of radio-waves propagation in atmosphere at nanoseconds accuracy"

Methods for measuring time of radio-waves propagation in troposphere are presented in article. The estimate of measurements is 1-10 nanoseconds for purpose of high-precision synchronization. [C97]

"Analysis of relay network duplexing, multiplexing, & multiple access: Application to aeronautical networks"

Relay networks have seen use in many systems, including satellites, sensors, aeronautical systems, etc. Advantages of relays include range extension, capacity increase, reduced transmission power, and possibly diversity. Disadvantages include increased latency and implementation complexity. In aeronautical applications, link distances can be orders of magnitude larger than in terrestrial cases, and propagation conditions are also substantially different. Thus, solutions for terrestrial settings are not necessarily applicable to aeronautical cases. Although relay networks have seen increased attention, optimal resource allocation methods have not been determined. The question of which multiple access, duplexing, and multiplexing (MA/Dup/Mux) techniques are preferable for relay networks is still under study. In this paper, we analyze several MA/Dup/Mux techniques in non-redundant uni-directional and bi-directional relay networks. These techniques allocate resources to network nodes in the time, frequency, and time-frequency domains. We provide comparisons among the various schemes for uni- and bidirectional relay networks, in terms of resource allocation, duty cycles, required data rate per transmission, required transmit power per link, and relative range. Although commonly employed techniques that only use time division appear adequate in some cases-such as short range networks-our results show that appropriate time-frequency schemes can be superior in terms of data rate and/or quality of service, especially for long range aeronautical networks. Pure frequency division schemes also attain the largest range for a given data rate and performance. [C98]

"The effect of human shadowing on RF signal strengths of IEEE802.11a systems on board business jets"

Wireless networks provide the technology that allows the service provisioning of a number of applications to mobile stations. In recent years, aircraft manufacturers have been evaluating the possibility of offering this technology on-board their aircrafts. This will help manufacturers to reduce cable complexity while offering new services to the passengers. This paper proposes a novel and efficient simulation technique that can be used to analyze the effect of a cabin attendant, or a passenger, walking down the aisle of a business jet on the signal strength received by the mobile users. The aircraft environment provides a particular radio propagation scenario with its tunnel shape and a high density clutter. The propagation is effected by obstacles inside the cabin, like furniture and seats, resulting in propagation that is mainly due to reflection, refraction and scattering. A further factor affecting the received signal field of a wireless system is human shadowing. Therefore, successful modeling of the wireless system requires that simulations include the effects introduced by people moving. This can result in signal fluctuations with fading depths that can exceed 40 dB. A 3D ray tracing technique, based on Geometric Optics (GO) was used to simulate the propagation characteristics inside a Falcon business jet. The internal of the aircraft was divided into a number of cells, with each cell having very small dimensions. The simulation was performed in two steps. Initially only a static channel was considered, where a large number of rays were launched from an antenna and the propagation path of each ray was followed. For each cell inside the cabin the index of the rays that passed through the cell were kept in conjunction to the power contribution of that ray. The starting angle of each ray launched was also stored. Secondly, the model of the human, consisting of different cylinders representing the legs, arms, torso and head, was superimposed on the cabin's layou--t. For each human position, only the rays passing through those cells were simulated, resulting in a significant reduction in simulation time. The human advanced 4 cells at a time, resulting in a walking speed of around 1.5 meters per second. Thus, the person will cover the length of the cabin's aisle in a total of 67 steps. Different scenarios can thus be considered for the communication devices within the cabin. This work considers the scenario with four laptops, using an IEEE802.11a wireless connection, placed on top of the tables representing

passengers working at their seats. Depending on the position of the moving person within the aisle, the received signal at particular laptop positions resulted in signal fluctuations between -6 dB to +67 dB from the nominal received signal strength. [C99]

"On the propagation of wireless signals on board ships"

The characterization of the wireless channel on board a cruise ship is considered by means of frequency domain measurements of received power and propagation attenuation. This electromagnetic environment is rather new and is characterized by abundance of reflecting surfaces and diffracting elements, so that a significant difference with respect to more common residential and office environments has been found. The measurement setup is simple and easy to position and operate. The results consist of corrected path loss laws for halls and corridors and the quantification of scattering influence. [C100]

"An optimised of high-efficiency vehicular loop antenna for NVIS applications"

The performance of several commonly used vehicle-mounted, both whip and loop antennas is analysed in this paper. From these results it is apparent that the loop is the preferable configuration and an optimised, loaded loop antenna is presented. The loading is necessary to control the current distribution around the loop and a procedure for determining the value of that capactive loading. Therefore, conclusion obtained that the loop antenna exhibited high efficiency in the condition mentioned above. [C101]

"Application of the differential evolution algorithm to the optimization of two-dimensional synthetic aperture microwave radiometer circle array"

A new optimization technique based on the differential evolution algorithm is presented for the design of two-dimensional synthetic aperture microwave radiometer circle array. The object function is designed by minimizing redundant array and maximizing the distance between spatial frequency coverage samples and the optimal results of 16~32 elements circle array are obtained. Compare with simulated annealing algorithm and symmetrical distribution array, the numerical results show that the differential evolution algorithm can obtain a better solution and observably decrease computational run time. The image reconstruction and inversion algorithm of two-dimensional synthetic aperture microwave radiometer is G matrix algorithm. Compare with the symmetrical circle array, the image reconstruction of the optimal array is better. [C102]

"Multiple time-domain diffraction of plane waves by an array of perfectly conducting wedges for UWB signals"

The time domain (TD) solution for multiple wedge diffraction case considering plane wave incidence is investigated. The proposed TD solution is based on the representation of the inverse Laplace transform of the corresponding frequency domain (FD) solution in closed form, as it is given by a hybrid of the uniform theory of diffraction (UTD)-physic optics (PO) solution. An algorithm to predict the TD diffracted field after an arbitrary number of perfectly conducting wedges having different interior angles is presented. The algorithm has the major advantage of saving the computation time over the existing formulation when the number of wedges is very large. The source is assumed to be above, bellow, or level with the wedge height. The proposed TD solution is validated with the numerical inverse fast Fourier transform of the FD solution. [C103]

"Measurement on 2.3GHz wideband indoor MIMO channel based on dual polarization antennas"

This paper describes a newly-built broadband multiple input, multiple output (MIMO) channel characterization platform in indoor environment. The platform has been designed for measuring the S21 parameter between M transmitters and N receivers (M<;=8, N<;=8), which enables us to analyze the capacity and the directional multipath of the radio propagation channel. Data has been collected within a band varying from 2.2 GHz to 2.4 GHz inside a typical modern building with 8 transmitting antennas and 4 receiving antennas. Capacity results from these experiments are discussed for different propagation conditions, including none line-of-sight (NLOS), obstructed Line-of-Sight (OLOS) and line-of-sight (LOS) propagations with various spacing diversities and polarization diversities between array elements. [C104]

"A technique for wireless LAN connection through building concrete wall at 2.4GHz"

A technique for wireless LAN connection through building concrete wall is proposed. The propagation loss in a 10 cm-thick concrete is found at about -8.9 dB at 2.4 GHz by simulation and experiment. Using a large aperture horn antenna mounted flush on the back of wall, the attenuated signal power is raked over a wide area and reradiated into a space behind the wall via a small second antenna connected back-to-back to the first one in the downlink. It is possible to make the reradiated field in a limited region near the second antenna nearly as

strong as that of the wave incident on the wall. An unlicensed small-power relay station based on the IEEE802.11 g/b standards is placed in this region to complete the downlink. In the uplink, the signal power from the relay station antenna is picked up by the second antenna and radiated into the space outside the wall. An amplifier of about 13 dB gain is required in the uplink in order to make the uplink versus downlink link budgets balanced. The amplifier gain is so set as to comply with the limit set by regulatory agency. The proposed method is analyzed by 3D simulation and its feasibility is supported by experiment. [C105]

"An Improved Recurrent Neural Network for Radio Propagation Loss Prediction"

Prediction of the radio propagation loss using a numeric parabolic equation method is often accepted for its accuracy, but the large computational time is a hindrance in applications requiring real-time situation awareness. A modified Elman recurrent neural network is proposed and developed to resolve this problem. In this paper, the three dimensional parabolic equation models is used to provide the sample set of the neural network, and improved BP algorithm is used for the training and study of network. Then the Elman network model established is used to predict propagation loss in rest region. In contrast to other prediction models, the results show that Elman neural network that dramatically improves the computation speed with a better precision is reliable and practical. [C106]

"Analysis of two-dimensional circle-array synthetic aperture microwave radiometer channel errors"

Analysis of synthetic aperture microwave radiometer errors in channel such as mutual-coupling, channel imbalance, system noise based on two-dimensional 16 cells array arrangement is given, and the simulation models are established. Then the error compensation method, noise elimination and Image reconstruction based on BG Algorithm is given. Simulations show compensation method of channel error is valid. [C107]

"Waste of radio frequency signal analysis for wireless energy harvester"

Process by which energy is derived from external sources like thermal energy, wind energy and kinetic energy, captured and stored are called `Energy Harvesting' or `Energy Scavenging'. Normally this method is applied to small autonomous robot, wearable electronic devices and wireless sensor networks. Firstly, radio frequency (RF) radiation is a subset of electromagnetic radiation with a wavelength of 100km to 1mm, which is a frequency of 3 KHz to 300 GHz, respectively. This range of electromagnetic radiation constitutes the radio spectrum and corresponds to the frequency of alternating current electrical signals used to produce and detect radio waves. RF can refer to electromagnetic oscillations in either electrical circuits or radiation through air and space. Like other subsets of electromagnetic radiation, RF travels at the speed of light. The reasons that this project focus on Radio Frequencies Energies is that for starter, radio frequencies itself are electric energy that is transmitting though the air by ionizing the medium on its paths. The energy also can be easily found in our surrounding as it is used widely by many applications like television broadcasting, telecommunication and in microwave too. By using it availability, we are harvesting it and turning it into electrical energy although only small amount of it can be obtained. [C108]

"Wireless channel modeling for campus sensor networks"

This paper deals with the modeling of radiochannel propagation characteristics of wireless sensor networks in a hybrid indoor/outdoor environment. In order to perform radioplanning calculations, in house empirical models as well as full 3D raytracing algorithms have been implemented. The results aid in optimal layout of the hybrid network configuration. [C109]

"Application of multi-antenna technologies in cellular mobile communications"

In cellular mobile communications, multipath fading, shadowing, near-far problem and the Doppler effect have led to a complex radio wave propagation environment. Furthermore, with the continuously increasing of users and operations, not only new bandwidth is required, new technologies and measures are also expected to improve the system capacity and channel capacity. This paper introduces the general structure of multi-antenna communication systems firstly, then analyzes the characteristics of various multi-antenna technologies and their advantages over single antenna system when applied in cellular mobile communications. Finally, combined with the trends and requirements of cellular mobile communications, the further application of multi-antenna technologies in future cellular mobile communications is prospected. [C110]

"Effect on source signal condition for pyramidal microwave absorber performance"

In designing a microwave absorber for anechoic chamber, there are many condition can affect the performance of microwave absorber. In this work, four conditions are discussed to compare the reflectivity or S11 of the

pyramidal microwave absorber. The conditions are different signal source position, areas, angle, and lastly the distance between signal source and pyramidal microwave absorber. These pyramidal microwave absorber are simulated in CST Microwave Studio by using the rice husk as it based material that have dielectric constant, εr = 2.9. This absorber has been designed to operate effectively in frequency range of 1 GHz to 20 GHz. [C111]

"Experimental setup for Earth-space propagation research"

The use of new frequency bands in Earth-space links requires a detailed knowledge of channel characteristics. Propagation experiments, as the one presented in this paper, allow improving the characterization of the different atmospheric effects that must be taken into account in the slant-path channel: attenuation by rain, cloud and gases, and fast fluctuations due to tropospheric turbulence. The experiment carried out in Madrid consists of a beacon receiver at Ka-band, a radiometer at the same frequency and several devices for measuring precipitation. The effects of rain attenuation have been analyzed in more detailed using the first two years of experimental measurements. [C112]

"GPR signal phase structure aplication for estimation of distribution of soil electrical properties on depth"

The mathematical algorithms for reconstruction of the soil layers electrical characteristics using the estimated dependency of radio waves attenuation per unit length on frequency or similar dependency on phase velocity are described in [1, 2]. To perform this reconstruction we used a well known Kramer-Kronig equation, which is then lead to a nonlinear singular integral equation for the unknown functional dependence of the soil conductivity on the frequency. Then the equation is solved by a numerical iterative method, with evaluated dependencies of conductivity and permittivity on the frequency in a range of probing signal carrier frequency as a result. The main difficulty here is an attempt to assess the functional dependence of attenuation per unit length or the phase velocity on frequency. The first method uses filtering of signal that corresponds to specific soil layer on the output of georadar receiver phase detector. Then the frequency dependence of the phase velocity of radio waves in this layer is estimated using the displacement of the object image in depth when using low-frequency and high frequency parts of the probe signal spectrum. Both the first and second algorithms do not allow obtaining highly accurately estimated electrical characteristics, so it is impossible to estimate accurately the frequency dependence of attenuation per unit length or the phase velocity of radio waves propagation in the layers of the soil. [C113]

"Diagnostics of refraction coefficient on results of meteorological parameters measurement in arbitrary points of area"

It is known the operating efficiency of radio technical systems of different function (navigation, radar, communication), to a great extent depend on condition of propagation of radio-waves is conditioned on atmosphere refraction state. It for one's turn is conditioned on spatial-temporal distribution of refraction coefficient n. And variation of mean refraction and numerous cases of so called anomalous propagation of radio-waves could lead to considerable increasing of signal level over the horizon or signal fading in the radio optical line of distance and influence on accuracy of radar and navigation measurements.At present for location the systems of global navigation is in wide application. The completely deployed GPS system of USA exists today. Russia realizes intense work on unwrapping of complete constellation of GLONAS satellites. In the Europe the development of Galileo system is finishes. To the utmost the troposphere influences on results of coordinate measurements. Ignoring of this fact leads to error of measuring of pseudo-range from 2,5 m. (in zenith) to 25 m. (while satellite elevation about 5 degrees). The possible way to decreasing of location error is taking into account troposphere influence while processing of information in the Ukrainian system of cosmic navigation provision (USCNP) [1, 2]. There are two main modes of correction: real-time and post session. For real-time processing we propose to use the data of meteorological stations are in the set of controlling-correcting stations (CCS) USCNP. At that have to be provided accuracies of coordinates determination not worth of some meters. While post session processing corrections are forming on the base of phase observations by stations of USCNP net. The obtained errors of measurement are about some centimeters. Troposphere delays in the realtime the meteorological parameters are obtained in series of points of space are used for approximation. The meteorological parameters of functions approxi--mating dependence of temperature, pressure and humidity on latitude and longitude in the range of Ukraine are forming and giving for users on the base of these delays. Besides the parameters of functions approximating dependence of zenith troposphere delay on latitude and longitude in the range of Ukraine are forming and giving for users. Both these approaches are on the base of troposphere delays calculation using data of meteorological stations to the sea level. Truncation error of estimation is about 2.5%. The analyses is carried out [2] and shows the order of approximating model practically not influences on error of troposphere delay measurement and so we conclude about possibility of usage of zero order model, i.e. the mean data for Ukraine. We seem the bases for such conclusion is small accuracies of

measurement of meteorological parameters. [C114]

"Exact transparent boundary condition for beam propagation in rectangular domain"

In this paper we report an exact 3D transparent boundary condition for the parabolic equation in a rectangular computational domain. It is an exact generalization of the well known 2D transparent boundary condition. The condition is based on an assumption that any wave that reaches a boundary of the computational domain is lost. It relates a boundary value of the field at any given longitudinal position to the field values at the preceding computational steps. As an example propagation of light along a simple structured optical fiber is demonstrated. The proposed condition is simple and robust and reduces the size of the computational domain considerably. [C115]

"System Capacity and Coverage Analysis of Femtocell Networks"

Recently much attention has been devoted to the potential of femtocell to improve indoor cellular coverage and high speed wireless communications. Femtocell networks use home base station and existing digital subscriber line (DSL) or other cable line as backhaul connectivity constructing a hierarchical cell structure (HCS) networks operating with macrocells which cover wider service areas. This paper investigates the effect of interference on system performances of femtocell embedded HCS networks adopting detailed radio propagation models while most of works evaluate system performance using simple radio propagation models. Considering various environmental factors such as wall structure, number of walls, and distance between femtocell and users, this paper evaluates not only the overall outage probability and the dynamic range of spectral efficiency achieved by overall femtocells in HCS networks, but also separation distances from macrocell required to femtocell for provision of the minimum required spectral efficiency. Our evaluation includes outage probability of 2~40%, spectral efficiency dynamics of around 250%, 50~200m of required separation from macrocell with various wall structures, which could be useful for femtocell embedded HCS network planning. [C116]

"Design and Simulation of Narrowband Indoor Radio Propagation Channels under LOS and NLOS Propagation Conditions"

This paper deals with the design and simulation of narrowband indoor propagation channels under line-of-sight (LOS) and non-LOS (NLOS) propagation conditions. We propose a reference channel model assuming that the scatterers are uniformly distributed in the two-dimensional (2D) horizontal space of a room. We derive analytical expressions for the probability density function (PDF) of the angle-of-arrival (AOA), the Doppler power spectral density (PSD), and the temporal autocorrelation function (ACF). We derive a sum-of-cisoids (SOC) channel simulator from the reference model. It is shown by numerical results that the statistical properties of the SOC channel simulator match very closely with the ones of the reference model. It turns out that our indoor reference model can be approximated by an SOC channel simulator with reduced realization expenditure. The resulting SOC channel simulator allows us to evaluate the performance of mobile communication systems in indoor environments by simulations. It is demonstrated that the generalized method of equal areas (GMEA) and the basic Riemann sum method (BRSM) are efficient parameter computation methods for the design of SOC indoor channel simulators. [C117]

"60 GHz Radio Channel Measurements and Modeling in a Shielded Room"

This report describes results from 60 GHz channel measurements and modelling in a shielded room. Final goal of this work is to investigate potential and feasibility of 60 GHz radios for very-high-data-rate short-range communications in medical applications. The measurement in a shielded room is meaningful for studying propagation characteristics in medical applications, since real surgery rooms are typically shielded. One particular usage scenario, i.e., real-time video streaming for ultrasonic imaging, was considered, where the antenna settings were adjusted to the usage scenario accordingly. Link budget and delay domain multipath characteristics were analyzed and modelled. Finally, model parameters that fit the measured power delay profiles were given. [C118]

"Low Complexity Positioning System for Indoor Multipath Environments"

In this paper, we consider localization based on the Time-of-Arrival (ToA) of Ultra-Wideband (UWB) impulse radio pulses. We present a receiver structure for ToA estimation, which can be implemented with very low complexity and low power consumption. Standard approaches for ToA estimation of UWB pulses require very high speed A/D conversion, which makes them impractical for implementation. Although ToA estimation based on phase estimation of narrowband signals circumvents that problem, the estimation performance suffers strongly from multipath propagation. We propose to combine the advantages of both techniques by performing spectral estimation at the output of a UWB energy detection receiver. This system benefits from resolvability of

multipath components due to a large signaling bandwidth, but requires only low sampling rates. The impact of bandwidth on the ToA estimation accuracy is derived analytically and a closed form approximation of the estimation variance for a multipath channel is given. Moreover, we present a performance evaluation based on measured channels and show that accuracy up to 20 cm can be reached in strong multipath environments. [C119]

"Extension of the dRET Model to Include Scattering from Tree Trunks in Microcell Urban Mobile Scenarios"

This paper proposes a framework for extending the applicability of the discrete RET (dRET) model to accommodate radiowave scattering from tree trunks, particularly in microcell urban mobile scenarios, at micro- and millimetre wave frequencies. This framework aims to provide accurate modelling of the signal emanated inside and around isolated blocks of tree trunks, for instances, in raised canopy forests or in urban street canyons like scenarios. Model validation against measurement results inside an anechoic chamber for a double line of regularly spaced metallic and dielectric trunks at 18.8 GHz, as well as recommendations for a more encompassing model, are presented. [C120]

"Cauchy Angular Distribution for Clustered Radio Propagation SIMO Channel Model"

This paper presents a state-space based simulation model for single-input and multiple-output (SIMO) channels with spatio-temporal channel-correlations due to clustered radio propagation. The scattering clusters are modeled as two-dimensional Cauchy (TDCA) clusters. This renders an angle of arrival (AOA) that can be approximated as a Cauchy angular distribution. An autoregressive order one (AR1) model is able to approximate the spatio-temporal correlation. A state-space model is employed to the temporal dynamics of the SIMO channels. The contribution of the cluster to each antenna is a state in this model. A correlated innovation process adjusts the correlation between antennas. This renders the appropriate spatio-temporal channel correlation in the simulated channels. [C121]

"Empirical Time-Spatial Propagation Formula for Outdoor NLOS and LOS Environments"

In order to accurately evaluate spatial processing techniques such as MIMO for wideband mobile communications, a Time-Spatial Propagation (TSP) model that can simulate the characteristics of both the delay profile and the spatial arrival angular profile for travelling waves at the same time is required. We proposed an empirical TSP model for wideband mobile communication systems using UHF and SHF bands in non-line of sight (NLOS) environments. Based on field measurement data, this paper extends the TSP model for NLOS environments to also cover Line of Sight (LOS) environments. [C122]

"A Novel Sampling Method for the Spatial Frequencies of Sinusoid-Based Shadowing Models"

Careful modeling of the radio channel characteristics is an important issue for system level simulations. While a number of detailed path loss, shadowing and fast fading models can be found in literature, many of them entail large computational efforts and hence lead to long simulation times, or require huge amounts of memory. In this paper, we focus on shadowing models with two-dimensional correlation properties. We present handover performance evaluations as a use case from which requirements to the modeling of the shadow fading are derived. For different implementations of the shadow fading in system level simulations, we discuss their pros and cons and then focus on the sum of sinusoid model proposed by Cai and Giannakis. Our main contribution lies in a new frequency sampling method to determine the coefficients of the sinusoidal waveforms. We show that this new method, denoted as Power Sampling Method (PSM), allows for a significant reduction of the number of sinusoids while the correlation properties of the shadow fading channel are preserved. [C123]

"Impact of Network Coding on System Delay for Multi-Source Multi-Destination Scenarios"

Existing work has shown that random coding across multi-cast sessions can reduce the system delay significantly, however, such a scheme requires the strong assumption that each source has the priori information of other sources' messages. Actually the broadcasting nature of radio propagation can provide an opportunity to realize collaboration across sessions without causing much system overhead. In this paper, we propose the application of network coding to multi-source multi-destination (MSMD) scenarios and provide formal analysis for the improvement of system delay. In particular, two types of analytical results have been developed, one based on the outage probability and the other based on the use of practical convolutional codes. Monte-Carlo simulation results have also been provided to demonstrate the delay performance of the proposed network coded protocol. [C124]

"Mult-wavelength radar performance modeling during an extreme clear air propagation event over the Persian Gulf"

Non-standard radio frequency (RF) propagation extends for hundreds of kilometers over the water when surface ducts are formed due to offshore flow of warm and dry air over colder sea surfaces. Surface ducts are created when the vertical gradient of modified refractivity (dM/dz) is less than zero. The vertical gradient of M is dependent on the vertical gradient of potential temperature (dθ/dz) and the vertical gradient of water vapor mixing ratio (dw/dz) as shown in equation 1. Depending on temperature and relative humidity, the w gradient term can be two to six times the θ gradient term. [C125]

"Advances in antennas and propagation for body centric wireless communications"

Research in antennas and propagation for body centric wireless communications continues to grow, in response to increasing demands for body area networks (BANs) for healthcare, defence and personal communications and entertainment. This paper will briefly review recent international work, and then report on advances in three UK BAN research centres, Birmingham, Queen Mary and Queens Belfast. The demand for greater security in BAN links could be met by the use of 60GHz channels, and the likely channel characteristics will be discussed and initial results given. New insights into surface wave excitation on the human body has enabled a novel low profile antenna to be designed that maximises link performance where very thin antennas are necessary. Finally advances in the numerical computation are reported, in which the importance of relating phantoms directly to patients to give subject specific simulations and to allow improved modelling of internal organs. [C126]

"Calculation of interference from fixed services to a deep space earth station"

This paper aims at methodology of calculation of interference from terrestrial services to a deep-space earth station. Certain radiowave propagation issues related to calculation of the interference are addressed. The purpose of the analysis is to determine the possible level of interference in 32 GHz frequency band with respect to the reliability of operation of deep space missions. The methodology is applied to Robledo deep space earth station, Spain. The results are given in form of statistical distribution of interference levels. [C127]

"Simulation of propagation through a frequency selective wall at 3 GHz"

A novel hybrid model is presented to study the radio wave propagation through frequency selective structures (FSS) used to control propagation in an outdoor to indoor building environment. This hybrid model is based on combining ray-tracing with a commercial tool, Computer Simulation Technology (CST) Microwave Studio. Numerical results of the hybrid model have been compared with those of a full wave rigorous solver for FSS small in wavelength terms. Good agreement has been achieved with substantially increased computation efficiency, which validates the recommended hybrid method for this class of applications. [C128]

"Propagation Path Loss Estimation Using Nonlinear Multi-Regression Approach"

Some theoretical and experimental models have been considered for the prediction of the path loss in mobile communication systems. This paper presents an alternative method to model the path loss characteristics, taking into account data analytical methods to discover dependency pattern among propagation model parameters. We applied the concept of nonlinear multi-regression to predict path losses from the collected data, such as considering carrier frequency, path loss exponent, and distance between transmitter and receiver. Based on this information, the pseudo gradient search approach is adopted to determine the optimal search direction, build propagation knowledge, and accurately estimate the path loss. Finally, the free space path loss is adopted in order to validate our approach. The results are found to be well in agreement with theoretical results. [C129]

"Articulated Postures for Subject-Specific RF Simulation"

With the development of miniaturized wireless wearable and implantable medical devices, pervasive monitoring is becoming a clinical reality. With an increasing drive for minimizing power utilization, optimal antenna design and radio wave propagation are important topics for BSN (body sensor networks) research. To this end, subject-specific modeling is essential for achieving a truly personalized and optimized sensor design. In this paper, a Volumetric Graph Laplacian method is used for subject-specific whole-body mesh warping for finite-difference time-domain (FDTD) simulations. Validation of the method is shown with data from both phantom and MR studies with FDTD simulations. [C130]

"Use of the HYCELL model for predicting rain attenuation on UAS low elevation datalinks"

A new approach based on the HYCELL model for predicting the rain attenuation on low elevation links is

presented. Using the Cumulative Distribution Function (CDF) of rainfall rate and the probability of rain occurrence for a specific region as an input to HYCELL, rain fields are simulated at mid-scale (i.e. 150Ч150 kmI) for different locations in the world. From the geometrical (path length, elevation angle) and radiowave (frequency, polarization) characteristics of a link, the simulated rain fields are then converted into rain attenuation fields. Monte-Carlo technique is used to compute the long-term CDF of rain attenuation for links with elevation angles as low as 0° and for different frequencies at Ku and Ka bands. The methodology is applied on UAS datalinks operating at Ku and Ka frequency bands located at any elevation angles in a distance of less than 150 km from the transmitter. The results are compared to experimental distributions provided by the ITU-R DBSG3 database for Earth-satellite and terrestrial links. The results are also compared to Recommendations ITU-R P.618 and P.530. It is shown that the predictions of rain attenuation derived from HYCELL are close to the considered DBSG3 measurements and, in some cases, more accurate than the attenuation prediction derived from ITU Recommendations. [C131]

"A Comparison between Performances of QPSK and 16QAM Signals for a Underground Multiuser Scenario"

We will present a security/disaster scenario for a communications system with multiple access and code division in direct sequence where a number of sources communicate concurrently over the same physical channel. Since the main difference between the underground communications and the terrestrial one is the communications medium, we have investigated the specific propagation problems in dielectric medium for 16QAM and QPSK modulated signals. We found that QPSK technique is a better choice for propagation at large distances (over 200m) while for short distance transmissions, the 16QAM has some clear advantages. [C132]

"Wave propagation communication models for Wireless Underground Sensor Networks"

Wireless Underground Sensor Networks (WUSNs) can be used to monitor a variety of conditions in both underground and above ground environments. Sensor nodes in WUSNs are usually buried underground and this posses the biggest challenge in as far as implementing WUSNs is concerned. Sensors in WUSNs are expected to communicate through dense substances such as soil or rock. This paper first discusses wave propagation attenuation modeling for wireless communication in underground channels and then proposes an enhanced model based on the CRIM-Fresnel, the modified Friis model and other models. The proposed model considers most of the characteristics comprising the underground wireless channel that would affect the communication efficiency in this environment. In particular, the underground communication channel is modeled by considering not only the propagation attenuation due to dielectric properties of the soil, but also other factors such as reflection, phase shifting, refraction, and the distance between sensor nodes. The proposed model shows through simulations that with lower frequencies and shorter distances underground communication with EM waves is possible with minimal attenuation. [C133]

"Resolution analysis of the MUSIC-based TOA algorithm"

The MUSIC based TOA algorithm was briefly introduced. And the resolution analysis of the algorithm was made both in theory and simulation experiments. The function of the resolution ability and the noise threshold of the algorithm were developed. Some conclusions about the choices of the algorithm parameter values were made. [C134]

"Measurement of energy absorption flux during ionospheric heating in polar region"

Based on energy and momentum equations, the energy absorption flux near the reflection height is calculated by using the electron density, electron temperature and ion temperature measured in the heating campaign on August 16-19 2009. It is shown that the energy absorption flux is close to Gauss distribution, but the structure is not symmetric along beam absorption centre. The curve of absorption maximum with frequency difference exists break point near 0.6MHz, and we can carry out an optimization heating in a critical state, which is important for building the experiential and semi-experiential model of energy absorption flux. [C135]

"Outage probability analysis of opportunistic cooperative multicast based on coded cooperation"

Cooperative communication has been proposed to improve the performance affected by multi-path propagation in the wireless network. Then, coded cooperation is emerging as a promising technology to improve the outage performances. Combining the coded cooperation with opportunistic relaying scheme can minimize the outage probability. In this paper, we propose a multicast cooperation strategy based on opportunistic relay selection with coded cooperation. The outage performance analysis of this strategy is obtained in this work. Furthermore, through numerical results, we analyze the average outage probability of different number of relay and cooperative ratio. [C136]

"A novel positioning method for WLAN based on propagation modeling"

In recent years, many researchers have paid attention to using the existing wireless local area network infrastructure to estimate position. There are two kinds of signal-strength-based modeling for WLAN positioning system: propagation modeling and fingerprinting modeling. The propagation modeling can not have high positioning accuracy; and the fingerprinting modeling will take great effort and time. In this paper, a novel method is proposed to determine the position of user according to the ratio of distances from the difference of RSSI, which improves the more accuracy than traditional propagation modeling and saves the more cost than fingerprinting modeling. Also, one filtering measure is presented to discard incorrect information. It makes the positioning system work efficiently. [C137]

"A Multi-Hop Broadcast scheme for propagation of emergency messages in VANET"

In this paper, a multi-hop broadcast scheme called LDMB (Link-based Distributed Multi-hop Broadcast) is proposed to broadcast emergency messages efficiently in VANET (Vehicular Ad Hoc Network). The forwarding scheme in LDMB is completely distributed, where each vehicle who receives the emergency message estimates its link status firstly and then computes the waiting time before forwarding this message. LDMB does not need any handshakes and there may be several candidates to forward the message which guarantees the reliability of the multi-hop broadcast. Simulation results show that LDMB can have close performance in reliability but offer lower latency compared with other multi-hop broadcast protocols. [C138]

"An optimization method of station distribution"

In order to improve the measurement precision of ballistic trajectory, station distribution is taken as optimization object in this paper. Beginning with the observation equation of Photo-electric theodolite, the target function is constructed based on error propagation theory, which considers all the constraint conditions of engineering application: the capability of the optical measuring equipment, the angle between the optical measuring equipment and the sun, and the rules for the area selection. A distribution optimization algorithm on the basis of genetic arithmetic is proposed based on the target function. At last, the simulation experiments are presented, and the experiment results prove that the optimization algorithm can be applied to improve the precision of the measurement of ballistic trajectory. [C139]

"Forecasting the ionospheric fo F2 in Chinese region by neural network technique"

By using artificial neural network (NN) and considering the effects of the solar and geomagnetic activities on the ionosphere, a method for forecasting the ionospheric critical frequency, foF2, up to 5 hour ahead at any target geographic location in Chinese region has been proposed. The inputs of the NN are time, day of the year, geographical latitude, solar zenith angle, the twelve recent past observations of foF2and the 30-day mean moving values of foF2from the target location. The outputs of the NN are F+1, F+2, F+3, F+4, F+5, representing the values of foF2up to 5h ahead. Data from Wulumqi, Changchun, Chongqing and Guangzhou stations spanning the period 1958-1968 are used for training the NN. Historical data at nine different stations in China are used to checkout the network respectively (Not including the training set). The performance of the NN is measured by calculating the root-mean-square error (RMS) difference between the NN outputs and measured station data. The results indicate that the prediction of NN has good agreement with measured data. [C140]

"Extension of clutter loss calculation for recommendation ITU-R P.452"

With the aim of extending the method in recommendation ITU-R P.452, this paper derives a new clutter loss calculation method, which yields losses for given occurrence probabilities. We use the knife-edge model to derive a new relation between the clutter losses and occurrence probability, the only essential parameter is the average building height in the area being investigated. The proposed method also makes it possible to take frequency characteristics into account. Numerical examples are given and their results are compared to the clutter losses output by the current method in P.452. [C141]

"Localization of Lee model based on measured data"

This article analyzes radiowave propagation prediction model of Lee thoroughly, and limitation is presented using this method; mathematical basis of model localization is given, and a high-accuracy radiowave propagation prediction model is obtained after model localization; the article shows that the error of new Lee model can be controlled in less than 20%. [C142]

"The ELF/VLF field at the depth of submarine excited by satellite electropult"

In this paper, propagation of ELF/VLF waves from the low ionosphere to the surface of the sea is discussed. The ionosphere is regarded as a homogeneous anisotropic plasma. Specially, heavy ions is considered as a part of the tensor permittivity in the analysis and computation of ELF waves. Further more, according to the atmosphere yawp and attenuation characteristic of the waves penetrating into the sea, a proper frequency has been given in submarine communication. [C143]

"Low-latitude ionospheric perturbations responding to zonal disturbance electric fields"

The equatorial electric field plays an important role in low-latitude ionospheric plasma drifts and distributions at both quiet and disturbed time, which leads to complex ionospheric variability near the Equatorial Ionization Anomaly (EIA). In this study, ionospheric foF2 data from two low-latitude ionosondes and equatorial disturbance fields from an empirical model during fifty storms between 1978~1995 are picked in search of the nonlinear responses of low-latitude ionospheric perturbations to zonal disturbance electric fields. The results show that the responses exhibit remarkable differences versus season and location. This indicates that the low-latitude ionospheric variabilities caused by the disturbance electric field show deep relation to their quiet-time evolutions. [C144]

"Basic MUF observation and comparison of HF radio frequency prediction based on different ionosphere models"

Representative basic MUF of six circuits in China region of lower solar activity year was collected, which had over a 250° azimuth from 3.1° to 261.3°, and distance from 592.9 km to 1734.0 km. Then, basic MUF theoretical prediction based on ITU-R reference ionospheric model and China reference ionospheric model are compared with observation data. The results show that: 1) basic MUF prediction method recommended in ITU-R is valid in China region; 2) basic MUF prediction results based on China reference ionospheric model is better than that based on ITU-R reference ionospheric model in China region. [C145]

"A study on the ionospheric parameter f0 2 instantaneous mapping based on equivalent sunspot number"

A CRI (Chinese Reference Ionosphere model) based kriging real time updating method for foF2 is presented in this paper. This method uses effective sunspot number (Reff) and selects the relative difference between the observed and the CRI model calculated values of foF2 as the variable. During solar maximum, the root mean square error is 1.32 MHz and the relative error is 14.86%. While during solar minimum, the root mean square error is 1.06 MHz, and the relative error is 19.02%. On average, the globally root mean square error is 1.2 MHz, and the globally relative error is 17.07%. The evaluate method of `relative comparison method' is put forward, and by comparing with the algorithm without using Reff, the root mean square error is reduced by 0.75%,and the relative error is decreased by 1.05%. [C146]

"The applications of multiple phase-screen technique in ionospheric scintillation"

Understanding the effects of propagation of radio wave through ionospheric irregularities is critical in the design of transionospheric link. In this paper, some results of scintillation simulations based on the multiple phase-screen (MPS) technique is presented. The results include the fluctuation of amplitude and phase of received signal, the calculation of S4 and sigmaphi index, and the distortion of wideband pulse shape. It can be seen that the MPS technique is very convenient in the modelling of transionospheric scintillation channel. [C147]

"Comparison between Xia and Walfisch-Ikegami models for low-rise building path loss prediction"

This paper presents path loss prediction on 2-D aerial images taken from the actual areas. The original Xia path loss model and the Walfisch-Ikegami model were applied for predicting in low rise building area. In case of the Xia model for non line of sight (NLOS), it requires a set of model parameters such as distance from the last roof top to receiver, average building height, and antenna heights. While the Walfisch-Ikegami (WI) model requires road parameters such as road width and road orientation. We performed measurements at frequencies of 900 and 1800 MHz for comparison between the two approaches. From the results it is found that the Xia model provides good agreement, while the WI model provides good agreement especially when the receiver is on the street between two buildings. [C148]

"Radio propagation modelling in the downlink LTE"

In order to support development of third generation partnership project long term evolution (3GPP LTE) packet

scheduling algorithms, research has been conducted into several radio propagation effects. The radio channels of interest are the downlink (eNodeB to user equipment) of LTE mobile networks. Through network simulator modification and repeated testing the effects of error and delay in reporting available user mobile Signal to Noise Ratio (SNR) has been investigated. Simulation results show that errors in reported SNR will increase erroneous transmission, and the effect increased with greater numbers of users. Simulations results also show that the effect of processing delay is largely dependent on the velocity of the affected mobile user. [C149]

"Propagation characteristics for a 60 GHz Wireless body area network (WBAN)"

The 60 GHz band is an unlicensed band which features a wide communication bandwidth and a low probability of intercept due to high oxygen absorption. The wide bandwidth allows for a high volume of information to be transmitted wirelessly over a short interval of time. The signal confinement in both time and space makes the 60 GHz band an ideal candidate for a covert Body Area Network (BAN). Current and future soldiers can attain enhanced mobility and increased survivability by taking advantage of advancements in V-band WLAN technology. In this paper, we study the 60 GHz propagation conditions associated with a BAN, optimized for interconnecting various subsystems on a soldier. The 60 GHz wireless channel model study presented includes both human and pig measurement results and analytical channel simulations using ray tracing methods. Measurements were made using three different antennas-horn, slot and patch. The characterization of the channel is provided through path loss data and in some cases, S-parameter data from each node at different receiver points on a soldier's body and gear. [C150]

"Effects of nearby objects on fading and coupling in Line-Of-Sight environments"

Frequency-agile wideband radios may be susceptible to non-linear effects from strong electromagnetic signals coupled from co-site or nearby emitters. Also, such signals can impact spectrum sensing capability of Dynamic Spectrum Access (DSA) systems. Therefore, it is important to understand the characteristics of the coupling channel between nearby systems due to Line-of-Sight (LOS) propagation and reflections from nearby objects, such as buildings in the urban environment or hills in the rural environment. The presence of nearby objects can cause significant variations in the strength of the coupling leading to enhancement or fading of the coupled signal. Significant fading or variation in coupling may inadvertently cause DSA radios or other systems that have spectrum sensing capability to make erroneous decision on the selection of the operating frequency. In this paper we define a channel model for coupling among nearby systems. Our analysis considers two-ray and six-ray propagation models to define the nearby LOS coupling channel. We investigate the variation of the coupling as a function of frequency and the arrangement of the surrounding obstructions. We aggregate this data to provide a comprehensive channel model that can be used by radio designers and system integrators to help analyze the electromagnetic environment caused by nearby emitters. [C151]

"Investigation of indoor WIFI radio signal propagation"

The purpose of this study is to analyze the WIFI signal propagation, using IEEE 802.11g radio interface. In most cases, the WIFI radio interface is installed by the people who are not familiar with the system, especially when dealing with signal propagation at high frequency. Hence, there is a need to understand this signal behavior particularly in indoor scenarios. This study focuses indoor signal measurement and prediction. The measurement and prediction of this signal propagation is taken at the campus environment of University Kuala Lumpur British Malaysian Institute. Signals were monitored using a fixed Cisco Aironet 1200 Series access point (AP) and NET STUMBER software runs on portable computer. The Log Distance path loss model is used as the mathematical analysis. The measured data is compared with mathematical model to obtain the new possible path loss coefficient, for 802.11g radio interface. [C152]

"Modeling and statistical characterization of wideband indoor radio propagation channels"

In this paper, we focus on the modeling of wideband single-input single-output (SISO) mobile fading channels for indoor propagation environments. The derived indoor reference channel model is based on a geometrical scattering model, which consists of an infinite number of scatterers uniformly distributed over the two-dimensional (2D) horizontal plane of a rectangular room. We derive analytical expressions for the probability density function (PDF) of the angle of arrival (AOA), the power delay profile (PDP), and the frequency correlation function (FCF). An efficient sum-of-cisoids (SOC) channel simulator will be derived from the proposed non-realizable reference model. It is shown that the SOC channel simulator approximates the reference model with respect to the FCF. The SOC channel simulator can be employed to evaluate the performance of wideband indoor wireless communication systems. [C153]

"Evaluating vehicular radio connectivity with environment-based metrics"

Modeling radio wave propagation by a perfect circle around a transmitter is absolutely wrong. Obstacles effect must be considered especially in obstructed environments. In this paper we present a propagation model for vehicular network which takes into account the impact of physical obstacles present in the environment on electromagnetic wave propagation. Based on this model, we present a study of mobile connectivity for vehicular network in city environment. The considered area is a real map to which is added information on terrain type and zones attraction power. This information is used in both propagation and mobility models. We define several metrics characterizing radio connectivity and examine the effect of vehicles density and obstacles on this metrics. The study shows that when obstacles are ignored, the results are really optimistic in comparison with reality. [C154]

"Radio coverage and performance analysis for local area networks"

The paper is concerned with the study of coverage and co-channel interference for local area networks operating at three different frequencies -2.4 GHz, 5 GHz and 60 GHz. The studies will be conducted in an indoor environment. The effects of the surrounding environment on the radio wave propagation are studied in detail for each of the three technologies. Advantages and disadvantages of each of the networks are presented, taken from the analysis of the obtained results. Finally, the best solution for our environment is proposed. [C155]

"Limiting physical-layer attack propagation with power equalization placement in transparent WDM networks"

We propose and evaluate a Greedy Randomized Adaptive Search Procedure applied to minimize the number of power equalizers (GRASP-PE) needed to limit the propagation of high-power jamming attacks in WDM networks. Simulation results show that GRASP-PE significantly reduces the required number of power equalizers when compared to a greedy approach. [C156]

"Measurement and modeling of subway near shadowing phenomenon"

This paper focuses on one vital aspect in propagation characteristics inside subway tunnels: near shadowing phenomenon in a practical environment. In order to characterize this effect, an accurate measurement has been made at 2.4 GHz in a real environment in Madrid subway. By analyzing the numerical results in this measurement, the characteristic of near shadowing phenomenon in propagation process has been revealed and corresponding engineering suggestions have been given in order to compensate the near shadowing effect. Finally, statistical model including the depth, duration and length of near shadowing, fast fading and attenuation inside wide tunnel and narrow tunnel has been built and simulated. [C157]

"High-accuracy positioning method using public wireless network based on recorded radio propagation characteristics"

By focusing on the Personal Handy-phone System (PHS) positioning service used in physical distribution logistics, a method that improves the positioning accuracy is developed. A disadvantage of PHS positioning is that measurement errors caused by the fluctuation of radio waves due to buildings around the terminal are large, ranging from several tens to several hundreds of meters. Therefore, in this study, the proposed method developed estimates in advance the radio intensity distribution of each cell station containing errors and matches them with new data according to the radio propagation map. As a result, the positioning error is reduced to approximately 60% of that of the conventional positioning method. [C158]

"Enhanced Fractional Frequency Reuse for large-scale OFDMA networks with heterogeneous cell layout: Optimization and performance evaluation"

Fractional Frequency Reuse (FFR) is one of the key concepts for mitigating inter-cell interference and improving cell-edge performance in OFDMA networks. The standard FFR scheme is intuitive and optimal for the hexagon-shaped cell pattern. In contrast, real-life OFDMA systems have very irregular cell layout, thus the number of surrounding cells and their respective interference vary significantly over the network. For such scenarios, the standard scheme, if applicable at all, is inadequate because the number of sub-bands and the reuse factor are fixed. To overcome the limitations, we present enhanced FFR (EFFR) that allows for high flexibility in the total number of sub-bands as well as the allocation of sub-bands in edge zones. An optimization algorithm is developed to determine sub-band allocation to maximize the cell-edge throughput. Hence EFFR adapts the allocation and reuse pattern to the irregularity of each individual network. Evaluations based on networks with realistic radio propagation conditions show the high performance of EFFR in improving cell-edge throughput. The improvement allows for better trade-off between cell-center and cell-edge throughput. These results along with the analysis demonstrate the benefits of EFFR to performance engineering of OFDMA networks. [C159]

"Path loss models in viaduct and plain scenarios of the High-speed Railway"

This paper focuses on propagation path loss modeling in viaduct and plain scenarios of the High-speed Railway. The data used for modeling comes from measurement on Zhengzhou-Xi'an passenger dedicated line with the maximum moving speed of 340Km/h. Based on the measurement data, tuned Free-space path loss models in these two scenarios are proposed. The performance of the tuned models is compared with that of the Hata model. The evaluation of the models is in terms of mean error, root mean square error and standard deviation of the residuals between the models and measurement. The simulation results and related analysis show better performance of the proposed tuned models compared with the conventional Hata model. [C160]

"Cyclostationary-Based Architectures for Spectrum Sensing in IEEE 802.22 WRAN"

The well known noise rejection property of the cyclostationary spectrum makes it an ideal candidate for spectrum sensing in low SNR environments such as the IEEE 802.22 WRAN, which stipulates detection of primary signals at -20.8dB. In this paper, we propose two novel detector architectures that exploit cyclostationary properties: the Spectral Correlation Density (SCD), and the Magnitude Squared Coherence (MSC). Through extensive simulations, both on generated data and real world ATSC capture data, we show that our detector achieves an improvement of 2.5dB compared to existing proposals. Additionally, we compare our proposal against two popular choices for spectrum sensing in cognitive radio-the matched filter detection and energy detection, and show the superiority of cyclostationary spectrum sensing in such low SNR environments. [C161]

"Lowering Error Floors Using Dithered Belief Propagation"

We propose dithered belief propagation decoding algorithms to reduce the number of decoding failures of a belief propagation decoder and lower the error floor. The random nature of the algorithms enables a low hardware complexity compared to previously reported techniques. We introduce two dithering methods that target check node operations and channel input values, respectively. We present simulation results that confirm the error rate gains in the floor region, and that relate those gains with the maximum number of decoding iterations. The results show that the first algorithm can achieve good error rate gains with a low iteration limit. For the second algorithm, results show that with a large iteration limit, high FER gains are possible. Furthermore the average time complexity remains the same as that of a standard belief propagation algorithm. [C162]

"Secret Key Agreement Based on Radio Propagation Characteristics in Two-Way Relaying Systems"

We consider secret key agreement based on radio propagation characteristics in two-way relaying system where two legitimate parties named Alice and Bob communicate with each other via a relay. In this system, Alice and Bob share secret keys generated from their radio propagation characteristics by the help of the relay. In this paper, we present two secret key agreement schemes: an amplify-and-forward (AF) scheme and a multiple-access amplify-and-forward (MA-AF) scheme. In both of the schemes, the basic idea is to share the effective fading coefficient between Alice and Bob and use it as the source of secret keys. The AF scheme is based on a conventional amplify-and-forward two-way relaying method, while the MA-AF scheme utilizes the inherent combining of signals provided by simultaneous transmissions over a multiple-access channel in order to share the secret keys more securely efficiently. We analyze eavesdropping strategy in terms of eavesdropper's location and show that if the eavesdropper is located near the relay and can receive signals from the relay without multipath fading and noise, the AF scheme is not secure. Simulation results show that the MA-AF scheme is more secure and efficient than the AF scheme. [C163]

"Optimization of synthetic aperture microwave radiometer antenna array distributed on two-dimensional grid points"

The principle of antenna array distribution of two-dimensional synthetic aperture microwave radiometer is presented. The optimization technique based on differential evolution algorithm (DE) is presented for the design of antenna array. The object function is designed by minimizing redundant array and maximizing the distance between spatial frequency coverage samples, the stochastic array distributed on two-dimensional grid points are optimized, and the optimal results are obtained. Comparing with two-dimensional regular antenna array, the results show that the optimal array can obtain more spatial frequency samples and larger spatial frequency coverage. [C164]

"The signal propagation effects on IEEE 802.15.4 radio link in fire environment"

Radio communication systems play a major role in supporting wildfire suppression crews in firegrounds. In this

paper, we consider the effect of fire upon 2.4 GHz IEEE 802.15.4 radio link and propagation characteristics variation over the distance. Observations revealed that the considered bandwidth has perceptible degradation in signal strength and link quality in the presence of fire. Moreover, consistent results were observed in deterioration in signal strength and link quality parameters over the distance for the considered small fire environment. [C165]

"Feasibility study of radio links using evaporation duct over sea off Malaysian shores"

This study presents the feasibility of beyond-the-horizon radio links using evaporation duct over sea off Malaysian shores. Optimum frequency verses height, link budgeting and range analysis is studied with the help of Advance Refractive Effects Prediction System (AREPS). Results give a good indication that using off-the-shelf radio equipment with few meter antenna height, a reliable and cost effective maritime communication system can be attained. [C166]

"Occurrence of space VLF due to the earthquake events"

In recent years many research has pinpointed possible precursory signs that occur before an earthquake. One of the precursory signs that associated with earthquake (EQ) is the electromagnetic phenomena. Among these, the VLF electromagnetic emission is recognized as one of the most promising candidates for short-term earthquake prediction. This project focuses on revealing the perturbation of the VLF signals during earthquake event. In order to reveal possible earthquake precursor though the changes of VLF signal, Northern Sumatera Indonesia earthquake that happened on 7thApril 2010 is chosen as a study case. The observation was made on the day of the earthquake event occur. VLF data deployed from system called Atmospheric Weather Electromagnetic System for Observation Modeling and Education (AWESOME) through its VLF receiver. Matlab is used to simulate the data. The result shows that strong correlation between VLF and determination of earthquake precursors. [C167]

"Performance evaluation of beaconing in dense VANETs"

Beaconing is one of the core communication method for Vehicle Ad Hoc Networks (VANETs). In this paper we traced the beaconing behavior in dense VANETs by NS2 with free space, two-ray ground, and shadowing radio propagation models. Among the 100 line up vehicles with 10m inter-vehicle distance, one beacon can be successfully received by all vehicles in 55ms, the packet loss rate is about 40%. We also observed that there is fluctuation behavior in packet receive. [C168]

"Analysis of propagation model performance in WiMAX (IEEE 802.16e)-based wireless mobile vehicular networks"

WiMAX is an appropriate wireless technology for networked vehicular applications in intelligent transportation system because of its mobility support at vehicular speeds and its inherent wide coverage. In this paper, performance of a WiMAX (IEEE 802.16e Standard) mobile vehicular network is investigated under different existing empirical propagation models, hand-off scenarios and variation of speed for a moving MS. The study leads to the selection of a suitable propagation model for better performance with higher throughput and lower path loss. The network simulation is done by NCTUns simulation tool with design paradigms specified for WiMAX (IEEE 802.16e). [C169]

"Travelling wave approach for high field magnetic resonance imaging"

A theoretical investigation of the travelling-wave approach for high field magnetic resonance imaging (MRI) is presented. The travelling wave probes excite the fields in the longitudinal direction of the bore, so that the effects of the attenuation constant due to high permittivity and lossy tissue need to be calculated. In addition, the travelling wave modes should affect the B1+field homogeneity inside high permittivity and lossy tissue. The full-field solution of infinite waveguide loaded with a lossy dielectric cylinder for 7T travelling wave phenomenon is presented. The transcendental equation was solved numerically to find the attenuation and propagation constants. Results indicate that, the B1+field is independent of the antenna type, other than the magnitude as the purpose is just exciting modes. In this paper, the traveling wave probes were designed, fabricated, and tested for 7-tesla (7T) MRI. [C170]

"Aperture coupling near-field cavity effects for electromagnetic testing with measurements on a slotted circular cylinder"

Electric field measurements for an electromagnetic wave excited from a log-periodic dipole array at two separation distances on a finite slotted circular cylinder are compared to an analytical model of a plane wave on

an infinite slotted circular cylinder. The four foot diameter cylinder cross section is used to represent the cross section (1/2 scale) of an Army Blackhawk helicopter. The frequency range of interest is in the Very High Frequency (VHF) band where the first resonances of the cavity occur. Transverse Magnetic (TM) and Transverse Electric (TE) polarizations are considered. [C171]

"Wideband radio channel measurements around 800 MHz in outdoor to indoor and urban macro scenarios"

In this paper, the results of wideband multiple-input multiple-output (MIMO) measurements around 800 MHz in urban macro (UMa) and outdoor to indoor (O2I) scenarios are presented. The motivation for conducting the measurements was to extend the frequency range of the International Mobile Telecommunications-Advanced (IMT-A) channel model down to 700-800 MHz. The measurement campaigns on the lower frequency bands reported in literature are mostly narrowband measurements and therefore new measurements were needed. The results reported in this paper include path loss, shadow fading, delay spread, angular spread and Ricean K-factor. Angular spreads for both the mobile and base station are not previously presented in the literature for radio channel propagation at 800 MHz range. Also extensive measurement results for outdoor to indoor scenario around 800 MHz are non-existing in literature. [C172]

"Surface electric field distributions of lightweight phantom composed of wave absorber for simplified SAR measurement"

In recent years, the use of wireless communication devices that are used in close proximity to the human body has been increasing, and there has been growing concern about the effects of human exposure to electromagnetic waves radiated close to the human body. For this reason, a simplified method for measuring the specific absorption rate is required. In this paper, a flat-plane lightweight phantom comprising a radio wave absorber is considered as an alternative to a liquid phantom. The electrical parameters of the lightweight phantom are determined to be such that the amplitude of its surface impedance is identical to that of the surface impedance of the liquid phantom; the parameters are determined by using transmission-line theory. When a finite-difference time-domain (FDTD) method is used to determine the distributions of the electric field, the surface distributions of the electric field on the flat-plane lightweight phantom are found to be identical to those using a liquid phantom. Finally, surface distributions of the electric field using the lightweight phantom are determined from measurements and compared with those obtained using the FDTD method. [C173]

"A Closed-Form Formula for propagation characteristics of substrate integrated waveguide"

An analytical simple method is developed to calculate dispersion characteristics of substrate integrated waveguide (SIW). The complex propagation constant is derived as a closed-form equation which is a function of geometrical parameters. The periodic structure of an SIW can be considered as two consecutive rectangular waveguide with specific difference in widths. Each section is modeled by a transmission (ABCD) matrix. Propagation constant of the SIW is extracted by applying the Floquet theorem to the overall transmission matrix of a single unit cell. The results of this simple analytic expression agree well with numerical techniques and empirical equations. [C174]

"On side street effects in a ray tracing street canyon model"

In this paper we studied some side street effects in a ray tracing street canyon model. Introduction of side streets in a model results with the loss of some rays, and a street canyon model loses it strength. On all simulations 6 rays model is used. On the end, results from the simulations are compared with the ITU-R P.1411-4 recommendation. [C175]

"Effect of vertical angle spread of propagation channel on MIMO OTA measurement method"

Various OTA (over-the-air) measurement systems have been proposed and discussed for the evaluation of MIMO wireless communication devices. The spatial channel emulators, which is a typical MIMO OTA measurement method, usually assume only the horizontal angle spread of multipath radio propagation channel. In this report, the effect of vertical angle spread of propagation channel on MIMO OTA measurement is evaluated by the simulation based on the model of vertical and horizontal angle spread. The simulation result shows that the vertical angle spread has a substantial effect on antenna correlation and thus MIMO transmission performance. The need of emulation of vertical angle spread in the typical spatial channel emulators for MIMO OTA measurement is obviously inferred from the result. [C176]

"ZigBee Sensor Network propagation analysis for health-care application"

The goal of the work is to investigate the Radio Frequency (RF) propagation of ZigBee devices operating within a hospital environment to analyze their real indoor behaviour to design healthcare systems. Different Received Signal Strength Inidcation (RSSI) measurement campaigns have been carried out to characterize the main propagation features. On the basis of the experimental results it has been possible to analyze the different factors that affect the measurements, such as external factors (e.g. multipath, fading) or internal ones (e.g. hardware device, integrated antennas). Furthermore to deeply define the ZigBee behavior we have compared the measurements with a suitable propagation model. This preliminary study permitted us to include the main measurements outcomes in a planning simulator which emulates the radio propagation in hospital environments. Specifically the planning model proposed is useful to design a "Smart Hospital" and thus to define main performance requirements for a ZigBee Sensor Network deployed in real hospital environment. [C177]

"A cross layer framework for WLANs: Joint radio propagation and MAC protocol"

This paper proposes a cross-layer design (CLD) framework called channel-aware buffer unit multiple access (C-BUMA) for improving wireless local area network (WLAN) performance. In the framework, the radio propagation (i.e. PHY layer) is combined with the medium access control (MAC) protocol for packet transmissions. By sharing channel information with the MAC protocol, the approach reduced unnecessary packet transmissions and hence improved system performance. Through performance evaluation, we demonstrate that our CLD can significantly improve network throughput and packet delay. The proposed C-BUMA is simple and can easily be implemented in 802.11 networks without changing hardware infrastructure and no additional costs. In this paper we describe C-BUMA and present two algorithms for the implementation of the framework. [C178]

"Noise sensitivity analysis of spherical wave modelling of radio channels using linear scanners"

Spherical wave modeling has gained interest in radio propagation channel modelling. The idea is to consider the responses of radio channels for different spherical wave mode fields. In this paper, generation of spherical wave mode responses of a channel from measured data over a cubical scan surface is studied. Based on virtual array principle the robustness of spherical wave generation over 2-octave band for different cubical scan schemes is analyzed. This method presents the advantages for exploiting the measured data from widely used 3D linear scanners. Importantly, linear scanning supports well the acquisition of cubical scan data. Noise sensitivity analysis on a wide frequency range shows the feasibility of cubical scanning. Rules for the required number of scan locations on a cubical surface are provided. [C179]

"Photonic Millimeter-wave generation and long-term operation for the high-frequency Radio Interferometers"

Photonic millimeter-wave generation and long-term operation for the high-frequency radio interferometer are reported. The photonic millimeter-wave generator is installed in an antenna for the antenna holography system which measures the antenna surface accuracy. The photonic millimeter-wave generator is under continuous running more than 2 months.The operation frequency is 103.97 GHz. Undesired signals are suppressed to less than -30 dB. [C180]

"Predicting ionospheric storm-time fof2 using Support Vector Machine"

Using data from two ionosonde stations, Haikou and Chongqing, based on the knowledge gained from the variability of low latitude ionospheric storms, we have developed an empirical model using a new technique, Support Vector Machine, to predict the storm time F2 layer critical frequency, fof2. The model is driven by Dst, AE index and the historical data of fof2. Ionosonde data was sorted as a function of season, and the intensity of the storm, to obtain the corresponding dependencies. It indicated that the model described here can capture the low latitude storm time F2 layer variability at most times. [C181]

"The observations of Kunming meteor radar and height distribution of meteor"

Based on the meteor radar, one can study the radiant distribution and the time variant of meteors, investigate space debris and predict the passage time of meteor showers, and so on. By observation of the Kunming meteor radar, the observation data of meteor decay time and the ambipolar diffusion coefficient are consistent with the theories. By analyzing the 571632 meteors observed by Kunming meteor radar, the parameters of meteor are analyzed and the height distribution of meteors model has been constructed, the result predicted by this model agrees with observation data at different months. The work of the paper will be helpful to study distribution of meteor and passage time of meteor showers. [C182]

"Simulation modelling the GPS signal propagation in the tropospheric ducts"

This paper presents a thorough research on the GPS (Global Positioning System) signal propagation in the tropospheric ducts with ray tracing approach and the split-step parabolic equation (SSPE) method. In recent years, radio wave propagation in the troposphere has been attended extensively by many researchers, especially for the radio wave propagation in the ducting environment and its effect on radar system and electronic system. Generally, strong gradients of humidity and temperature can be observed closely to the air-water interface leading to anomalous propagation effects such as atmospheric ducting. Radio system and radar of maritime operation are greatly influenced by the existence of atmospheric ducts, it can give a rise to over-the-horizon detection and form the radar detection shadow zone. This paper introduced the GPS signal as the initial field by the PE method to study the electromagnetic wave propagation characteristics in the tropospheric ducts, and given the results by the ray tracing approach as comparison at the same time. [C183]

"Physical mechanism of the electric field amplification in the mid-latitude ionosphere over active tectonic faults"

The issue of seismo-ionospheric anomaly is noticeable increasingly. In this paper we use a model for the generation of the electric field in the ionosphere by an external current on the Earth's surface to calculate the electric field in the ionosphere over the forthcoming earthquake preparation area. At the selected parameters the horizontal electric field in the ionosphere reaches ~10mV/m, while the magnitude of the vertical electric field disturbance on the Earth's surface is limited by 100V/m. Then we discuss the influence of the anomalous electric field on the ionosphere characteristics. It leads to a perturbation in the critical frequency of F2 layer (foF2). We find the result is consistent with the observations. [C184]

"The operating frequency selection in HF hybrid sky-surface wave system"

Operating frequency selection of high frequency (HF) hybrid system with a single-pass sky-wave transmitting path and a single-pass surface wave receiving path is presented and analyzed in this paper. Based on the theory of ocean wave energy spectrum, the first and second-order sea clutter scattering cross section equations of biostatic system is introduced and the connection between the sea clutter and operation frequency is simulated. Using the experimental platform of the hybrid system and analyzing the emblematical experimental data, the criterion of frequency selection in favor of sea clutter detection is established. [C185]

"Impact of low marine atmospheric refractivity profiles on GPS signals' propagation"

Atmospheric duct is an abnormal refraction mechanism in marine atmospheric environment, which may influence the propagation of utralshort waves and microwaves significantly. In this paper, the propagation characteristics of low-elevation Global Positioning System (GPS) signals under different troposphere environment are calculated using the parabolic equation method. The results show that the propagation of GPS signals in atmospheric duct conditions is obviously different with that of standard atmosphere condition, and the propagation power is more. The propagation characteristics of GPS signals in condition of horizontal-inhomogeneous-evaporation-duct are firstly studied, it is concluded that the propagation of GPS signals will be more complex due to the horizontal inhomogeneity of the evaporation duct, and the propagation loss may be up to tens of dB. [C186]

"Antarctic SLF/ELF radio atmospheric noise measure and research in China"

It is the first time that the Antarctic super low frequency (SLF) and extremely low frequency (ELF) radio atmospheric noise has been measured in China. The time domain profile and the frequency domain profile of the data have been gained by analyzing and processing the measured data, and the change characteristic of the radio atmospheric noise has been discussed along the day, night and the frequency. The analysis of the measured data shows that the value of the radio atmospheric noise is very low in South Pole. It can reveal the real radio atmospheric noise because it avoids effectively the industry and the artificial electromagnetic interference. Moreover, the characteristic of Schumann resonance is very obvious. [C187]

"Anomalous enhancement of the ionospheric TEC before Haiti earthquake on 12 January 2010"

A major earthquake (M=7.3) occurred in Haiti (18.5°N, 72.5°W) at 21:53 UT on 12 January 2010. On the basis of regular GPS observations from the International GNSS service (IGS) network, Global Ionospheric Maps (GIMs) of total electron content (TEC) from 27 December 2009 to 16 January 2010 were analysed. It was shown that there was a significant enhancement of TEC around the epicentre on 11 January 2010, with a maximum of ~10TECu during 20:00-22:00UT. Taking into account of very quiet solar and geomagnetic activities during this period, we can conclude that the observed anomalous enhancement of the ionospheric TEC was likely associated with the imminent earthquake. [C188]

"A visual C++ program prototype for CADI ionogram scaling"

The Canada Advanced Digital Ionosonde (CADI) is a kind of low-cost, compact and full featured ionosonde, which is capable of good performance in observation and research of ionosphere physics. However the original software for CADI was developed in the DOS operating system, being limited in several points. Recently a CADI ionosonde was installed at Beijing space environment station (40.3°N, 116.2°E), China and its routine operation has started. In this paper, we present a visual C++ program prototype "CadiScale", which can be used to perform the preliminary scaling of CADI ionograms. This program also owns the capability for autoscaling the F2 and Es layer parameters. This program can be modified easily to scale other types of ionograms. [C189]

"An algorithm combined with EOFs analysis and MART for GPS-based ionospheric tomography"

Ionospheric imaging usually involves solving an underdetermined inversion problem. The inversion involving additional constraints is performed to enforce realistic profiles in the vertical. A new algorithm combined with empirical orthonormal functions (EOFs) analysis and multiplicative algebraic reconstruction technique (MART) for GPS-based ionospheric tomography has been given in this paper. EOFs can be used to reconstruct the background ionospheric electron density effectively with lower distortion, while the MART can lead to more accuracy by iteration. Numerical simulations and its application on actual GPS-based TEC observations proved that this algorithm offers better performance in physical study of the anomaly, particularly under storm events when its morphology deviates from normal. [C190]

"Adaptation of COST-231 Walfisch-Ikegami method to Ordu city in GSM 900 frequency band"

In this study consistency of measurement results obtained for one base station in Ordu city and COST-231 Walfisch-Ikegami method is investigated. It is observed that this method and measurement results are consistent when base station antenna height is higher than building height and when the distance between buildings is regular. Measurement result are plotted and tabulated by using MATLAB. All measurements are taken in case of non line of sight. [C191]

"Wave height dependence of L-Band small-grazing-angle sea clutter"

The representative semi-empirical sea clutter models (the GIT model and the TSC model) are not ideal applicability in littoral environments. In order to develop a really meaningful sea clutter model, relationship between sea clutter and parameters of sea conditions need to be studied. The wave height is a major influencing factor among these parameters of sea conditions. In this paper, experimental data of L-Band small-grazing-angle sea clutter were used to study the relationship between sea clutter and wave height. The parameters of relationship between wave height and sea clutter are obtained. These work play an important role in establishment of L-Band small-grazing-angle sea clutter model in littoral environment. [C192]

"Determination of the local electron density based on millimeter wave interferometry II: Experimental operations and comparisons"

The determination method of the local electron density is shown based on millimeter wave interferometry and the electron density measuring is experimented on a cylindrical capacitively coupled plasmas (CCP) setup. Results show the excellent agreement between the radial density profiles in the central plane measured by interferometry with the proposed analysis method and by the Langmuir probe system. [C193]

"Effects of objective functions on evaporation duct height estimation from radar sea clutter"

A new evaporation duct profile structure is presented by two parameters: evaporation duct height and strength. Two different objective functions are also introduced and analyzed, which show that the objective functions are multi-peak and not sensitive to evaporation duct strength. Based on the new duct model and the two objective functions, the estimations are operated by using differential evolutionary (DE) algorithm. All the estimated results are obtained by 200 Monte Carlo simulations and statistically analyzed. The effects of population size (PS) and clutter to noise ratio (CNR) is also investigated. The analyzed results show that increasing PS can not effectively improve the accuracy of estimations. However, high CNR can obviously improve the accuracy. [C194]

"Estimating low-altitude atmospheric refractivity structure from multi-frequency radar returns"

An estimation model for atmospheric refractivity structure based on multi-frequency radar sea returns is introduced in this paper. The model was assessed using evaporation duct inversion processes with a two-parameter environmental model employed. Through comparisons of RMS evaporation duct height and strength errors predicted by multi-frequency and single-frequency estimation model, it is illustrated that this multi-

frequency model is more robust in atmospheric refractivity structure inversion. [C195]

"Physical Layer Impact in Wireless Ad Hoc Network Routing"

In this paper, we present the set of factors in the physical layer that are relevant to the performance evaluation of the routing protocols. Such factors consist of signal reception, path loss, fading and interference considerations. Therefore it would be desirable for routing algorithms in wireless ad hoc networks, to be able to select paths that are more likely to be stable. With this in mind we adopt a numerical approach based on Finite State Markov Chain channel model to study the performance of an ad hoc routing protocol under various radio propagation models. Further this paper presents a new cross-layer algorithm for joint physical and routing layers in wireless ad hoc networks, applying this to the Optimized Link State Routing (OLSR), protocol. We address the problem of link and route stability, focusing particularly on multipoint relay (MPR) selection method, to find the most optimal routes between any pair of nodes. Our simulation results indicate that the network throughput is greatly improved and the delay is significantly decreased using this cross-layer mechanism, compared to the original OLSR. [C196]

"Indoor WLAN Monitoring and Planning Using Empirical and Theoretical Propagation Models"

The wireless propagation prediction and measurement techniques are the ideas behind a successful deployment of indoor wireless local area network (WLAN). Therefore, a solution is proposed to monitor and plan the WLAN, based on the propagation prediction and measurement techniques with coloured contour visualization for IEEE 802.11 a/b/g/n standards. The solution is able to help wireless designers to visualize the WLAN signal coverage, overlapping channel interference, data rate and signal to noise ratio (SNR). The radio predictions or planning works are based on the theoretical model and the measurements or monitoring works are based on empirical model. The visualization will show the results of the WLAN monitoring and planning works with indoor wireless propagation effects from the multiple floors of the building. The experimental devices are two dual band 2.4 GHz and 5 GHz (IEEE 802.11n) access points, a 2.4 GHz (802.11g) access point, and a wireless receiver from a laptop. [C197]

"Optimization of WLAN Indoor Location Network Based on Signal Coverage Requirement"

This paper presents the optimal networking strategy based on signal coverage requirement in wireless local area network (WLAN) indoor location environment. Up to now, much attention has been paid for the improvement of various positioning algorithms to guarantee the location efficiency in WLAN environment. However, the layout of access points (APs) and corresponding topological structures also significantly influence the accuracy performance. Therefore, in order to fill this gap, the optimization of WLAN indoor location network is introduced. Firstly, the indoor signal propagation model is analyzed in order to obtain the field distributions and calculate the requirement matrix. Then, the requirement matrix is utilized to optimize the numbers and positions of APs with best signal coverage performance. Furthermore, in the target location region with dimensions of 66.4Ч24.9m2, the feasibility and effectiveness of optimal WLAN networking strategy are verified by the typical positioning algorithm nearest neighbor (NN) respectively in the straight corridors and regular office rooms. [C198]

"Utilizing a channel emulator with a reverberation chamber to create the optimal MIMO OTA test methodology"

4G mobile wireless radio technologies are focused on delivering higher levels of throughput through the use of Multiple Input, Multiple Output (MIMO) technology. MIMO systems use multiple transmit and receive data paths to provide significant increases in data throughput by exploiting the characteristics of the radio channel. Thus, MIMO system performance is directly related to the propagation environment in which the device is operating. Full system test with all components in place, including the antennas, is critical to performance testing of MIMO transmissions. This paper will explore a new solution for over-the-air MIMO testing that combines a channel emulator with a reverberation chamber to achieve MIMO throughput performance testing and enable an accurate wireless device performance prediction. [C199]

"The impact of propagation environment and velocity on the handover performance of LTE systems"

In this paper, a generalized model is proposed to analyze the impact of propagation environment and velocity on the handover performance of user equipment (UE) for long term evolution (LTE) systems. An adaptive time window is defined within the generalized model, to provide additional flexibility to perform handover procedure over conventional reference signal received power (RSRP) and reference signal received quality (RSRQ) based procedures. The proposed algorithm reduces the call dropping rate during handover at the cell boundary of

urban cells, due to its enhanced degree of freedom in decision making process. In providing so, the process requires additional statistics, which are readily available at the receiver. Therefore, it does not require any additional computational complexity at UE. Finally, to demonstrate the validity of the proposed algorithm, simulation results along with the observations are presented. [C200]

"Using Automated Regularization deconvolution to extract input parameters of the phase function from measurement"

In recent years theory of Radiative Energy Transfer (RET) has been adapted as a reliable tool to predict radio wave propagation through and near vegetation. 4 independent input parameters are demanded for the developed RET model. Those parameters so far had to be established from one measurement only, thus limiting their accuracy. An independent measurement, which is termed the phase function, can readily yield 2 of the 4 input parameters independently, which significantly increases the accuracy of these parameters. However one major factor influencing the phase function measurement is the radiation pattern of the receiving antenna. The actually measured pattern will be the convolution production of the antenna radiation pattern and the phase function. The measurement therefore needs to undergo an "inverse process", i.e. deconvolution, before any RET input parameters can be derived from it. This paper presents a deconvolution technique developed by using the Automated Regularization method. Improved results are demonstrated in terms of the RMS errors. The measurements were conducted in a vegetation setup inside an anechoic chamber. [C201]

"Simulation models for independent Rayleigh fading channels"

Rayleigh fading channel plays an important role in mobile radio channel modeling. In this paper, the simulation models for Rayleigh fading channel based on sum-of-sinusoids are divided into four categories by a uniform framework, depending on whether the parameter sets (amplitudes, phases, or Doppler frequencies) are fixed or random in simulation trials. Furthermore, the mechanisms of multipath radio propagation show that the fading phenomenon is a primary result of time variations in phases, and we summarize altogether three methods to define the specific initial phases for each category of the simulation models. For comparison purposes the second-order statistics of different kinds of simulation models are presented. Based on these analyses, some conditions of an effective Rayleigh fading channel model simulator are concluded, and a useful simulator based on Zheng's model in Class II for multiple independent Rayleigh fading waveforms is achieved, which outperforms the other techniques in terms of its accuracy and convergence rate. [C202]

"An analytical path-loss model for on-body radio propagation"

An analytical model for across the body surface communication systems is presented. The paper is focused on the calculation of the approximate path gain, both along and around planar and cylindrical geometries, representative of the human body for antennas polarized normal to the body surface. The model is validated at 2.45 GHz using finite-difference time-domain numerical analysis and in-situ measurements on an adult-male test subject. [C203]

"Study on aluminate of cathode emission active substances"

Microwave tubes are used at the field of radar, electron counterwork and communication widely. The cathode is the heart of the microwave tube. The impregnated aluminate Ba-W cathode is used most widely. Along with the development of microwave technology, the high performance cathode is necessary with big current density, long life. The performance of cathode is decided by aluminate of cathode emission active substances. Forming method and sintering process are very important to the emission performance of aluminate. This paper studies the emission performance of aluminate forming method and sintering process. [C204]

"On distance estimation based on radio propagation models and outlier detection for indoor localization in Wireless Geosensor Networks"

The determination of a precise position in Wireless Geosensor Networks (GSN) requires the use of e.g. distance measurements. These distance observations derived by Received Signal Strength (RSS) measurements are inherently inaccurate. Furthermore, in general, the distance observations using RSS do not take obstacles into account. In this work in progress paper we present a new approach and first simulations to correct erroneous RSS measurements affected by obstacles in indoor scenarios. This technique is combined with the known "Anomaly Correction in Localization" (ACL) algorithm where sensor measurements are used to improve the determined sensor node positions and to detect and to eliminate outliers. Therefore, the new "extended Anomaly Correction in Localization" algorithm (eACL) will be formulated. [C205]

"Accuracy considerations of UWB localization systems dedicated to large-scale applications"

This contribution considers the accuracy limits of ultra-wideband localization systems dedicated to large-scale applications. Industrial environments are known for being extremely difficult for wireless communication, mainly because of the high concentration of large metal objects, such as containers or machines; leading to strong multipath propagation. In this work a detailed 3D model of the warehouse is used for wave propagation simulations. In the simulation, the transmitter is moving along the predefined path and the receiver infrastructure consists of eight base stations. The aim is to model the tracking system and asses its accuracy-first, the upper bound of the accuracy is determined under ideal conditions and second, the precision estimation with the inclusion of effects of hardware non-idealities is done. Effects such as the influence of pulse detection methods, pulse shape and geometrical configuration of base-stations are investigated. The position calculation of the mobile beacon is realized using a Time Difference of Arrival approach. Eventually the accuracy of the obtained results and the theoretical limit are considered based on the dilution of precision evaluations. [C206]

"Propagation modeling and placement algorithms for wireless sensor networks"

The energy efficiency is critical for application of wireless sensor networks, since it is a main precondition for their long-live functionality, small modification costs and reliability. This paper deals with the placement of wireless nodes based on the modeling of radio wave propagation. The methods are realized in a planning tool CANDY Wireless Site Finder that provides optimized topologies of wireless networks under considering of transmitted power, frequencies, propagation environments (in-door/out-door) and obstacles given in CAD-compatible formats. The tool is integrated in the framework of other CANDY tools aimed to efficient planning of heterogeneous wired and wireless networks. [C207]

"Large scale underwater FDTD ELF simulations using Acceleware and MPI parallel processing"

Very large FDTD simulations are being developed to determine the underwater propagation of EM signals at ELF frequencies. Two different approaches are being use to handle the large computation spaces, the use of hardware and software by Acceleware, and the use of the Message Passing Interface (MPI) for parallelization. [C208]

"Kirchhoff integrals applied to 3D simulations of radio wave propagation over complex terrain"

Kirchhoff integral techniques can provide a method of calculating radio wave propagation over complex terrain with non homogeneous atmospheres. For the case of 2D propagation, it has previously been shown that, when coupled with fast Fourier transform techniques, they provide efficient propagation simulation algorithms. In this paper we consider the extension of these ideas to the provision of efficient 3D propagation simulation algorithms. It is shown that appropriate extensions to the 2D algorithms can provide efficient 3D propagation simulation algorithms. [C209]

"Characteristics of the FM radio waves propagated over the epicenters"

We have gotten the first opportunity to observe characteristics of the FM radio wave propagated over the epicenter. In our observation system installed at Nobeyama, fluctuations of the FM radio wave of 82.3MHz had been observed on the two Niigata Prefecture earthquakes on October 23 in 2004 and on July 16 in 2007. In this paper, the propagation characteristics of FM radio wave are carefully checked for six years. Some EM anomalies of the FM radio waves had been detected before the earthquakes. However, the similar EM anomalies were detected not only before the earthquakes but also the following years. They have good correlated with the refractive index gradient of the atmosphere. Then, these EM anomalies are concluded not due to seismic but meteorological phenomena. [C210]

"Implementing a Trust-Aware Routing Protocol in Wireless Sensor Nodes"

Wireless Sensor Networks are gaining popularity due to the fact that they offer low-cost solutions for a variety of application domains. However, these networks are highly susceptible to attacks, due to both the open and distributed nature of the network, as well as the limited resources of the nodes, which dictate the implementation of sophisticated security frameworks. Trust-aware routing is an important direction in designing secure routing protocols for WSN. The common approach to provide trust-aware routing is to implement an efficient mechanism to evaluate the trustworthiness of neighboring nodes, based on a proper set of trust metrics. In this paper, we discuss several challenges addressed during the implementation of a trust-aware management scheme on commercial sensor nodes, as well as problems faced during the deployment of the test-bed network. As it will be discussed, the limited memory, computational power, energy resources and radio bandwidth of sensor nodes deeply impact the implementation strategy, while additionally, the realities of radio propagation, such as lossy

and asymmetric links, require careful evaluation of the routing selection metrics. [C211]

"Blind Path Identification System Design Base on RFID"

Blind path identification with the help of RFID technology not only makes the blind can gain feelings of orientation during walking, but also has the knowledge of the exactly location of the street. The main idea is that when a blind man walking on the path which has electronic tags pre-built under the tile of the blind path, those tags activated by radio wave came from the RFID reader sent their identity codes transmitted by the reader to the computer, and after the query of the database, the number of the street, the name of the shop of the current location of the blind will be known immediately, meanwhile, the corresponding voice data will be sent via earphones to the blind in order to get the precise identification. The system is composed of the hardware and software. The hardware includes the electronic tags, reader, MCU, wireless earphone and GSM circuit. The software is consisted of the database that controls the read-write of the tags, the management of the street info as well as the sending of the voice data. Experimental result shows that the system almost can achieve the proposed objective and provide the novel technology support for the blind path construction. [C212]

"Estimating Indoor Walking Velocity Profile Using a Software Radio-Based Radar"

Radar is an attractive technology for long term monitoring of human movement as it operates remotely, can be placed behind walls and is able to monitor a large area depending on its operating parameters. A radar signal reflected off a moving person carries rich information on his or her activity pattern in the form of a set of Doppler frequency components produced by the specific combination of limbs and torso movements. Deploying radars in indoor environments poses however challenges for the interpretation of signals reflected off a moving object due to multipath propagation. Two strategies for the estimation of human walking velocity profile in indoor environments are suggested and discussed. The accuracy of the strategies are evaluated and compared in a field experiment using a flexible and low-cost software defined radar platform. The results obtained indicate that both methods are able to estimate the velocity profile of the person's translational movement with less than 10% error. [C213]

"Characteristics of Diffracted Waves Going over Building Rooftop"

In order to have an effective utilization of the radio wave resources, it is important to estimate propagation path in the urban area. In our previous work, we have examined the diffracted fields by two edges with an arbitrary angle which are in different and same heights. In this paper, the characteristics of the diffracted fields by two horizontal edges of a building rooftop are discussed. The numerical calculations are carried out for two wedges of a building rooftop on perfect conductor and concrete wedges. The results show that the waves grazing on the rooftop of concrete building are considerably attenuated for the low concrete conductivity, but when parapets are constructed on the rooftop, the diffracted waves become stronger than the grazing waves. [C214]

"Analysis of the Lunar Atmosphere's Effect on the Observation of VLBI and USB"

This paper introduces the relevant research related to the navigation and positioning of the moon detector. Then, it takes an analysis of the distribution and component of the lunar atmosphere and determines the impacts on VLBI and USB of the lunar atmosphere by the effects on principles of electromagnetic wave through the atmosphere. Finally, appropriate solutions are given out. [C215]

"Path Loss Analysis for 3G Mobile Networks for Urban and Rural Regions of Mauritius"

In view of designing any mobile network system, the fundamental task is to predict the coverage of the proposed system. A wide variety of approaches have been developed over the years to predict coverage using what are known as propagation models. In this paper, we compare the measured path loss obtained for the sub-urban areas with that for the rural areas and then with four propagation models, that is, Clutter, Lee, Okumura-Hata and Extended COST-231. Firstly, for both areas, the results show that the path loss is not constant at various locations for a constant distance around the respective base transceiver station (BTS) showing that the terrain of Mauritius is irregular. The effects of multipath are more pronounced in the rural than causing higher probability of signal errors. Secondly, we find that Lee model is not in agreement with the values obtained for both regions. Observations show that the Clutter model gives better agreement for rural regions. However, observations show that the Okumura-Hata gives better agreement for all rural, suburban and urban regions, hence, it can be used to model any region in Mauritius. [C216]

"The analysis of effective width of the radiation pattern of space communication system antennas"

Formulas for the integrated distribution law of the normalized values of the envelope's square are deduced and

the effective width of the radiation pattern taking into account admissible irregularity and demanded probability is defined. [C217]

"Experimental spatial correlation characteristics of propagation channels in indoor environments"

Spatial auto- and cross-correlation characteristics of propagation channels are investigated for four indoor scenarios using measurement data. In addition to the well-known spatial auto-correlation effect, significant cross-correlation between channels is also observed. We found that non-zero spatial cross-correlation among channels may occur in three scenarios with possibly different mechanisms. These results should be considered when establishing realistic models for the spatial cross-correlation behavior of channels. [C218]

"Compound algorithms for simulation of electron devices with irregular waveguides"

Compound methods for solution of boundary problems for irregular waveguides with the use of statements of carry and averaging are suggested. [C219]

"Modified truthiness propagation algorithm for lossy source compression based on LDGM codes"

This letter considers the lossy source compression of a binary symmetric source using low-density generator matrix (LDGM) codes and truthiness propagation encoding algorithm. And a simple variant on the truthiness propagation is proposed by softening the a priori probability of the reconstructed source sequence. Comparisons with the truthiness propagation reveal that the proposed algorithm has better rate-distortion performance at low-to-medium code rates. [C220]

"NLOS error mitigation based on modified Kaiman filter for mobile location in cellular networks"

Non-line-of-sight (NLOS) propagation biases Time of Arrival (TOA) and Time Difference of Arrival (TDOA). It causes the principal error for the mobile location in cellular networks. To mitigate the positioning error, a mobile positioning approach based on modified Kalman filter is proposed in this paper. With this approach, the true range is estimated based on the measurements, and the estimated range is utilized to location solution, which can reduce the impact of NLOS effectively. In our approach, the modified Kalman filter adapt its parameters with the estimate of NLOS's standard deviation, which make the approach remain effective in different environments. Simulation results show that this approach presents a good positioning accuracy even under NLOS propagation environments. The approach can be well applicable to mobile location in cellular networks. [C221]

"Modeling of the electromagnetic interference map generated by 3G systems inside small aircraft"

The substantial increase in customer demand for office-like communication services during flights is pushing aircraft manufactures to implement wireless solutions inside aircraft. Nevertheless, aircraft safety is a paramount criterion for operators, thus the potential risks posed by such communication systems on aircraft equipment must be carefully assessed and respective countermeasures taken. In this work, we adopt a three-dimensional ray tracing method based on geometrical optics and combine it with electromagnetic field computation to model the interference generated by a 3G cellular system inside the cabin of a typical business jet. The model initially develops a propagation map of the electromagnetic (EM) radiation emitted by the Node B station inside the aircraft to determine the power incident on the receiving antennas of personal electronic devices (PEDs). This is used to establish the transmission power employed by each PED. Subsequently similar propagation maps are generated for each mobile device. All the radio space propagation maps are then vectorially combined to produce an EM interference map at the fuselage. [C222]

"Delay Profile Using Scale Model Method for Microcells in Urban Areas"

This paper proposes a scale model approach to clarify radio wave propagation for wireless link design of mobile radio communication systems. The objective of this study is channel impulse response for micro cells in urban areas. To verify reproducibility using the scale model, a one-hundredth scale model of an urban area using concrete blocks is constructed and power delay profiles are measured using the model in the 2 GHz and 10 GHz bands. The measured r.m.s. delay spreads are small values and are approximately 1/5 compared to those for a real environment. The lack of reproducibility of the power delay profile in the scale mode is examined, and the cause is found not to be the scale model itself, but rather the measurement frequency. [C223]

"Prediction of presence of communication on intervals of digital line-of-sight radio-relay systems"

A method, an algorithm and software for prediction of presence of communication on intervals of digital line-of-sight radio-relay systems are developed. The method for known characteristics of radio means and propagation

parameters calculates factor of unavailability of an interval and severely erroneous second ratio and compares them to the normalized values. The method takes into account a signal fading caused by a subrefraction of radio waves, by a multipath beams spreading, by a precipitations, by atmospheric gases and water vapours. [C224]

"Variations of electron density in the regional middle latitude D-region of the ionosphere, conditioned by the morning solar terminator during magnetic storm of the 7-11th of November, 2004"

The results of experimental investigations by the partial reflection radar of the electron density variations in the middle latitude ionospheric D-region during the morning solar terminator passage in the period of the magnetic storm dated the 7-11thof November, 2004, are presented. There was found the increase of the electron density more than 200% both in the period of the morning solar terminator passage and during tens min after this event. To explain such events a hypothesis concerning electron precipitations from the magnetosphere stimulated by the morning solar terminator is used. There were made estimations of the ionization rate. On the basis of the experimental data of electron density changes over the electron precipitation periods, corresponding fluxes were estimated, being p ≈ (0.6-8.8) 109m-2sec-1. [C225]

"Large-scale fading model for mobile communications in disaster and salvage scenarios"

Within a running project, I-LOV, wireless communication channel model for mobile radio propagation in disaster and salvage scenarios is developed. This contribution focuses on a semi-empirical large-scale fading (LSF) model, which is able to estimate signal power loss between base station and mobile phone under debris. Due to multitude of diverse materials appearing in burying scenarios, the signal loss factor varies heavily depending on electromagnetic properties of involved materials. Additionally, highly variable shape and dimension of rubbles impact strongly the loss factor. Besides numerous LSF models investigated in urban environments, only a few are in ruins. This paper presents a novel modeling concept of LSF in catastrophe scenarios. The proposed LSF model handles the radio propagation way in two parts: outside ruins and through the ruins. Measurements have been conducted at GSM 900 and GSM 1800 bands in collapsed buildings of stratified rubbles, as well as in an avalanche scenario. The model predication fits the measured data well. [C226]

"Analysis performance of decode-and-forward scheme in distributed MIMO repeater system"

Multiple-input multiple-output (MIMO) repeater systems have been discussed in several published papers. When a repeater has only one antenna element, the propagation environment is called keyhole. In this kind of scenario an achievable channel capacity and a link quality are decreased. Another limit is when the number of the antenna element of a repeater is larger than the one of a MIMO transceiver, the channel capacity cannot be increased. In this paper, to obtain an upper bound of the channel capacity, we express a propagation process of the distributed MIMO repeater system with decode-and-forward method by the numerical formula, and optimize the position of each repeater. [C227]

"Performance and comparison of large scale propagation models for an iBurst™ network"

This paper introduces ISIS as an application for iBurst™, a Mobile Broadband Wireless Access technology classified under the IEEE 802.20 standard. A study conducted on the behaviour and propagation characteristics of an iBurst™ network in the Belfast Metropolitan Area is discussed in this paper. The measurement of iBurst™ is compared with the performance of traditional large scale prediction models such as the Okumura model and the COST-231 model. The predictions of the Okumura and COST-231 models were generated using Matlab™. The performance of these models against measured iBurst™ data is outlined in this paper. [C228]

"The effect of the head size on the ear-to-ear radio-propagation channel for body-centric wireless networks"

The effect of the head size on the ear-to-ear radio-propagation channel as a part of a body-centric wireless network is examined. The channel quality is evaluated at 2.45 GHz in terms of path gain (|S21|) between two monopole antennas that are placed normal to the surface of the head. The investigation is done by measurements and HFSS simulations. It is found that the characteristics of the head may cause constructive or destructive interference that may result in up to 10 dB variation in the path gain. [C229]

"The ultra-wideband indoor radio channel: Antenna and propagation aspects"

After some basic definitions regarding the ultrawideband radio channel, this paper illustrates the characteristic effects of varying the bandwidth on the channel impulse response ranging from narrowband to ultra-wideband. A coherent description of antenna transfer functions that are suited as building blocks for ultra-wideband channel

models is reviewed and a coherent equivalent to Friis' formula based thereon is given. Furthermore, the particular shape of the multipath envelope found in some ultra-wideband channels, which is different from a simple exponential decay, is discussed using the example of measured data. [C230]

"On-body channel modelling: Measurements and statistical analysis"

This paper investigates the propagation phenomena and the fading experienced by on-body channels at 2.45 GHz, focusing on the effect of the human body. This investigation is based on signal measurements conducted for both stationary and mobile user cases using bodyworn antennas placed in various positions on the human body. The effect of the antenna location and the human body movement on the fading characteristics of the on-body channels is extensively studied through statistical analysis of the measurement data. [C231]

"Privacy aware localization in VANET"

Positioning or tracking in VANET is currently based on GPS. However, GPS is known to be prone to failure in case of emergencies. In addition, the current market penetration rate of GPS devices is low. Vehicles with built-in cellular communication capability are expected to be a part of the near future. Therefore, it is reasonable to assume that any vehicle possesses the functionality of a mobile unit (MU). The principal contribution of this paper is the proposed novel concept that employs the existing cellular RSS measurements as the basis for position estimation in VANET in situations where GPS services are unavailable. The proposed localization technique involves sampling the signal beacons received from three base stations surrounding the mobile unit for a very small time duration. Each of the RSS samples are then mapped to a sample of distance estimates based on shadowing radio propagation model. The medians of the generated distance sets are then used by a state of the art technique to produce a final location estimate. One of the important contributions of this work is justifying the selection of median over mean. An extremely small sampling duration negates the impact of mobile unit movement while the median selection neutralizes the deviation caused by time varying radio channel characteristics. All computation is restricted to mobile unit, thereby ensuring privacy. Simulation results demonstrate the efficiency of the proposed algorithm. [C232]

"MAC layer performance evaluation of IEEE 802.16e Radio-over-Fiber networks"

This paper investigates the performance of the IEEE 802.16e Medium Access Control (MAC) in 802.16e Radio-over-Fiber (RoF) networks, in terms of MAC Data Rate (MDR). It is shown that the accommodation of the extra propagation delay induced by the optical fiber links increases the protocol overheads and reduces the protocol's efficiency. [C233]

"Studies on enhancing wireless signal for indoor propagation"

This paper reports some of the findings in a project at Loughborough University in the UK. An objective of the work has been to create a band pass square-loop Frequency Selective Surface (FSS) in walls to increase the coverage of certain communication systems. With the increasing use of mobile computing devices such as PDAs, laptops, and the expansion of Wireless Local Area Networks (WLAN), there is growing interest in increasing productivity and efficiency through enhancing received signal power. The FSS is simulated by Computer Simulation Technology (CST) Microwave Studio (MWS). Remcom `Wireless InSite' is used to simulate indoor propagation and to predict the performance. The concept has been tested inside half-wave chamber. Significant improvements are shown using an FSS based surface. [C234]

"In-body to off-body channel modelling"

Recently, implanted devices have provided a promising area in medical telemetry. To make a reliable communication link between an implanted device and a base station, knowledge about wave propagation is necessary. Although there are some formulas for the path loss from in-body to off-body devices, there is no statistical model for this channel. In this paper, a ray tracing method is applied to model a cardiac implant in-body to off-body channel in an indoor area. The frequency is 403 MHz, which is allocated for medical implant communication services (MICS). Simulation results show that the electric field probability distribution function is almost log-logistic. Because of ray tracing accuracy limitations at this frequency for indoor areas, the error of this method is also calculated. The error estimation results show that in most of the cases (more than 90%) the relative error is less than 100%. [C235]

"Relationship between physical and subspace propagation channels"

The channel capacity of a MIMO telecommunication system depends on different parameters such as the signal-to-noise ratio, the space-time characteristics of the propagation channel, the antenna array geometry and the

antenna pattern. However, the propagation channel remains the strongest constraint imposed on designers of new radio air interfaces. Using a MIMO channel model, computer simulations are performed to highlight the relation between the radiation pattern of subspace channels and the physical space-time characteristics of the propagation channel. This provides a better understanding of the subspace channel origins and achievability of degrees of freedom. In addition to the simulation approach, UWB MIMO channel measurements are used. Both simulation and experimental results show that there is not a bijective relation between physical paths and subspace channels. The number of subspace channels is the same but the amplitudes and directions can be different, leading to inaccuracies in the space-time characteristics of the propagation channel. Nevertheless, the results are promising for fast-jointed DoA-DoD channel estimation. [C236]

"Unified propagation model for Wi-Fi, UMTS and WiMAX planning in mixed scenarios"

This paper presents an unified and empirical propagation model to obtain the received power in mixed scenarios, with outdoor and indoor environments, or in a scenario with only one kind of environment, either for an urban, sub-urban or rural scenario, with or without vegetation. This unified model is called the Lisbon University Institute (LUI) one and can be included into planning tools for wireless communication systems. The developed model is suitable for Path Loss prediction in mobile, as well as fixed wireless network systems, e.g., Wireless Fidelity, Universal Mobile Telecommunications System and Worldwide Interoperability for Microwave Access, considering Line-of-Sight or Non-Line-of-Sight propagation conditions. [C237]

"Validation of the unified propagation model for Wi-Fi, UMTS and WiMAX planning"

This paper presents the validation of the unified propagation model, the Lisbon University Institute (LUI) model, which is valid for three wireless technologies: Wireless Fidelity, Universal Mobile Telecommunications System and Worldwide Interoperability for Microwave Access. With this purpose in mind, several experimental trials for those technologies were performed in different scenarios, where mixed environments (outdoor and indoor) were included. This generalized and unified propagation model was tuned by adjusting specific parameters for each different technology, based on the achieved results from the field experiments. [C238]

"Characterization of delay spread for mobile radio communications under collapsed buildings"

Numerous investigations of mobile radio communication have been conducted in environments such as urban, outdoor-to-indoor or indoor, only a few are in ruins. Within a running project, I-LOV, a study of a mobile radio propagation channel in urban search and rescue scenarios is conducted. Due to complex environment in ruins, great multipath interference can take place, which strongly impacts communication quality and localization accuracy. This paper focuses on the characterization of time dispersion in such scenarios at GSM 900, GSM 1800 and UMTS frequency bands. High resolution measurements have been performed under collapsed buildings and post-processing data analysis were executed. The mean delay and RMS delay spread has been investigated according to power delay profiles. The effect of frequency window function on impulse responses and delay spread is also researched. [C239]

"WLAN hot spots to increase UMTS capacity"

The seamless integration of heterogeneous wireless access networks is currently one of the issues of major interest in the field of telecommunication systems. In an early future technologies like UMTS, WLAN and WiMAX will give broadband access to users that perform their voice/video calls or data sessions without knowledge of the specific technology their terminals are using, following the paradigm of always best connected. In this scenario, UMTS and WLAN integration has a primary role, due to the coverage of cellular systems and the low cost of the latter technology. This work, in particular, focuses on the gain in terms of capacity that the deployment of WLAN access points allows in an area fully covered by an UMTS network, assuming that the radio resources are not managed by complex multi radio resource management algorithms. For this scope a real scenario is accurately simulated and the end users perception is evaluated taking care of all aspects related to each level of the protocol stack, with particular attention to radio propagation. [C240]

"Modeling and analysis of polarized MIMO channels in 3D propagation environment"

A novel 3D cluster-based double-directional MIMO channel model with consideration of polarization is proposed and the modeling process is described in detail. The spatial channel model (SCM) proposed by 3GPP (3rdGeneration Partnership Project) is retrieved and compared with the new model. Based on the new model, capacity and spatial correlation of the co-located dual- and triple-polarized MIMO systems are simulated through Monte-Carlo method and the results are analyzed. Simulation results reveal that triple-polarized antennas can be deployed in MIMO systems to improve the channel capacity remarkably in rich scattering environments. The impact of the azimuth and elevation angle spread (AS) on the channel correlation is also analyzed by simulation

at the end of the paper. [C241]

"Inaccurate path correction in ray tracing using ray expansion method"

This paper presents an efficient way for overcoming the inaccurate path error encountered in ray tracing for site-specific indoor propagation modeling. The source is modeled using triangular ray tubes each of which consists of three rays which do not lie in the same plane. Each possible source ray inside an arbitrary ray tube is expanded in terms of the three rays defining that ray tube. The variations of the expansion coefficients during the intersections of the ray tubes with dielectric media are derived and used for correcting the paths of the rays toward the receiver. A verification example is presented which proves that the presented method has the ability to be efficiently used in indoor propagation modeling. [C242]

"Green handover-A new handover mechanism that minimizes radiation from mobile devices"

In recent years, cellular technology has become very widespread, with over 4 billion users worldwide. The increase in usage has been accompanied by a growing concern related to the possible adverse effects of the cellular radiation on human health. The radiation from the cellular phone, which is in close proximity to the user, is of special interest for this matter. In this paper we propose a new handover mechanism for cellular networks, aiming at minimal emission from mobile phones. The criterion for handover in common cellular systems is based on the received downlink signal strength or signal quality. This criterion makes sense when the uplink and downlink are symmetric. However, the advent of MIMO technology changes this assumption since MIMO transmission and reception techniques may significantly alter the uplink and downlink characteristics. For example, the number of transmit antennas may differ from the number of receive antennas. Alternatively, the techniques may significantly differ, such as when the transmitter broadcasts the downlink signal whereas the receiver performs beamforming. Consequently a mobile phone may receive Cell A with best quality, whereas Cell B may receive the mobile at better quality than Cell A, and hence Cell B requires minimal emission from the mobile phone. The new handover mechanism uses this concept and chooses, among neighboring cells with sufficient downlink, the cell for which the emission from the mobile phone is minimized. This mechanism requires methods to estimate the expected uplink emission. We propose several such methods. These include procedures where cells broadcast their uplink reception capabilities or request mobiles to perform test transmissions. Finally, we discuss the application of the proposed handover mechanism to create a new bidding procedure aiming at minimal uplink transmission power and minimal exposure to radiation. [C243]

"Estimation and compensation of ionospheric delay for SAR interferometry"

For spaceborne SAR (Synthetic Aperture Radar) systems, the dispersive effects of the ionosphere on the propagation of the SAR signal can be a significant source of phase error. While at X-band frequencies the effects are small, current and future L-band systems would benefit from ionospheric compensation. We consider two ways to estimate the ionospheric delay in SAR signals and evaluate them on L-band ALOS-PALSAR acquisitions. [C244]

"Multi-components mobile propagation model of park environment"

This work describes a theoretical mobile propagation model and simulation for horizontal and vertical polarization for different types, size and shape of vegetation or trees. Horizontal and vertical attenuation values for different kind of leaves, trees and branches, as a contribution to total attenuation are obtained and contribution of each elements are assessed. Moreover a comparison is done between 900 MHz, 1800MHz and 2270 MHz. The difference in path loss between the three frequencies has been analyzed for park environment. The result shows that the loss from vegetation is substantially higher for the higher frequencies. [C245]

"Application of UTD ray solution for characterization of propagation in Thai commercial orchard"

The radio wave propagation model is theoretically proposed in this paper, by using the uniform geometrical theory of diffraction (UTD) together with the Gaussian beam (GB) via the complex source point (CSP) technique. The path loss and multipath propagation are predicted in a Thai commercial orchard. The durian orchard is primarily chosen to be an example for this study but the radio wave propagation model obtained in this work can be applied to any commercial orchard with slightly changing the scenarios in the orchard. To improve the source in the durian orchard modeling to be more practical, the GB expansion via the CSP technique is applied. In this work, one combines the UTD and CSP to deal with the path loss analysis in the durian orchard. This leads to the 3D propagation model of the durian orchard. This study will be very useful for designing the wireless sensor network (WSN) in any Thai commercial orchard. [C246]

"Simulating and mitigating ionospheric effects in synthetic aperture radar"

The ionosphere is magnetized plasma that forms above the neutral atmosphere due to solar ionization of upper atmosphere constituents. It presents an obstacle to space based synthetic aperture radar (SAR) systems since it affects the radar signals traveling through it. Its impact can be split into two groups: uniform effects (those caused by a spatially uniform non-turbulent ionosphere) and nonuniform effects (those caused by irregularities in the ionosphere). In this paper, we present a method for simulating the uniform non-turbulent effects such as dispersion, group delay, Faraday rotation, and phase shift. This method is then validated using PALSAR data of Washington, DC. We also show the coherence in this scene after ionospheric effects are added. Finally, the model is used to predict the level of ionospheric effects in future space based SAR systems such as ALOS-2. [C247]

"Determining the refractive index structure in the littoral marine boundary layer by in situ measurements and sensing techniques"

Evaporative and advective processes can significantly affect the refractive index structure in littoral environments. This paper discusses the validity of existing models in accurately describing refractive index profiles in both a tropical littoral environment and also a temperate environment. The results show that in some instances the refractivity models agree quite well with measurements. In other instances there is strong disagreement which results when the models are applied to regimes for which they are not strictly applicable. [C248]

"Retriveval of soll moisture under vegetation using Polarimetric Scattering Cubes"

Soil moisture inversion from polarimetric SAR data has attracted significant attention for the past twenty years. Comparing with the simple case of bare surface, it is extremely complicated for vegetated terrain to invert soil moisture because of a larger number of scattering mechanisms that contributes to the observation. In this paper, we show how polarimetric decomposition technique, which decomposes SAR observations into preferred scattering mechanisms, can be used for the inversion. The result leads us to give up the use of polarimetric decomposition because of an unknown attenuation ratio caused by the canopy. Then a new inversion algorithm using Polarimetric Scattering Cubes (PSC) is introduced with simulation results to show a sensitivity to physical parameter such as vegetation distribution. Finally, we also discuss how the technique should be implemented for the real SAR data. [C249]

"Localization in industrial halls via ultra-wideband signals"

In this work a study on an indoor ultra-wideband (UWB) localization system for applications in industrial buildings is presented. Industrial environments are known for beeing extremely difficult in terms of wireless communication, mainly due to the fact, that this sort of channels are characterized by high concentration of metal objects, which cause reflections, leading to strong multipath propagation. A three-dimensional model of the warehouse has been created and used for deterministic wave propagation simulations. In the simulation, the transmitter travels along a predefined route. The receiver infrastructure consists of eight antennas with known coordinates. By means of multiple simulations, the channel influence on the UWB signals has been determined. The implications of this influence, in terms of practical system design and localization accuracy, are assessed. Furthermore the influence of pulse detection methods and geometrical configurations of base-stations are investigated. The position calculation of the mobile beacon is realized using Time Difference of Arrival approach (TDoA), employing a direct solution as well as iterative methods. Eventually the accuracy of obtained results and the theoretical limit are considered based on dilution of precision (DOP) evaluations. [C250]

"A comparison between Unscented Kalman Filtering and particle filtering for RSSI-based tracking"

The task of tracking targets carrying active radio-frequency identification (RFID) tags based on the received signal strength indication (RSSI) values of tag transmissions is a classical Bayesian filtering problem. Since the problem is nonlinear, no closed-form solution is known and tractable approximations must be used. Unscented Kalman Filtering (UKF) and Particle Filtering (PF) are two leading candidates proposed in literature. However, a head-to-head comparison of the two is currently unavailable. In this paper, we address this issue by comparing and contrasting these two tracking techniques in terms of their tracking accuracies and consistencies in various scenarios. Based on extensive simulation results as well as real-life experimental data, we conclude that the UKF significantly underperforms relative to the PF in two realistic scenarios: (i) when there are significant co-dependencies in the motion of the targets, and (ii) when a diverse radio environment affects the propagation characteristics of the tag transmissions (like occlusions, multipath and shadowing). The second situation is especially significant because it implies that the success of the UKF is contingent on a free-space like environment. Therefore, it is not a robust solution in practice. [C251]

"Towards an improved wind and rain backscatter model for ASCAT"

The ASCAT scatterometer measures the backscatter from the ocean surface with which it infers the near-surface wind vector. When rain is present in the observation area the windinduced backscatter is modified by the rain. This paper uses co-located observations from TRMM PR to model the effects of rain on the ASCAT observed backscatter. Two model types are considered, a phenomenological rain model and a lumped effect rain model which are comparable for most rain rates. For low rain events the ASCAT observed backscatter due to rain is not substantial, however for moderate to high rains the rain-induced backscatter from the ocean surface can be significant, and for extreme rain rates the atmospheric scattering and attenuation are dominant. [C252]

"Rain effect on polarimetric SAR observation"

The purpose of this paper is to consider the radio wave propagation of Polarimetric SAR in rain and to verify the influence of rain quantitatively. We assume the Polarimetric SAR observation model in non-spherical rain drop environments and evaluate the influence of rain at 5.405, 9.65 and 13.9GHz by calculating the rain distortion matrix with parameters of rainfall rate and the rain drop canting angle. The results show that the rain attenuation, the attenuation difference between horizontal and vertical polarization, and the cross-polarization factor increase as the frequency and rainfall rate increase, and they depend on the rain drop canting angle and the incident angle. [C253]

"Research on High-speed mobile radio Large-scale propagation characteristics and interference"

Study of high speed radio wave characteristics is significant for development of High-speed mobile communication technology. According to the mobile radio propagation characteristics, a method of measurement of these characteristics is proposed in this paper. Based on the sophisticated measurement instruments and the virtual instrument technology, the high speed measurement system is established and conducted at one high-speed channel pilot section in China. Through the test and measured data, the propagation characteristic such as slow fading pass loss exponent and standard deviation of shadow fading, etc. is obtained. Furthermore, the influence of interference from pantograph-catenary disconnection discharge on high-speed mobile channel is analyzed. [C254]

"How the L-DACS2 Radio-Frequency signals modulation affects the DME performance"

In this paper, we consider the Radio-Frequency Compatibility (RFC) of a candidate system within future aeronautical communication infrastructure, being developed since 2004 to accommodate the evolution of the aeronautical environment. The system presented in this paper is one of the two preselected proposals for the L-band Digital Aeronautical Communication System (L-DACS), in charge of the continental communications. It is named L-DACS2 and will use the 960 to 1164 MHz band, allocated to the Aeronautical Mobile Service reserved for communications relating to safety and regularity of flight. This band is characterized by a very dense spectral occupation by a large number of aeronautical systems. The RFC (branch of electrical science that studies the coexistence of radio systems in the same electromagnetic environment) is very important for L-DACS deployment and if it is not satisfied, the flight safety could be endangered. We propose to study in this paper the impact of the LDACS2 on the Distance Measuring Equipment (DME), which has been using the L-band for decades. According to recent studies performed in the frequency domain (continuous transmissions and no time domain variations), the achieved RFC level seems insufficient. The objective of this work is to analyze the RFC between LDACS2 and DME considering the time domain aspects of both systems. The idea is to quantify the impact of the radio-frequency signals generated by L-DACS2 interferer (transmitter) on the performance of a DME victim (receiver). The study is performed for the co-site case (equipments onboard of the same aircraft). To study the RFC between the two systems, we investigate various modulations for the future communication system. The results are obtained through computer simulations and laboratory measurements with an aeronautical test-bed using a commercial DME unit. The DME performance degradation is evaluated for some values of the Signal to Interference Ratio. [C255]

"An intelligent Differential GPS using Π-Σ Neural Network"

The main component of Global Positioning System (GPS) positioning error results from time and space varying conditions of radio wave propagation, which depend on atmospherics, disturbances in the satellite constellation, orbit stability, and also due to the U. S. military intentionally such as Selective Availability (SA), among other things. The error caused by the transmitter and receiver operation precision or time-measurement accuracy is negligible. A method for GPS precision enhancement commonly used by civil users is the Differential GPS (DGPS). If DGPS service is interrupted, it will lead to the degraded navigation performance. This paper focuses on applying a Π-Σ Neural Network (PSNN) model to predict Pseudo-Range Corrections (PRC) for DGPS. A low

cost commercial module (Rockwell single-frequency GPS receiver) is employed to represent the improvement in DGPS. Experimental results show the proposed NN can online predict the PRC precisely when the PRC signal is lost for a short period of time. [C256]

"Spectral and energy efficiencies of OFDMA wireless cellular networks"

We study in the present paper the spectral efficiency of OFDMA cellular networks which is a classical indicator of their performance usually calculated by simulations. On the other hand, due to an increasing interest on the environmental impact of these networks, we study also their energy efficiency which may be defined as the ratio of the spectral efficiency and the consumed energy. We give an explicit expression of the signal to interference and noise power ratio (SINR) as function of the user's location. This permits to calculate easily the cell spectral efficiency, and thus to study its variations with respect to the key parameters of the network such as the cell radius, the propagation characteristics and the single link performance. We show that the energy efficiency admits a maximum for some value of the transmitted power which is finite and nonnull. Moreover, we observe that optimizing the transmitted power permits to double the energy efficiency. [C257]

"A review of ionospheric effects in low-frequency SAR-Signals, correction methods, and performance requirements"

Ionospheric signal distortions are commonplace in low-frequency space-borne SAR observations and can lead to the degradation of SAR data quality and data consistency if no signal compensation is applied. In this paper we will give an overview of the problem of ionospheric influence in SAR, PolSAR, and InSAR data. We will characterize the spatiotemporal signal properties of ionospheric signals, introduce a selection of currently available correction methods, and present a list of performance requirements to be met by ionospheric correction. [C258]

"Theory of propagation for direct on-body wireless sensor communications"

Wireless body-area networks require low power data transfer between on-body nodes, and much has recently been published about propagation between on-body sensors. Most of these contributions have comprised physical experiments, and they cover both on-body and off-body paths. The measurements to date have not produced conclusive evidence of surface waves. For compact, power-efficient sensors, there is a need for high antenna efficiency and low transmit power. Using high frequencies allows physically small antennas, and to be unobtrusive, flush, "band aid" antenna profiles are preferred. For communications between flush antennas via a direct path, a surface wave is required. Moreover, surface waves can propagate around modest body contours. This motivates a look at the theory of propagating waves near a body surface. The Zenneck and Norton waves are revived. These were originally conceived for propagation along the ground over intercontinental distances, and here we look to them for distances of centimetres along a body surface. [C259]

"Modelling of propagation and interaction between body-mounted antennas, and the modelling of Body-Centric, context aware application scenarios"

Body area networks consist of a number of sensor placed in proximity or inside the human body. The paper presents a simulation environment based on the finite-difference time-domain (FDTD), for radio propagation modelling of body-centric wireless devices. The proposed numerical tool has been applied to characterize the body losses in implanted devices, and to study the body communication channel in a hospital environment. The results highlighted the significance of subject specific modeling when designing wireless implants, and body worn systems. [C260]

"Design challenges of body-worn baby and toddler monitor"

The paper presents a collection of slides that deals with the design challenges of body-worn baby and toddler monitor. It outlines some design challenges associated with developing body-worn radio product manufactured in low/medium volumes. It describes the approach taken in meeting the design objectives. It dwells on antenna design and propagation issues. [C261]

"Ultra wideband body area network channel measurement and analysis using textile antennas"

Measurements of the ultra-wideband (UWB) propagation channel are presented for different body area network (BAN) configurations using flexible textile antennas, which operate in the 4-9 GHz band. The experiments involve two static and contrasting environments: an anechoic chamber, and a small communications laboratory. Analysis of the channel statistics of the two environments indicate that models solely based on anechoic chamber measurements can underestimate the length of the channel impulse response (CIR) by a significant

amount. Path loss was found to better fit a single slope model when the antenna separation is measured around the body and not through it. This result is due to the high attenuation of UWB signals by the body. [C262]

"Compound dynamic and static effects from wind turbines on the reception of television signals"

To meet the clean energy challenges, the wind farms creation is one of the most promising alternatives. The wind project developer must verify whether there would be a risk on the existing broadcast links in the area before moving towards the construction phase. Geometrical wind turbine modeling can help in determining the scattering of the signal around and assess whether the signal reception in the vicinity will be affected. From ITU Recommendation 69-1/6, we establish a clear propagation methodology to determine the dynamic scattering from the rotor blades and the static scattering from the large pylon. [C263]

"Propagation Impairment Countermeasures in Mobile Stratospheric Operating Environment"

The efficiency of wireless communication systems largely depends on proper understanding of propagation impairments and the design of suitable countermeasures, taking into account physical causes and time-scales of propagation phenomena. The primary focus of this paper is the link between High Altitude Platform (HAP) and a collective mobile terminal onboard high speed train. The paper characterizes the temporal behavior of the propagation channel on this link by means of first- and second-order statistics, presents a QoS framework based on IP architecture, and discusses potential propagation impairment countermeasures from the perspective of their usage in the provision of different services. [C264]

"Prior Models for Indoor Super-Resolution Time of Arrival Estimation"

We propose a scheme for super-resolution estimation of the time of arrival of a radio signal which makes use of a prior model of the radio propagation conditions. The method is based on examination of the leading edge of the channel impulse response, and comparison with a database of leading edge shapes generated by Monte Carlo simulation. We also propose an efficient implementation, which makes the method practical for mobile devices with limited computational power. We verify the performance of the method using actual measured data, taken in a number of different situations, and show improved performance over other super-resolution methods proposed in the literature. [C265]

"Route Construction Based on Measured Characteristics of Radio Propagation in Wireless Sensor Networks"

There are many constraints on electrical power and communication in wireless sensor networks since sensor nodes can only be equipped with poor devices. Therefore, it is important to construct an effective communication route in terms of energy-efficiency and quality of communication. Many studies have been conducted to address this issue. In particular, controlling the transmission power of each individual node has been one of the hottest issues in recent years. Most conventional studies have assumed an environment in which radio signals transmitted by nodes propagate equally in all directions. However, this model cannot be applied to real environments due to several effects such as the presence of obstacles and antenna characteristics. In this paper, we propose a routing method based on the measured characteristics of radio propagation in a real environment. Our method first involves measuring the characteristics of radio propagation for all radio links. Second, the transmission power of each individual node and a communication route from the node to the sink node are determined based on the measured characteristics. [C266]

"Results from a First Approach to a Point-Scatter Simulator for MIMO Radio Channel Modeling"

This paper presents some results obtained from a first approach to a point-scatter simulator for multiple-input multiple-output (MIMO) radio channel modeling. Specifically, we present the comparison of capacity obtained using the point-scatter simulator with that obtained with the Kronecker model. Capacity results obtained from measured propagation data are also presented. Ideas to enhance the simulator, which include the development of a statistical-based generative channel model for MIMO systems, are discussed. [C267]

"Autocorrelation of signal facing in wireless body area networks"

The autocorrelation of signal fading in wireless body area networks will be dependent upon a number of factors including wearable node positioning, user state and local environment. In this paper, we present some of the preliminary work undertaken to model the correlation function of the complex envelope for various on-body propagation channels. [C268]

"Short-term fading simulator based on artificial neural networks"

In this paper, a novel technique for simulation of the short-term fading is presented and analyzed. A proposed solution is based on a trained artificial neural network (in further text ANN) and an oscillator for regulating the simulation process. In order to obtain adequate input data for training, cross-validation and testing, extensive measurements of electric field level were carried out in indoor environment. Statistical analysis of gained results has shown good performances of the proposed technique, and thereby the possibility for applying it in the real life situations. [C269]

"Parallel implementation of Irregular Terrain Model on IBM Cell Broadband Engine"

Prediction of radio coverage, also known as radio ldquohear-abilityrdquo requires the prediction of radio propagation loss. The Irregular Terrain Model (ITM) predicts the median attenuation of a radio signal as a function of distance and the variability of the signal in time and in space. Algorithm can be applied to a large amount of engineering problems to make area predictions for applications such as preliminary estimates for system design, surveillance, and land mobile systems. When the radio transmitters are mobile, the radio coverage changes dynamically, taking on a real-time aspect that requires thousands of calculations per second, which can be achieved through the use of recent advances in multicore processor technology. In this study, we evaluate the performance of ITM on IBM Cell Broadband Engine (BE). We first give a brief introduction to the algorithm of ITM and present both the serial and parallel execution manner of its implementation. Then we exploit how to map out the program on the target processor in detail. We choose message queues on Cell BE which offer the simplest possible expression of the algorithm while being able to fully utilize the hardware resources. Full code segment and a complete set of terrain profiles fit into each processing element without the need for further partitioning. Communications and memory management overhead is minimal and we achieve 90.2% processor utilization with 7.9times speed up compared to serial version. Through our experimental studies, we show that the program is scalable and suits very well for implementing on the CELL BE architecture based on the granularity of computation kernels and memory footprint of the algorithm. [C270]

"Wireless propagation modelling inside a business jet"

Wireless communication on-board aircraft has recently received increased attention as passengers are demanding for seamless office-like communication environments during their flight. Aircraft manufacturers are also interested in this technology to reduce cable complexity and provide new in-flight services. Various technologies are being considered for this purpose, such as IEEE802.11a/b/g. A radio propagation map is necessary to determine the received signal strengths inside the environment and can be obtained either through accurate modelling or through a measurement campaign. A simulation model is more attractive as it can be used to identify ideal antenna locations that maximize coverage at the design stage. Since the business jet market necessitates customized cabin configurations for each customer this will avoid costly measurement campaigns. This work presents a novel simulation model which has been used to characterize propagation characteristics inside a Dassault aviation business jet. The developed package is based on geometric optics (GO) and adopts ray tracing techniques. Simulation results were compared with actual measurements performed on-board the aircraft with a good correlation between the two. This study takes into account only a static channel whereby all passengers are seated. [C271]

"Efficient implementation of 3-D ADI-FDTD method for lossy media"

This paper presents the efficient implementation of 3-D alternating direction implicit finite-difference time-domain (ADI-FDTD) method for lossy media. Utilizing forward-backward scheme and symmetrical source implementation, the efficient ADI-FDTD method features better efficiency and simplicity where the conductivity terms and source excitation are required only for the first substep. Detail formulation of the efficient algorithm is shown and it yields exactly the same computation as the conventional ADI-FDTD method for lossy media. The accuracy and higher efficiency are also illustrated and verified by means of numerical results. [C272]

"Four-channel spatial multiplexing over a millimeter-wave line-of-sight link"

A scalable system architecture is proposed and demonstrated for spatial multiplexing over millimeter-wave line-of-sight communication links. This architecture provides increased data capacity without increasing the channel bandwidth. The modulation format is simple (BPSK or QPSK); this facilitates high-rate operation. The spatially multiplexed channels are separated at the receiver using broadband adaptive analog I/Q vector signal processing, a technique which should readily scale to data rates exceeding 10 Gb/s per channel. A control loop continuously tunes the channel separation electronics to correct for changes with time in either the propagation environment or the system components. Design and characterization of a four channel 60 GHz hardware prototype is presented. [C273]

"Down the Block and Around the Corner The Impact of Radio Propagation on Inter-vehicle Wireless Communication"

Vehicular networks are emerging as a new distributed system environment with myriad possible applications. Most studies on vehicular networks are carried out via simulation, given the logistical and economical problems with large-scale deployments. This paper investigates the impact of realistic radio propagation settings on the evaluation of VANET-based systems. Using a set of instrumented cars, we collected IEEE 802.11b signal propagation measurements between vehicles in a variety of urban and suburban environments. We found that signal propagation between vehicles varies in different settings, especially between line-of-sight ("down the block") and non line-of-sight ("around the corner") communication in the same setting. Using a probabilistic shadowing model, we evaluate the impact of different parameter settings on the performance of an epidemic data dissemination protocol and discuss the implications of our findings. We also suggest a variation of a basic signal propagation model that incorporates additional realism without sacrificing scalability by taking advantage of environmental information, including node locations and street information. [C274]

"Ka-band propagation characterization: Madrid experiment"

The use of the Ka-band (30/20 GHz) for broadcasting applications is envisaged for the future, in order to fulfill the needs for higher and higher data rates. A propagation experiment is being carried out in Madrid, Spain, with the objective of characterizing the propagation channel in the downlink sub-band. Propagation results can be related to meteorological data obtained from co-located instruments. Rain attenuation is the main propagation impairment in this band. Its effects are analyzed in detail. [C275]

"DRM (Digital Radio Mondiale) tests results for mobile reception in 26 MHz band for local coverage"

The 26 MHz band is the highest frequency broadcasting band covered by DRM bellow 30 MHz. Due to its low use for long-range transmissions, this band is been tested for using the DRM digital radio for local coverage. This paper shows the results for mobile reception of two field trials made in Mexico City and Brasilia. [C276]

"A statistical UWB transmission networks in an indoor environment for PAN systems"

The wideband indoor propagation channel measurements data at 3.1 GHz-10.6 GHz, a statistical ultra wideband (UWB) transmission networks are investigated and considered a promising technology for the future personal area network (PAN). In this paper, the UWB transmission channel characteristic are evaluated in the term of the frequency responses by using the vector network analyzer (VNA) in a convention room. The UWB signal with the specific center frequency and bandwidth is used for the transmitted signal. From the measured data, the major channel parameters such as path loss, mean excess delay and root means square (RMS) are shown. All of those results, a statistical model (e.g. power density function (PDF), and cumulative distribution function (CDF)) are provided and discussed. [C277]

"A study for development of propagation model based on ray tracing for coverage prediction in terrestrial broadcasting systems"

In this work, improvements on propagation prediction models based on ray tracing in coverage estimation for digital broadcasting systems are presented. For this purpose, firstly, propagation models based on Geometrical Theory of Diffraction (GTD) are discussed, and then an improved model is proposed for prediction of propagation path loss or electric field strength at the receiver. The proposed model incorporates first order expansion of classical GTD in field computation and convex hull for ray tracing. Simulation results are presented for comparison of various models in terms of computation time and accuracy. [C278]

"Predicting the K-Factor of Divided Paths in Wideband Mobile Propagation"

In order to design wideband mobile communication systems, we must analyze the multi-path propagation characteristics more accurately. The distribution of received power in mobile communication systems is well known to follow a Nakagami-Rice distribution with the key parameter being the K-factor. When the K-factor is set to 0, the Nakagami-Rice distribution equals a Rayleigh distribution. Wideband wireless systems can divide multi-paths into delay paths and improve the communication quality by combining the delay paths effectively. Therefore, in wideband mobile communication systems, it is more important to calculate the K-factor than the distribution of each delay path. In this paper, we clarify the relation between excess delay time and the K-factor of each delay path and introduce an empirical formula that predicts the K-factor as a function of excess delay time. [C279]

"Multi-frequency path loss in an outdoor to indoor macrocellular scenario"

Multi-frequency path loss measurements have been conducted in an outdoor to indoor macrocellular scenario. Four discrete CW signals were transmitted in the band 460-5100 MHz from the roof of a 29 meters tall building. The loss was measured inside and outside 5 different buildings at distances up to 600 m from the base station. Excess and building penetration loss and their dependencies on frequency and floor level have been studied. It was found that the loss decreases as the floor height increases. Based on corresponding measurement data an empirical building penetration loss model based on the transition between floor levels for which the building is in non line of sight and in line of sight condition with respect to the base station is proposed. Moreover, it was found that the excess path loss increases somewhat with increasing frequency, in particular in the range 2-5 GHz. It was found that the indoor excess path loss could be approximated with a lognormal distribution around about 30 dB. [C280]

"Simultaneous observations of X-band polarimetric SAR and ground-based weather radar during a tropical storm to characterize the propagation effects"

Synthetic aperture radar (SAR) is a well established surface imaging technology with recent launches of SAR systems at smaller wavelengths for increased resolution observations. However, these higher frequency systems have to deal with the impact of precipitation modifying the observations. In particular, the X-band, multi-polarization TerraSAR-X launched by German Aerospace Center (DLR) in 2007 has acquired data with distinct storm signatures in the resulting images. These signatures usually appear as dark cloud-like features and occasionally are brighter on the near range side if significant backscatter from the melting layer is received. The dark feature is due to attenuation as the electromagnetic wave passes through the heavy precipitation and can have a polarization dependent effect. Together with ground based weather radar, the attenuation due to the storm can be further studied and quantified. This paper presents results from a storm case over Florida, USA from dual-polarization TerraSAR-X with simultaneous observations from a National Weather Service WSR-88D radar during a cyclone. In addition, since the primary SAR data is from surface backscatter which can change for a variety of reasons, images acquired 11 days prior to and after the storm are used to provide additional insight into the propagation component. [C281]

"Global Archive of propagation measurements for satellite communication systems"

This paper presents the study carried out to design and develop an archive of propagation measurements. The goal of this action was to be able to keep measured datasets in good shape, because due to the rapid changing situation in the telecommunication sector, some of the datasets may become unavailable. This will be damageable since these datasets are of very good value for the development of propagation models, that are used for Satcom systems design. This activity results in the development of a global archive of propagation data collected worldwide. The global archive is accessible through a Web interface and will be proposed for standardization (e.g. to the ITU) in order to ease the adoption by Industry, National and International organisations. [C282]

"Multipath detection metrics and attenuation analysis using a GPS snapshot receiver in harsh environments"

This paper focuses on the analysis of GPS L1 signals when propagating indoors. Two criteria are proposed with the aim of detecting the presence of multipath, which is one of the major degradations experienced by GPS receivers when operating in indoor environments. The proposed criteria have been evaluated through an exhaustive field test by using a high sensitivity GNSS software receiver. The results confirm the validity of these criteria and allow a better understanding of the underlying propagation phenomena of GPS signals. [C283]

"Propagation modelling in virtual environments, characterization of mobile propagation channel"

This paper presents results of wave propagation simulations to obtain characterization of radio communication channel in urban and forest environments. The modelling in urban environments is aimed at simulation of received field coming from reflections from building facades with various roughnesses. In this case the result is in the form of time series as the receiver moves along the building surface. The values of received multipath power for individual transmitter elevations are presented. The part dealing with the vegetation scattering is aimed at simulating the received field in the presence of trees. The results obtained are the specific attenuation of a tree canopy and scattering component of the received field. Time series of received field along tree-lined road is shown. [C284]

"Radio direction finding applied to DVB-T network for vehicular mobile reception"

To improve the quality of the mobile reception of DVB-T (Digital Video Broadcasting-Terrestrial) signal, the knowledge of the propagation channel characteristics is necessary. In this aim, this paper presents sounding methods and results for the estimation of Direction of Arrival (DoA) of DVB-T signals in mobile receiving configuration. The mobile passive sounder is presented, including post-processing and radio direction finding tools. Then, results in different kinds of environment (rural area, motorway, low density and high density town centres) are given and discussed. [C285]

"Measurements and comparison of WiMAX radio coverage at 2.5 GHz and 3.5 GHz"

The performance of co-located WiMAX transmitter sites operating at 2.5 and 3.5 GHz are compared, based on coverage assessments. The study showed that the 2.5 GHz performed marginally better than the 3.5 GHz under the same RF conditions and clutter environments. In general, the 2.5 GHz was found to provide slightly better coverage at the edge of the cell, with an average of 2 dB less loss at 1km from the transmitter location. Comparisons of the path loss difference between these two frequencies with various empirical propagation models (COST-Hata, ECC-33, WINNER II-Suburban, SUI Flat) were made, and differences from 2.9 dB to 6.2 dB are reported from these models, which are much larger than those reported here (around 2 dB for outdoor). These differences are also dependent on the distance to the site. Indoor penetration loss was found to be around 1 dB. [C286]

"Empirical time-spatial propagation model at BS in outdoor NLOS environments for wideband mobile communication systems"

In order to accurately evaluate spatial processing techniques such as Adaptive Array Antenna and MIMO techniques for wideband mobile communications, we require a time-spatial propagation model which allows the delay profile and spatial arrival angular profile characteristics of the travelling wave to be analyzed at the same time. In this paper, we propose an empirical time-spatial propagation model based on a heuristic formula estimated from field measurement data obtained in urban and suburban areas. [C287]

"Atmospheric water-vapour effects on Spaceborne Interferometric SAR imaging: Data synergy and comparison with ground-based measurements and meteorological model simulations at urban scale"

Spaceborne interferometric synthetic aperture radar (InSAR) is a well established technique useful in many land applications, such as tectonic movements, landslide monitoring and digital elevation model extraction. One of its major limitations is the atmospheric effect, and in particular the high water vapour spatial and temporal variability which introduces an unknown delay in the signal propagation. On the other hand, these effects might be exploited, so as InSAR could become a tool for high-resolution water vapour mapping. This paper describes the approach and some preliminary results achieved in the framework of an ESA funded project devoted to the mitigation of the water vapour effects in InSAR applications. Although very preliminary, the acquired experimental data and their comparison give a first idea of what can be done to gather valuable information on water vapour, which play a fundamental role in weather prediction and radio propagation studies. [C288]

"Shapes and orientations of raindrops from 2D-video disdrometer, polarimetric radar and a wind-tunnel study"

Measurements of shapes and orientations of raindrops using 2D video disdrometer have been compared with those derived from a recent wind-tunnel study as well as those inferred from an advanced polarimetric weather radar at S-band, respectively. Results are consistent with each other. This paper presents the quantitative comparisons. [C289]

"Can We Find (and Use) "Spectrum Holes"? Spectrum Sensing and Spatial Reuse Opportunities in "Cognitive" Radio Systems"

A main concern in spectrum overlays ("Cognitive Radio") has been the reliability of sensing techniques to predict the performance in the primary communication link if the secondary user decides to use the spectrum. The fundamental difficulty is that sensors detect the transmissions (i.e. the transmitters), whereas the communication performance is determined by the interference environment around the (possibly silent) receivers. In previous work, specific scenarios with rather simple propagation models, mostly neglecting the correlation properties between signal paths, have been used. In this paper, more realistic propagation models are used to compare the performance of various sensing and resource management strategies. Results show that simple transmitter based sensing works well only in very flat terrains and at low frequencies. In these scenarios unfortunately, the

opportunities for spectrum reuse are limited. In more rough terrains, where the potential for secondary use of the spectrum is large, simple sensing schemes on the other hand perform poorly. Even advanced sensing schemes and/or responsive primary system may not be sufficient to achieve acceptable performance. [C290]

"Analysis of the Space-Time Channel Behavior in Outdoor-to-Indoor Environment"

This paper analyses the space-time behavior of the propagation channel in macrocell Outdoor-to-Indoor (021) environment at 3.6 GHz. The study is based on a SIMO (Single Input Multiple Out) measurement campaign performed on the campus of the Technical University of Lille, France. The measurement equipment included a channel sounder and a 12*12 virtual antenna array at the mobile station (MS). One of the main drawbacks of virtual array is the delay shift and phase drift occurring during the measurement when there is no synchronization between the transmitter and the receiver. The paper thus first focuses on the correction method which has been developed to cope with this problem. Delay spread (DS) as well as azimuth spread at MS (MS-AS) were deduced from the Azimuth-Delay-Power Profiles and the results are detailed in the second part of this paper. The mean AS value is 66deg and the mean DS value varies from 75 ns to 160 ns depending on the line of sight conditions between the MS inside the building and the outdoor base station. Regarding the AS statistics, an acceptable agreement between our measurements and values reported in the literature was found. [C291]

"Fixed Wireless Access Propagation Modelling and Measurements"

Field trial results for different scenarios (propagation conditions, antenna heights, distance from the access point, etc.) in the city of Cambridge (UK) with a broadband FWA operating system (3.5 GHz) are used to evaluate the predictions of a 3D ray tracing propagation model. The model is optimised for FWA operational scenarios and combines the deterministic ray tracing techniques with the Fresnel zone theory. Rays diffracted over foliage as well as buildings are considered. The analysis considers the propagation characteristics of the FWA radio channel and also, the accuracy of the presented deterministic propagation modelling approach. It is shown that simulation results follow the measurements with a mean error -0.11 dB and standard deviation 4.86 dB. [C292]

"On the Ultra Wideband Propagation Channel Characterizations of the Biomedical Implants"

Ultra wideband (UWB) channel modeling from implanted antenna deep inside of a human body to receiving antennas on-body and outside body is considered for biomedical applications. Distance dependence of the channel path loss is modeled by simulating an implantable UWB antenna deep inside the chest of a human body. Time domain electromagnetic (EM) simulation using the anatomy model of a human body assuming frequency dependent tissue properties is conducted. It is shown that the energy coupling due to the non-radiative near-field of the implanted antenna becomes dominant for the signal transmission, where the link quality can be improved significantly by exploiting the near-field coupling. The effect of the implanted antenna polarization for UWB signal transmission is studied and shown that better link quality is obtained by utilizing the antenna polarization along the width of the body. Furthermore, we show that the distance dependent path loss for inside body can be modeled by a power function but it can only be modeled with a known logarithmic function for outside body. [C293]

"Modeling of Eigenvalues for MIMO Channel Capacity Based on Outdoor Measurements"

This paper aims at modeling of eigenvalues for 2timesN (i.e., 2 transmit and N receive antennas) channel capacity based on non line-of-sight (NLOS) wideband outdoor measurements. Our channel sounding system is the Band Exploration and Channel Sounding System (BECS) 2005, which works at a carrier frequency of 3.7 GHz with 100 MHz bandwidth. From the measured data, we investigate transmit antenna correlation coefficient (TxACC), receive antenna correlation coefficient (RxACC), channel capacity and eigenvalues of HH* where H and (*) are channel frequency response matrix and conjugate transpose. Based on eigenvalue characteristics, we derive mean and variance of eigenvalue which are a function of the absolute value of TxACC, |TxACC|, the absolute value of RxACC, |RxACC|, and the number of Rx antennas, and then model eigenvalues for 2timesN channel capacity. Monte Carlo simulations are used to generate eigenvalue realizations according to the model. The results are compared with the measure data and good agreements are found. [C294]

"A ray based indoor propagation model including depolarizing penetration"

This paper presents the results of radio channel measurements and ray tracing simulations for an indoor propagation environment. A model for depolarizing penetration is combined with a ray tracing tool to account for depolarization. [C295]

"Performance considerations for UWB MIMO antennas with multimode pattern diversity"

This paper considers the performance evaluation of multimode diversity antennas with spatially orthogonal radiation patterns in UWB indoor communications. Since the wave propagation in UWB indoor communications is subject to severe spatial dispersion leading to large angular spreads in the angular power density spectrum, diversity antennas with spatially orthogonal patterns may provide important means to substantially enhance UWB wireless link conditions. We will focus on the system analysis of the MB-OFDM UWB link with multimode antennas in receive diversity operation. The multimode antenna patterns are modeled in terms of orthonormal spherical harmonics. [C296]

"Simulation of Position-Based Routing Protocol in Wireless Mobile Ad Hoc Network"

New routing algorithms are being developed to reduce power consumption, effective utilization of resources and best route to a specific destination, to name a few, in wireless mobile ad hoc network. To simulate the algorithm, interaction between the different layers of the OSI, the link available and furthermore, employing a suitable propagation model in a wireless environment, the use of network simulators do eliminate irrelevant issues pertaining to the actual work which is testing the algorithm. This paper presents the development of the simulation program to test a new routing protocol called quadrant-based directional routing protocol (Q-DIR). Q-DIR uses exact location of nodes based on Cartesian-coordinate system to restrict the broadcast region to only a quadrant where the destination node and source node are located. [C297]

"A Hybrid SS-ToA Wireless NLoS Geolocation Based on Path Attenuation: Cramer-Rao Bound"

Non-line-of-sight propagation in wireless localization systems leads to a challenging problem for the estimation of a mobile position. A hybrid idea has been considered as a promising approach to increase estimation accuracy. Existing methods, however, are formulated using separate measurements, necessitating different observation quantities, e.g. received signal and received signal strength, thus making the parameter estimation cumbersome. In this paper, we propose a new hybrid wireless geolocation model requiring only one observation quantity, namely the received signal. The attenuation model for transmit power from base stations is explored herein to capture propagation features in the received signal model. Fortunately, it also provides a more realistic approach to wireless geolocation. To investigate geolocation accuracy, the Cramer-Rao bound (CRB) is derived for the estimation error of the mobile position. For any value of path loss exponent, the obtained result provides a generalized form of the CRB for the usual time delay case. In small cells, e.g. office building picocells, numerical examples illustrate that the accuracy of mobile position estimation exploring path loss is improved comparing with that provided by the usual time delay method. [C298]

"A Fully Cooperative and Distributed Medium Access Control Protocol for Large TDMA/TDD-Based Wireless Mesh Networks"

A medium access control (MAC) protocol is developed for time division multiple access (TDMA) and time division duplex (TDD)-based large wireless mesh networks (WMNs) with infrastructure support. Utilizing control time slots, the protocol operates in a fully cooperative and distributed manner: mesh routers cooperate to negotiate resource allocation, and the messages are exchanged only among one-hop neighbors. Data time slots are dynamically distributed among mesh routers adapting to the varying network conditions. A large high-fidelity and time-driven simulator is created which implements realistic radio propagation models and interference as well as capturing the stochastic network behavior due to random traffic arrivals and queueing. A novel parallel processing technique is employed to reduce the long runtimes. Through simulations, protocol performance is determined for different resource allocation schemes including data time slot selection policies and routing strategies. Results show that the effects of different resource allocation schemes on the network performance greatly vary under wide- ranging congestion levels. [C299]

"Rayleigh propagation environment simulation in iDEN reverberation chamber. power delay profile and uniformity implications"

This paper presents an analysis of the propagation environment simulated in a medium size reverberation chamber (3.4*3*2.4 m). Power delay profiles are measured in a 200 MHz bandwidth from 1900 MHz to 2100 MHz with different loading conditions. The general goal is to assess the ability of simulating Rayleigh propagation channels with different delay spreads and monitoring uniformity degradation with loading. The delay spread in a reverberation chamber without intentional loading is long due to the fact that the reflected rays arrive with significant energy after several reflections. The use of absorbers is necessary to reduce the delay spread which is critical to test wideband systems but, the addition of absorbers degrades uniformity. In addition to this time variant behavior is also analyzed. [C300]

"Efficient Ray Tracing post-processing schemes for UWB-IR channel simulation"

RT (ray tracing) tools are commonly used to simulate UWB-IR (ultra wideband-impulse radio) propagation channel for different applications like network optimization, interference monitoring, or localization based applications. In this paper, different methods of reconstructing received signal in RT tools are presented, concluding that they are not all equivalent from digital implementation point of view. Moreover, the received time domain signal reconstruction is closely related to computational complexity, simulation speed, estimation errors, required signal resampling etc. Approaches for performing received signal encompass hybrid time-frequency domain and need special care in choosing which specific pre-processing steps have to be executed in time-domain and which have to be executed in frequency-domain. Since there are advantages to both spectral and temporal approaches, the two methods must be efficiently combined, in order to be able to take advantage of the best features of each. [C301]

"Indoor Shadowing Correlation Measurements for Cognitive Radio Studies"

Cognitive radio is a potential technology for increasing spectral efficiency in wireless communications systems, where in a hypothetical future overlay policy, secondary cognitive radios temporarily use spectrum that is not utilized, as long as negligible impact is caused to primary licensed users. Dependable spectrum sensing is needed to overcome the hidden node problem that arises when a primary transmitter is in a fade relative to the cognitive radio. Although wavelength-scale spatial diversity can overcome fast-fading due to multipath, overcoming slow-fading (or shadowing) due to obstructions requires larger separation of sensors, possible through collaboration among multiple secondary nodes. The purpose of this work is to perform a detailed study of multinode shadowing for the analysis of collaborative sensing in cognitive radio. [C302]

"Downlink throughput evaluation in relay-enhanced variable data rate enabled cells"

Cellular system deployment can utilize relays both for the capacity improvement and for the coverage extension. This paper studies the performance of the relay enhanced circular cells via the metrics of throughput mean and variance, number of the relay stations, and outage probability. Single-hop links are used as a reference case. Link throughput varies according to four modulation levels whose coverage areas are calculated according to two different path loss models. A new relay position algorithm is proposed to jointly maximize the non-overlapping coverage of relays and minimize the number of them. The provided numerical examples show that the proposed relay placement scheme outperforms random deployments especially at low relay densities. In general, high relay station densities are required for two-hop communications to approach the average throughput of a single-hop scenario. However, the opportunistic two-hop deployments are beneficial also from the interference management and total network load balancing point of view. [C303]

"Port decoupling of two arbitrary antennas in close proximity through an Eigenmode feed network"

This paper presents an alternative approach to decrease the mutual coupling between two arbitrary antennas. In this design, using a ring hybrid of arbitrary power division as the eigenmode feeding network, two arbitrary closely-spaced antennas can be decoupled. The input port matching can then be performed independently. A printed monopole antenna and a planar inverted F-antenna (PIFA) operating at 900MHz are considered, though two antennas of other types can be decoupled in the same manner. Decoupling of better than 25dB isolation is achieved between these two antennas at 900MHz when placed in close proximity. [C304]

"Hybrid FDTD/waveguide theory for indoor hallway propagation modeling"

In indoor wireless communications, the abundance of random scatterers creates a strong multi-path environment that severely complicates the signal strength distribution originating from a transmitting source. Current prediction schemes range from rough empirical estimations to computationally intensive numerical simulations. However, a better approach is to capitalize on the known properties of indoor environments to simplify the problem so it can be solved more efficiently. This paper will illustrate how hybridizing numerical finite-difference time-domain (FDTD) and ray tracing techniques with an analytical waveguide model is an effective method for predicting field propagation within building hallways. The results will be supported by both FDTD simulation and actual measurement data. [C305]

"Modelling interference for indoor wireless systems using the FDTD method"

A 2D TMzimplementation of the Finite-Difference Time-Domain algorithm is used to model radio-wave propagation from multiple transmitter locations in an eight storey building. From the steady-state field data, the Signal-to-Interference Ratio (SIR) is calculated for down-link scenarios. One transmitter is located on each floor and two base-station configurations are examined: aligned and staggered. Vertically-aligned transmitters are found to have better SIR performance-9% of the sectors in the aligned configuration and 23% in the staggered

configuration have SIRs less than 5 dB. The central services core significantly reduces the SIR, however this effect can be alleiviated by including another set of vertically-aligned transmitters. [C306]

"Radio propagation in stairwell: Measurement and simulation results"

Propagation characteristics in a stairwell are investigated through simulation and experimental measurements. Field measurement has been carried out at 2.4 GHz on every step of the stairwell up to second and half of the 3rdfloor. In our measurements, the transmitter was placed outside the building. These results are then used for comparison with simulation results that take into consideration four different types of rays, namely the direct rays, reflected rays, transmitted rays, and hybrid rays. There is a good agreement between the measurement and the simulation results. [C307]

"Simulation of HF propagation through a grid of conducting rods with application to forest modeling"

Designing HF communication systems to work in forested environments motivates a desire to understand the forest as a medium for radio wave propagation. At HF frequencies the forest is highly anisotropic because the most significant scatterers are vertical tree trunks. So, a reasonable first-order model of the forest is a grid of vertical scatterers. Using the Numerical Electromagnetic Code (NEC), a moment-method-based program, a grid of long vertical wires was simulated. Antennas inserted in the grid allow a relative permittivity of the grid as a composite medium to be determined. The length and distribution of the rods and the presence of a realistic ground plane are shown to influence dispersion in the simulated grid. [C308]

"A Technique to improve the dynamic range and linearity of a near-field imager based on the modulated scatterer approach"

This paper describes a technique to improve the linear dynamic range of a near-field (NF) imager based on the modulated scatterer technique (MST). The potential of achieving a better dynamic range at the receiver is investigated by eliminating the carrier on which no information is transmitted. This enables us to increase the amplification gain to obtain better signal-to-noise ratio (SNR) and more importantly, expand the imager's dynamic range. The carrier at the receiving port is minimized by combining the received signal with a 180deg out-of-phase canceller whose magnitude and phase are adjusted adaptively. We first examined the canceller performance, which leads to a reduction of about 60 dB in the magnitude of the carrier, and then its impact on the operation of the NF imager. Significant improvements of NF images were obtained, both in terms of dynamic range and linearity. [C309]

"Blind Multipath MIMO Channel Parameter Estimation Using the Parafac Decomposition"

In this paper, we consider the problem of estimating the physical parameters that describe a multipath MIMO communication channel model characterized by specular reflections due to remote scatterers. Using the impulse response channel coefficients, we introduce a channel model based on a 3rd-order tensor structure that admits a Parafac decomposition with rank equal to the number of propagation paths. The alternating least squares (ALS) algorithm is used to estimate the channel spatial and temporal signatures and the multipath parameters are then extracted by means of MUSIC-like subspace algorithms, enabling us to recover the transmit and receive angles as well as the path propagation delays of the MIMO channel, without ambiguities. Computer simulation results are shown to illustrate the performance of the proposed ALS-MUSIC estimation algorithm. [C310]

"A Novel Ray Tracing Based Multipath Modeling Approach for Site-Specific WLAN Simulations"

Current propagation models used in network simulations neglect obstacles of a propagation environment and employ over-simplified assumptions that the received signal strength is a simple function of distance and the transmission area of a node is circular. These assumptions are in contradiction with the actual tests and the measurement results. To run reasonable simulations for evaluating the performance of a specific outdoor wireless testbed, a novel multipath propagation framework is proposed in this paper, which is based on the ray tracing technique and uses site-specific geographic data of the analyzed area. It provides accurate propagation predictions, and it does not significantly prolong the simulation duration. [C311]

"The Research of OFDM Channel Estimation in Broadband Satellite Communication Systems"

The Channel estimation is one of the key technologies in OFDM receiving system. Which will directly affect the transmission quality of communication systems. This paper, based on the analysis of the characteristic of Ka-band satellite-ground link Channel, and comprehensive consideration of the impact of free space, attenuation, rainfall and so on, to the communication system, the Satellite-Ground link channel model of OFDM System is established, then a method of channel estimation based on the channel model is put forward. Simulation result

shows that the method have lower complexity and higher performance. [C312]

"RF circuits and systems-an interleaving course of RF integrated systems and wireless communications beyond RFIC"

This paper describes a new graduate course developed in University of Florida in response to the increasing demand of training students to have broad knowledge in radio frequency (RF) circuits and systems and preparing them for the future challenges of designing highly integrated radio systems. The course covers a wide range of materials including antennas, radio propagation, spectrum regulations, wireless communication standards, modulations, transceiver architectures, packaging, and integration issues. In particular, it links the system-level specifications defined in standards and circuit-level specifications in transceiver. Design considerations and trade-offs are discussed. Students also practice how to use electronic design automation (EDA) tools to design and simulate a reference transceiver for a specific application in the final class project. [C313]

"High Resolution Delay Locked Loop for time synchronization with multi path mitigation"

Accurate localization systems, based on the measurement of the time of flight of a signal between radio devices, also known as real time location systems (RTLS) are becoming increasingly important especially in indoor applications. Due to severe multi path conditions, the largest problem for those RTLS systems is to detect the time of arrival of signals traveling over the direct line of sight path. We present issues of a new high resolution delay locked loop (HRDLL) architecture that allows an efficient hardware implementation of a high resolution method for multi path mitigation, and demonstrate first results. [C314]

"Efficient experimental path loss exponent measurement for uniformly attenuated indoor radio channels"

An efficient scheme is proposed for experimental measurement of path loss exponent in uniformly attenuated indoor radio channels (lognormal channels with fairly constant log-normal standard deviation). Basically, the scheme suggests proper transmitter (TX) regions to efficiently characterize the radio channel through measurement. The selection of TX locations is based on the statistical analysis of the received signal strength (RSS) derived from a rough pre-model. In this work Seidel-Rappaport site-specific models considered as the pre-model. In this work Seidel- Rappaport site-specific models considered as the pre-model. Experimental results show that the generated statistics of the RSS help select representative TX locations and reduce the number of required measurements accordingly. [C315]

"An Experimental Study of Signal Propagation and Network Performance in Monitoring of Food Transportation"

Food transportation, as an important division in logistics, requires thorough environmental surveillance, which can be realized with wireless sensor network (WSN) technology. However, the monitoring of the transported products is hindered by high signal attenuation due to the content of food products. Accessibility of thorough environmental information inside a packed cargo container is therefore only possible by using multi hop protocols. According to the results of field tests, bananas cause high signal attenuation compared to the air. Therefore, multi hop protocols are needed in banana transportation scenarios with containers. Minimizing the power consumption of sensor motes is also significant considering the time of transportation that can be from several days to weeks. Further work will be focused on analysing the performance of signal propagation to set up a radio propagation model in cargo containers, whereas multi hop protocol will be further perfected to realize better aggregation of data. [C316]

"On the co-existence of dual-polarized CDMA networks"

This paper investigates the use of the polarization as a diversity technique to allow the joint operation of co-located CDMA networks. We propose a closed-form expression for the link probability of success with respect to the topology of the deployment and the channel characteristics (code orthogonality and degree of polarization). Next, we derive the equivalence between the degree of polarization and the orthogonality in a scenario of two dual-polarized co-existent networks. A numerical analysis of the per-node throughput is presented to evaluate the gain achieved when a dual-polarized approach is used. [C317]

"Modeling and design of high-power single-beam and multiple-beam Inductive Output Tubes"

The Inductive Output Tube (IOT) is today the device-of-choice for terrestrial UHF broadcast applications due to the IOT's high efficiency with linearity and compact size. The accelerator community is also making the transition to IOT technology for a number of high-power UHF and L-band applications as a result of these benefits.

Although the IOT appears to be quite simple, the actual operation of the device is quite complex and difficult to analyze quantitatively. Consequently, we are investigating the physics of the beam-wave interaction of the IOT with the goal of achieving significantly higher power operation. The time-domain electrostatic PIC code MICHELLE, in conjunction with the Analystreg suite of electromagnetic codes, were used to model the cathode-grid-anode structure that comprise the input cavity. Our investigation has led to the discovery of a mechanism responsible for intra-bunch charge formation. Time-domain PIC results of this effect will be shown. We will also present simulation results of the large-signal beam wave interaction in the output cavity using the code TESLA. Examples of single beam and multiple-beam (MB) IOT designs will also be shown. [C318]

"WLAN propagation on the bridge of vessels under consideration of material properties"

This paper deals with the propagation conditions of 2.4 GHz RF waves on a bridge of a modern cruise vessel which is important for evaluation of the EMC behavior of the electronic bridge equipment. The intention of such an evaluation is to ensure, that electronic equipment as well as the wireless transmission line is not disturbed. The bridge has been discretisized as a 3D model which includes the material data of the different objects on the bridge, for instance: glass, metal and wood. The reflection, transmission and other material coefficients are taken into account. A ray tracing algorithm has been applied to this model and the maximum data rate of a 2.4 GHz wireless LAN system has been simulated. In addition measurements on the bridge have been performed to back up the simulation results and to investigate the real case. [C319]

"Indoor wave propagation measurements and modeling for evaluation of coverage enhancement using a repeater system"

In this paper, we demonstrated that hallway propagation is driven by multiple wall reflections leading to high received field in both LoS case and non-LoS case at hallway junctions due to multiple corner diffraction. The result was verified by T-shaped hallway measurements. Based on the simulation results, it was shown that a repeater system with 30 dB total gain can enhance propagation around hallway corners remarkably. [C320]

"Calculation of total isotropic sensitivity considering digital harmonic noise of mobile phone"

This paper introduces an efficient method to calculate the total isotropic sensitivity (TIS) of a mobile phone. The method is implemented by using the EM simulation, the digital signal modeling and the RF link budget simulation. By considering digital harmonic noise, the accuracy of the TIS calculation can be increased. Simulation results for the phone structure show the availability of this proposed method. [C321]

"Efficient computation of the scattering cross sections of large planar microwave structures using SVD-PML-MLFMA"

Large planar microwave structures, such as frequency selective surfaces and reflectarrays, are of practical use in many applications. These structures' scattering cross sections are of great interest to the design engineer. In the work Ginste et al. (2006) a perfectly matched layer based multilevel fast multipole algorithm (PML-MLFMA) was presented to accelerate the classical method of moments (MOM) for planar microwave configurations and to reduce its memory requirements. In this paper,the authors proposed a technique that reduces the memory requirements and the solving time even further. Making use of the low- rank property of the PML-MLMFA's multimodal aggregation and disaggregation matrices, a careful implementation of singular value decompositions (SVDs) allows to store and to solve the planar structures' linear MOM-system very efficiently. [C322]

"Path loss prediction in durian orchard using uniform geometrical theory of diffraction"

The analysis of path loss in scattering zone by using UTD is presented. The results of the total field results from the UTD solution agree very well with that from NEC-BSC. Around the vicinity of the source, the UTD results agree with experimental results but not in the further region. This is due to the fact that the line-of-sight and reflected field components are very strong in this region. For the further distance, the path loss of the UTD is stronger than the experimental results. The error comes from the present UTD propagation model which is under assumption that the trees and ground surface are PEC. Therefore, the effects of the actual surface of trees and ground must be included in the calculation to treat the actual environment. The results with the effects of the actual surface will be presented in the next meeting. [C323]

"Modeling the influence of walls shapes on radio signal properties in mines"

The purpose of the following paper is to introduce various types of unevenness encountered in mines and their respective influence on the radio signal time dispersion; a phnnomenon of a remarkable importance in wideband communication systems such as WLAN, WiMax (3.7 GHz band) or ZigBee (a 2.45 GHz band version operating

at 5 MHz-wide channels) which can be deployed in underground sites for communication, telemetry and identification. [C324]

"Waveguide propagation effect along the cargo hull on board a ship"

Channel sounding on board a merchant ship is performed between the cargo hull and the bridge room. Power delay profiles for 3 different spread bandwidths (5 MHz, 10 MHz and 20 MHZ) have been analyzed. From the periodicity and increasing amplitude of the multipath peaks, it can be concluded that the metallic cargo hull forms a structure analogous to the waveguide. The large RMS delay spread found again confirms the waveguide propagation mechanism and the complexity of the metallic merchant ship structure. The small coherence bandwidth shows wideband transmission on board a ship is not feasible. [C325]

"Wave propagation in a randomized cut-wire array"

In this paper, the randomization and ground effects on the wave propagation in a cut-wire array have been investigated. It is found that randomizing the height of the wires affects the low-frequency cut-wire resonance phenomenon, while randomizing the spacing between wires influences the high-frequency passband/stopband behaviors. The introduction of a lossy ground changes the propagation considerably, as the wire resonance shifts up to above the plasmonic cut-off. [C326]

"Distributed or Centralized Traffic Advisory Systems-The Application's Take"

We consider the problem of data dissemination in vehicular networks. Our main goal is to compare the application-level performance of fully distributed and centralized data dissemination approaches in the context of traffic advisory systems. Vehicular networks are emerging as a new distributed system environment with myriad promising applications. Wirelessly-connected, GPS-equipped vehicles can be used, for instance, as probes for traffic advisory or pavement condition information services with significant improvements in cost, coverage and accuracy. There is an ongoing discussion on the pros and cons of alternative approaches to data distribution for these applications. Proposed centralized, or infrastructure-based, models rely on road-side equipment to upload information to a central location for later use. Distributed approaches take advantage of the direct exchanges between participating vehicles to achieve higher scalability at the potential cost of data consistency. While distributed solutions can significantly reduce infrastructures' deployment and maintenance costs, it is unclear what the impact of "imprecise" information is to an application or what level of adoption is needed for this model to be effective. This paper investigates the inherent trade-offs in the adoption of distributed or centralized approaches to a traffic advisory service, a commonly proposed application. We based our analysis on a measurements study of signal propagation in urban settings and an extensive simulation-based experimentation in the Chicago road network. [C327]

"The effect of various human body tissue models on radiowave propagation from a bladder implanted wireless source"

The aim of this paper is to characterize the amount of power absorbed from the body tissues regardless of the antenna type. Furthermore, the efficiency of an implanted source is subject-specific; and it depends from the body size and composition. To the knowledge of the authors, the effect of different human subjects on the efficiency has not been presented in the open literature. In this paper the radiation characteristics of a bladder implanted source has been analyzed adopting two inhomogeneous male phantoms and one female phantom. [C328]

"High resolution interpolation for underwater FDTD simulation at ELF frequencies"

A high resolution interpolation scheme for use with the FDTD method at ELF frequencies under water is described. Since the interpolation is applied after the FDTD Simulation, it adds very little to the computation time or resources. [C329]

"Feasibility and potential application of power scavenging from environmental RF signals"

In this paper, we presented measurement results of electrical field intensity from broadcasting and mobile communication systems in order to show the feasibility of energy harvesting from RF signals. Experimental results show that RF signal from mobile phone systems are observed at various locations but the strength varies frequently depending on the mobile phone traffic. Radiowave from broadcasting tower, on the other hand, was very stable temporally but the strength depends on the distance from the broadcasting tower. From the measurement results, we believe it is possible to scavenge electric energy from RF signals using a carefully tuned rectifier with high gain directional antenna. However, it is also necessary to compensate instability of

energy supply by tricks in the upper layers such as network protocols and application software. [C330]

"Ultra wideband radio propagation around a human body in various surrounding environments"

Wireless body area networks (WBAN) have been discussed for medical and non-medical applications. Ultra wideband (UWB) technologies have been anticipated for use in WBAN because of their possible low power consumption and anti-multipath capabilities. Numerous literature has presented UWB propagation characterization and modeling around a human body in either a radio anechoic chamber or a particular room. However, no dependence on propagation environment volume has so far been reported. Multipaths (mainly reflected from the floor, walls, and ceiling) highly depend on the room size. This paper presents a UWB (3.1-10.6 GHz) radio propagation campaign in WBAN scenarios between on-body small antennas in three surrounding environments: a 3-m radio anechoic chamber, a classroom, and a small room. [C331]

"Experimental investigation and modeling of shadow fading by human movement on body surface propagation channel"

In this article, dynamic wireless BAN channel measurement results using a male specimen in a radio anechoic chamber, and the statistical channel model of body surface propagation with dynamic movement of a human being were presented. We found that the log-normal and Weibull distribution can provide a good characterization of dynamic channel behavior due to small and large movements, respectively, in the BAN channel. In addition, the temporal channel coherency at various receiving positions was investigated to understand the variability of the channel behavior. [C332]

"Preliminar propagation and MIMO experiments in train tunnels at 5.8GHz"

In this paper, a complete set-up to subway radio propagation measurement at L and C Band is presented. This set-up has been tested at a real subway tunnel with a special structural characteristics allowing propagation path loss measurements and MIMO analysis in order to study the best system configuration working in subway environments. Therefore, the next step is to present a new measurement camping where a complete characterisation of the diversity possibilities inside a straight and curved tunnel will be provided. This new campaign will take place at the L9 Barcelona Metro Network new facilities. [C333]

"Analysis of radio wave propagation from an indoor hall to a corridor"

In this paper the radio wave propagation from an indoor hall to a corridor was studied by analyzing the results from a multi-link MIMO channel sounding measurement. The results showed that despite NLOS conditions, the dominant propagation mechanisms comprised direct path through the wall and specular reflections. These findings were verified by plotting the dominant pathways with a measurement-based ray tracer. In contrast to what was expected, the wave-guide propagation around the corner had almost negligible effects in this case. The results indicate that indoor localization and navigation applications using the direction or the delay of the first arriving path can be possible even in NLOS scenarios. [C334]

"Characterization of passive UHF RFID tags in toroidal metal pipes"

Recently, automated identification techniques that utilize radio frequency (RF) systems have experienced growth both in the industry and in research worldwide. The current state-of-art of this identification realm is the radio frequency identification (RFID) system, which utilizes a transponder with a unique identifier. RFID systems can be classified into active systems (with built-in power supply), passive systems (requires RF energy scavenging), and other semi-active and semi-passive systems. The utilization of passive RFID systems have experienced a tremendous growth in the last decade, specifically in the supply chain area due to its' ability to offer process automation at a low price point, thus enabling return-on-investments (ROI) for corporations worldwide. In an attempt to derive an effective solution to their supply chain needs, many industries such as the oil and gas industry has since invested on research to understand the limitations of this passive (tag) technology. Unlike most other industries, the pipeline and tubular industry has a unique problem that requires the use of passive RFID tags inside metal pipes. These tags are typically required to be placed inside these metallic structures due to the stacking problems inherent in the storage facility of these large pipes. There has been much research focusing on the characteristics of these passive tags and systems within the metal pipe, however these studies have not previously focused extensively on passive UHF RFID tags operating in toroidal metal pipes. Toroidal metal pipes are often used as interconnects for the longer cylindrical metal pipes as studied, and present more irregularities (radial ratios must be studied independently from curvature) than studied. [C335]

"Radioelectric propagation in mature wet forests at 5.8 GHz"

Measurements in two different mature forests have been performed, considering a pine forest and a eucalyptus forest. The peer-to-peer scenario used responds to the current needing of radio data for network planning: there exist much information about propagation in vegetation in base station to mobile terminal (master-slave) configurations, but there is a lack in peer-to-peer configurations. The current trends in wireless networking in open environments, with growing interest to sensor networks, support the performing of such research work. The attenuation with distance between transmitter and receiver within the forests resulted to follows an exponent n=3.3 in the case of pine forest and n=3.6 in the case of eucalyptus one. This data is different than expected by ITU-R recommendation P.833-4, which uses lower frequencies in its input data, other type of trees, and different configurations. [C336]

"The effect of human body on indoor radio wave propagation at 57-64 GHz"

Seven GHz bandwidth around 60 GHz frequencies has been released to develop high- rate short-range wireless data communication for a small area such as an office or a research lab. A regular propagation phenomenon in such environment is the shadowing of the Line-of-Sight (LOS) link caused by moving people. One research shows this phenomenon disconnects the LOS link for 2% of the time; however, the blockage ratio could be higher depending on the number of people, geometry of the room, and transmitter-receiver (TX-RX) configuration. Moreover, it must be determined that how much attenuation is caused by a human body obscuring the LOS path. In this paper first the accurate ray-tracing analysis is used to answer this question. Next, a test set-up is developed to verify the accuracy of the simulation results by field tests. [C337]

"Statistical modeling of rainfall effect on a foliage propagation path"

Statistical modeling of rainfall induced temporal variations in a foliage channel at VHF frequency is performed in this paper. With the help of the Akaike weight omegaj, Weibull and Rayleigh functions are identified as the two suitable models to describe the tap amplitude variations. The Weibull function is then used as the channel model to analyze the rainfall induced temporal variations in a foliage channel. With its Weibull b parameter, the effects of rainfall is compared and studied. It can be concluded that, the free space propagation of the lateral waves over the treetops at VHF frequency is not affected by the rainfall. However, the through-foliage scattered components are significantly affected by the falling rains. This can be observed from the Weibull b parameter which decreases from 14 to 6, and even further down to less than 2. Therefore, when performing wireless system design in the forest environment, rainfall is an important factor that influneces the radiowave propagation and should be taken into consideration. [C338]

"Analysis of ground wave diffraction by a discontinuity of a planar impedance surface"

In this study, we have derived the asymptotic solution for the ground wave propagation over the land-to-sea mixed-path by applying the aperture field method. We have assumed that both the transmitting and the receiving antennas are placed at the heights sufficiently larger than the wavelength. By comparing with the reference solution calculated numerically, the validity of the asymptotic solution is confirmed. By comparing also with the mixed-path theory and the experiments, it is shown that the aperture field method can be applied to the problem of the ground wave propagation over the land-to-sea mixed-path. [C339]

"Wave propagation channels for intra-chip wireless communication systems"

Wireless interconnects have been proposed to solve the traditional metal line interconnects problem caused by the continuous downscaling of dimensions in CMOS technology. Many recent researches have focused on device designs and integrated antennas for wireless interconnect applications. However, aside from previous work, the basic propagation mechanisms on integrated chip structures have not been carefully studied, despite their importance for the development of intra-chip wireless communications. In general, there are several wave components that lead to different propagation paths (both physical and spectral) in a multi-layer chip structure. Each wave component travels with different propagation characteristics (phase/group velocity, attenuation), such that dispersion/distortion and interference can become important issues. In order to have a better understanding of the contributions from different wave components to the total electric field, in this work we use the Green function for a layered medium, evaluated via complex-plane analysis, to separate the discrete and continuous spectral field components. This model, containing both physically different propagation paths (direct radiation and guided energy), and multispectral components (discrete and continuous spectra), can be considered to be a generalization of the usual ray-based idea of multipath. [C340]

"Propagation aspects of vehicle-to-vehicle communications-an overview"

Vehicle-to-vehicle (VTV) wireless communications have many envisioned applications in traffic safety, congestion avoidance, etc., but the development of suitable communications systems and standards requires accurate

models for the VTV propagation channel. This paper provides an overview of existing VTV channel measurement campaigns, describing the most important environments, and the delay spread and Doppler spreads obtained in them. Statistical as well as geometry-based channel models have been developed based on measurements and intuitive insights. A key characteristic of VTV channels is the nonstationarity of their statistics, which has major impact on the system performance. Extensive references are provided. [C341]

"Utilization of Multi-Radio Access Networks for Video Streaming Services"

In comparison to traditional voice based circuit switched mobile systems, the multimedia content puts forward significantly strict quality of service requirements. In this perspective, a noticeable proportion of contemporary research has been driven towards exploring the possibilities of simultaneously utilizing geographically co-existing mobile networks belonging to a wide range of wireless technologies. This paper evaluates such co-existence by means of a novel macro diversity scheme referred to as Multi Radio Transmission Diversity (MRTD) which exploits the dynamic cooperation between the networks at the radio link level. Relevant QoS parameters for an MPEG4 encoded video streaming service have been analyzed by means of simulations in a hybrid network topology consisting of IEEE 802.11b WLAN and UMTS HSDPA. The performance gains have been observed for various load and radio propagation conditions in comparison to a benchmark system which is not capable of utilizing such cooperation between multiple network interfaces. [C342]

"Full wave simulation of radiowave propagation in unattended ground sensor networks"

The moving window finite difference time domain (MWFDTD) method is used to analyze propagation between low to the ground antennas commonly used in wireless unattended ground sensor networks. The propagation path loss at 300 MHz is computed for several terrains exhibiting different degrees of roughness. From the path loss results, the mean and standard deviation of the path loss distribution are determined as functions of distance from the transmitter. The mean loss is shown to be close to the loss over a flat ground for all roughness values, and the standard deviation is shown to increase with the roughness of the terrain. [C343]

"Discrete ray-tracing method (DRTM) analysis of propagation characteristics along random rough surface in relation to development of wireless sensor network"

Discrete ray tracing method (DRTM) is applied to numerically analyze electromagnetic wave propagation along random rough surfaces. In the DRTM analysis, we make some assumptions in order to simplify the ray searching algorithm as well as to save computation time. First we discretize the rough surface in terms of linear piece wise edges (1D), and second we determine whether the two edges are on the line of sight (LOS) or not by checking whether two representative points on the two edges can be seen each other or not. Diffraction rays are also determined by this algorithm. In the numerical computation, we neglect multiple diffractions or higher order of scattered waves in terms of between edges. As for reflection, we include reflection rays having at most two times reflections at the source side and two times reflections at the receiver side. Numerical examples are given for ray examples and propagation characteristics along three types of rough surfaces. [C344]

"Automatic UWB clusters identification"

Clustering phenomenon exists in the ultra-wideband (UWB) impulse responses. Although it is feasible to manually identify clusters via visual inspection, this task becomes very difficult and time consuming when a large amount of data needs to be processed. Furthermore, visual inspection highly depends on the person who performs the cluster identification task, which may cause inconsistent or unrepeatable results. In this paper, we propose an automatic procedure to identify clusters in UWB impulse responses. The algorithm takes both the amplitude and time delay into account when finding the clusters. The algorithm performs well. If the threshold is set correctly, there will not be any error. [C345]

"Frequency-Domain Transmit Processing for MIMO SC-FDMA in Wideband Propagation Channels"

Recently there has been considerable interest in the use of single carrier frequency division multiple access (SC-FDMA) as the uplink transmission scheme for the 3GPP long term evolution (LTE) standard. This paper investigates different multiple input multiple-output (MIMO) techniques for uplink SC-FDMA. Here we demonstrate how the transmitter can exploit the available channel information, through precoding and pre-equalization, in order to combat the frequency selective nature of the propagation channel and improve the system's performance under fading. In this work we investigate the achievable system capacity, and the peak-to-average power ratio (PAPR) characteristics of the precoded and pre-equalized SC-FDMA waveform. We consider unitary preceding for MIMO, as well as pre-equalization for a multiple-input single-output (MISO) system with maximum ratio combining (MRC), equal gain combining (EGC), zero forcing (ZF), and minimum mean square error (MMSE) algorithms. Results reported in this paper show that ZF pre-equalization for SISO

SC-FDMA is capable of achieving the Shannon Capacity limit for faded channels, with a BER performance that is identical to an AWGN channel, and that pre-equalized increases the capacity of MIMO SC-FDMA systems. [C346]

"Energy Savings Achievable in Connection Preserving Energy Saving Algorithms"

Energy saving is an important design consideration in wireless sensor networks. In this paper, we analyze the energy savings that can be achieved in a sensor network where each sensor is capable of reducing its transmission power from a maximum power pm, compared with that in a sensor network where each sensor can only transmit at a constant power level pm. To achieve a fair comparison, we assume sensors in both types of sensor networks are connected to the same set of neighbors, i.e. no connection is lost as a result of a sensor reducing its transmission power. We further assume that sensors are distributed in a given area following a Poisson distribution with known node density and the radio propagation is described by a log-normal model. Ignoring boundary effect, we establish analytically the probability for a sensor to achieve an energy saving of at least h dB. We also obtain the expected percentage of energy savings which can be substantial. The research reported in the paper helps to answer questions such as whether the energy savings achieved by using a sensor with a variable-transmission-power (and the consequent extension of its lifetime) justify the additional cost involved in manufacturing it. [C347]

"On the Construction of Orthogonal Spreading Code Groups for MC-CDMA with FDE in a Frequency Selective Channel"

The bit error rate (BER) performance of multicode MC-CDMA severely degrades due to the inter-code interference (ICI) in a strong frequency-selective channel. In, a spreading code group construction method for MC-CDMA was proposed. The Walsh-Hadmard (WH) codes are divided into a number of code groups such that the code orthogonality can be maintained within each subgroup even in a frequency-selective channel; any code pair taken from different groups is not orthogonal. The number of spreading codes in each group is determined by the maximum time delay difference of the channel. In this paper, we point out that the number of codes in each group is not determined by the maximum time delay difference but the distribution of time delay differences among the propagation paths in the channel and thus, more orthogonal spreading codes can exist in each code group. The conditional BER is derived taking into account the interference from other code groups and the achievable downlink BER performance is numerically evaluated in a frequency-selective Rayleigh fading channel. [C348]

"Simple Cooperative Relaying Strategies for WiMAX Communication System"

Cooperative relaying systems represent a promising solution for future wireless communications. In this paper simple cooperative relaying strategies are proposed in order to improve the performance of a WiMAX network, overcoming the drawbacks of a non-line-of-sight (NLOS) propagation. The cooperative schemes proposed combine the amplify and forward (AAF) and the decode and forward (DAF) algorithm with delay diversity (DD) and cyclic delay diversity (CDD) techniques, in order to exploit the features of the wireless communication channel. We investigated the pros and cons of each scheme, comparing the assumptions which are required and the simulation results with respect to two cooperative implementations of the Alamouti scheme. [C349]

"Realistic Radio Propagation Models (RPMs) for VANET Simulations"

Deploying and testing vehicular ad hoc networks (VANETs) involves high cost and intensive labor. Hence simulation is a useful alternative prior to actual implementation. Most works found in the literature employ very simplistic radio propagation models (RPMs), ignoring the dramatic effects presented by buildings on radio signals. In this paper, we present three different RPMs that increase the level of realism, thereby allowing us to obtain more accurate and meaningful results. These models are: (a) the distance attenuation model (DAM), (b) the building model (BM), and (c) the building and distance attenuation model (BDAM). We evaluated these different models and compared them with the two-ray ground model implemented in ns-2. We then carried out further study to evaluate the impact of varying some important parameters such as vehicle density and building size on VANET warning message dissemination. Simulation results confirmed that our proposed BDAM significantly affects the percentage of blind vehicles present and the number of received warning messages, and that our models can better reflect realistic scenarios. [C350]

"On Estimation Algorithm for Radio Communication Distance along Rough Surface"

This paper is concerned with the estimation of radio communication distance for wireless sensor networks when both the transmitters and receivers are arbitrarily distributed on a random rough surface such as desert,

vegetation ground, sea surface and so on. First, we simulate electromagnetic wave propagation along the rough surface by using the discrete ray tracing method (DRTM). Second, we determine three parameters necessary for evaluation of communication distance by conjugate gradient method combined with the method of least-squares. Finally, we derive an analytical expression which can estimate the maximum communication distance when the input power of a transmitter and the minimum detectable electric intensity of a receiver are specified. Numerical examples are also given for estimated communication distances with the deviation of rough surface height as a parameter. [C351]

"STUMP: Exploiting Position Diversity in the Staggered TDMA Underwater MAC Protocol"

In this paper, we propose the Staggered TDMA Underwater MAC Protocol (STUMP), a scheduled, collision free TDMA-based MAC protocol that leverages node position diversity and the low propagation speed of the underwater channel. STUMP uses propagation delay information to overlap node communication and increase channel utilization. Our work yields several important conclusions. First, leveraging node position diversity through scheduling yields large improvements in channel utilization. Second, STUMP does not require tight node synchronization to achieve high channel utilization, allowing nodes to use simple or more energy efficient synchronization protocols. Finally, we briefly present and evaluate algorithms that derive STUMP schedules. [C352]

"Electromagnetic Fields Diffracted by Two Horizontal Edges with Arbitrary Angle Considering Different Heights"

In order to have an effective utilization of the radio wave resources, it is important to estimate propagation path in the urban area. In our previous work, we have examined the diffracted fields by two edges with an arbitrary angle in a plane. In this paper, the diffracted fields by two edges which are in different heights and make an arbitrary angle are analyzed. The numerical calculation is carried out on perfect conductor, concrete and earth wedges. The results show that when the angle between two edges increases, relatively strong orthogonal polarized wave components appear to the incident wave. [C353]

"Radio waves scattering dependence on the statistical parameters of classical and fractal rough surfaces"

Currently there are two general approaches of scattering on the statistically rough surface: method of small perturbation and Kirchhoff approach (tangent plane method). These methods relate to the two extreme cases of very small flat irregularities or smooth and large irregularities respectively. Two-scale scattering model becomes a generalization of these methods. The model is combination of small ripple and large irregularities. We use fractal model which has many advantages. [C354]

"Computational efficiency of the extended three-dimensional Stationary Phase Method enhanced by Fresnel functions (3D-SPM-F)"

This paper quantifies the computational efficiency of the extended, three-dimensional Stationary Phase Method, enhanced by Fresnel functions (3D-SPM-F). This method was recently developed by this research group for the fast, yet accurate characterization of electromagnetic scattering from finite, perfectly conducting (PEC) plates. The improvement in computational cost is demonstrated via comparison to standard numerical integration, as well as to an integral equation technique. [C355]

"Specification of the middle-latitude ionosphere's parameters for increase of calculation's authenticity of fading depth at transionospheric propagation"

It had conducted the comparative analysis of the known and specified basic data about the parameters of the middle-latitude inhomogeneous ionosphere and expressions for fluctuations of phase front of wave on the output of ionosphere with the purpose increasing of calculation's authenticity of fading depth at transionospheric radiowaves propagation with frequency at 30 MHz-1 GHz. [C356]

"Adaptive signal strength prediction based on radio propagation models for improving multi-robot navigation strategies"

Multi-robot systems, i.e. groups of mobile robots which carry out complex tasks cooperatively, are becoming increasingly important in robotics research. For many applications, like exploration or search and rescue missions, multi-robot systems have great advantages over single robot solutions. Besides their ability to fulfill missions faster, multi-robot systems offer improved fault tolerance and the opportunity to combine a large

number of relatively cheap robotic systems with complementary capabilities. For the successful deployment of a multi-robot system, reliable wireless communication plays an important role. Especially if an operator is in the loop, the ability to communicate to every robot at any time can be vital. This article presents a technique to predict the expected signal strength of the wireless communication between mobile robots, based on parametric models of radio wave propagation. The predictor allows to take information about the expected future communication quality into account during mission planning and helps to increase the robustness of navigation strategies for multi-robot systems with respect to communication-loss this way. The presented signal strength predictor adjusts itself on-line to different operation environments and robotic systems being used. [C357]

"An experimental framework for the evaluation of cooperative diversity"

Cooperative diversity is the result of relaying among nodes to achieve space diversity in multipath environments that offer limited time and frequency diversity. Although there is now substantial literature covering specification and analysis of cooperative communication strategies based upon models of wireless environments, there is much less work addressing experiments with real-world radio hardware and propagation channels. This work describes the construction of a three node, experimental testbed based upon a network of software-defined radios for development and verification of cooperative protocols. Several decode-and-forward relay protocols have been implemented and evaluated in terms of their diversity gains as measured from experimental curves of bit-error rate versus average signal-to-noise ratio. In contrast to the few other implementation efforts reported, the experimental setup maintains the relative node geometry while moving the network to induce fading, and the experimental results exhibit diversity benefits. [C358]

"Opportunistic Routing with Directional Antennas in Wireless Mesh Networks"

Opportunistic routing significantly improves the average progress per transmission over unicast routing by leveraging the opportunistic receptions of multiple potential forwarders in wireless mesh networks. Prior studies mainly focus on networks with omni-directional antenna only. Our previous work suggests that not every node contributes equally in a transmission. By concentrating the beam energy at a particular direction, directional antennas may further improve the performance of opportunistic routing in multi-hop wireless networks. In this paper, we derive an analytical model which allows the incorporation of various node distribution models, radio channel models and antenna models to evaluate the average progress per transmission. It is found that a directional antenna with high directivity does not always improve the performance of opportunistic routing and an optimal beamwidth exists for each particular network. When compared to the case of omni-directional antenna, a directional antenna with optimal beamwidth and direction settings can achieve 30 to 50% performance gain, in terms of average progress per transmission, under typical network configurations. Moreover, such performance gain can be as high as 100% for radio propagation environments where the packet reception probabilities fall off slowly with distance. [C359]

"ALDO: An Anomaly Detection Framework for Dynamic Spectrum Access Networks"

Dynamic spectrum access has been proposed as a means to share scarce radio resources, and requires devices to follow protocols that use resources in a proper, disciplined manner. For a cognitive radio network to achieve this goal, spectrum policies and the ability to enforce them are necessary. Detection of an unauthorized (anomalous) usage is one of the critical issues in spectrum etiquette enforcement. In this paper, we present a network structure for dynamic spectrum access and formulate the anomalous usage detection problem using statistical significance testing. The detection problem is classified into two subproblems. For the case where no authorized signal is present, we describe the existing cooperative sensing schemes and investigate the impact of signal path loss on their performance. For the case where an authorized signal is present, we propose three methods that detect anomalous transmissions by making use of the characteristics of radio propagation. Analytical models are formulated for two special cases and, due to the intractability of the general problem, we present an algorithm using machine learning techniques to solve the general case. Our simulation results show that our approaches can effectively detect unauthorized spectrum usage with high detection rate and low false positive rate. [C360]

"Coverage Control and Irregular Radio Propagation in Wireless Sensor Networks"

Research in the field of wireless sensor networks (WSNs) has been plagued by difficulties in performing realistic simulations. For instance, most of the existing coverage optimization techniques presuppose that the region covered by a sensor node is a disc characterized by the radio transmission range. This assumption is rigorously false because of the propagation phenomena including fading and shadowing. This paper investigates the impact of these radio propagation phenomena on the coverage optimization strategy in a WSN. We rely on the log-normal shadowing model to represent the effect of the environmental features on the WSN performance. We

propose a coverage model taking into account irregular radio propagation. We carry out a mathematical analysis to compute the average number of targets a sensor would detect under both perfect and irregular propagation conditions. We also conduct simulations to assess our random deployment model with respect to the existing strategies. [C361]

"Ultra wideband propagation channel on two path model with laptop computers"

This paper presents the ultra wideband propagation (UWB) channel on two path model with laptop computers. The UWB pulse with specific center frequency and bandwidth is used for transmitted signal. Complex form Friis' transmission formula is applied for the UWB propagation channel. The received signal is evaluated. The UWB path loss is defined as the ratio between the maximum amplitude of the transmitted and received signal waveforms. For the data processing, the path loss of two path model is considered for the 0.10 and 0.20 m antenna heights. The double linear regression for the path loss is modeled by using the minimum mean square error (MMSE) and first Fresnel zone break-point curve fits. The characteristics of the path loss function of the antenna heights are evaluated and discussed in this paper. [C362]

"The investigation of phase synchronization of reference oscillators through atmospheric channel"

Presented paper is devoted to theoretical modeling and experimental investigation of transferring of initial phase of low frequency oscillations with modulation of carrier oscillations in separate high frequency link from one part of testing link to another. The main goal of this investigation is the determination of influence of phase stability and amplitude one of separate high frequency link on the phase stability of low frequency oscillations in a point of reception. The results of experimental investigation of the reference oscillator's synchronization channel are represented in the paper. [C363]

"Multi-wideband rectangle-triangle antenna with a taper line for feeding"

This paper presents a new multi-wideband microstrip antenna. The radiating elements in this antenna are composed of a rectangular patch connected with two triangular patches with different sizes. The small triangular patch has slots. This antenna was analyzed, simulated, and tested. This antenna is fed by a taper line. It can be used for ultra-wideband applications. The multi-band behavior is achieved by etching perturbation slots to the patch. This will influence the resonant current distributions. [C364]

"Current status of radio spectrum management policy in Korea and related issues"

Radio waves are defined as electromagnetic waves of frequencies arbitrarily lower than 3,000 GHz. Radio spectrum is limited public-resource such as water, gas and electronic power. Therefore it involves in various competitive demands and the government's management and enforcement activities are inevitable. [C365]

"Modelling New Indoor Propagation Models for WLAN Based on Empirical Results"

This paper presents the modelling of new WLAN models for different indoor environments. This work was carried out in the frame of the FIL project which is funded by the French research agency ANR, in collaboration with Thales Alenia Space France. Based on the standard Opnet models for WLAN nodes, the propagation loss estimation for these types of environment has been improved. We derive an empirical model for spatial registration patterns of mobile users as they move within a TeSA Labs wireless local area network (WLAN) environment and register signal power from different access points. Such a model can be very useful in a variety of simulation studies of the performance of mobile wireless systems, to address issues such as resource management and mobility management protocols. We base the model on extensive experimental data from a TeSA Labs 2.4 GHz WiFi LAN installation. We divide the empirical data available to us into training and test data sets, develop the model based on the training set, and evaluate it against the test set. The new scenarios used to simulate these new propagation models are shown. Finally, results, conclusions and further work are given. [C366]

"Interference Effects of Non-Ideal Dynamic Spectrum Access on Primary and Secondary User Capacities"

Dynamic spectrum access (DSA) technology can improve the spectrum utilization significantly and is the key solution to the spectrum scarcity problem. In a typical DSA scenario, the secondary user (SU) is required to co-exist with the primary user (PU) in a non-interfering manner. However, the SU's spectrum sensing limitations can result in erroneous secondary transmissions that can affect the PU's capacity. In this paper, we model the interference caused by the SU to the PU and simulate the resulting capacity loss experienced by the PU. The trends in the PU and SU capacities that occur with variation in the system parameters such as transmit SNR,

PU-SU spatial separation and the spectrum sensing time have been discussed. The results presented in this paper show that the capacity loss of the PU as well as the SU due to DSA interference is insignificant when limits are placed on the SU system parameters. Furthermore, the maximum effective throughput that can be achieved by the SU under such limited operation is also computed. [C367]

"Short Baseline Propagation Characteristics of Determinstic Wireless Fingerprinting Systems for Localisation"

Fingerprinting is a technique that records vectors of received power from several transmitters, and later matches these to a new measurement to position the new user. This paper examines data from locations at very short ranges from each other in order to observe the nature of the relationship between short-range fingerprints. We find that even at short distances, variation due to fading dominates and a suitable signal model has yet to be produced. We also conclude that fingerprints should be averaged over a range near the point of interest. [C368]

"Model-Free Interval-Based Localization in Manets"

Self-localization of sensor nodes has become a fundamental requirement for many sensor networks applications. In this paper, we propose an interval-based rings-overlapping technique using the comparison of the received signal strength indicators. The high performance of this method remains in the way that it avoids the estimation of the channel pathloss model. Compared to the guaranteed boxed localization based on connectivity measurements, the proposed method is robust under irregular radio propagation patterns. Simulation results corroborate the efficiency of this method in terms of accuracy and computation time. [C369]

"Adaptive OFDM radar for detecting a moving target in urban scenarios"

We address the problem of detecting a moving target in an urban canyon using an orthogonal frequency division multiplexing (OFDM) radar and exploiting the multipath reflections. The multipath propagation increases the spatial diversity of the radar system and provides different Doppler shifts over different path. In addition, the use of broadband OFDM signal provides frequency diversity to the system. We develop a parametric measurement model that accounts for the multipath components at multiple frequencies as well as Doppler shifts. Then, we develop a statistical detection test and evaluate its performance characteristics. Based on this, we propose an algorithm to optimally design the spectral weights for the next transmitting waveform. We present a few numerical examples to illustrate our analytical results. We demonstrate the achieved performance improvement due to the exploitation of multipath propagation, OFDM signalling, and adaptive waveform design. [C370]

"UWB Channel Measurement and Data Analysis in Offshore Oil Platform"

This paper presents the ultra-wideband (UWB) channel measurements conducted in an offshore oil platform working base of ShenLi oil field. The measurements are done with a vector network analyzer (VNA) in the frequency band of 3-10 GHz both in line-of-sight (LOS) and non-line-of-sight (NLOS) scenarios to characterize the path loss and small-scale fading statistics. The multiple scatter clusters are caused by the special nature of the environment, for NLOS with large distance, the maximum of the multipath components is several tens of nanoseconds after the arrival of the first component. The measurement data approximately can be fitted to S-V model, and some modifications are made to provide excellent fit: ray power decay constants depend on delay with a linear relationship,and total power of 50 bins in a cluster fit to an exponential function of delay. Channel characteristics including the distance and frequency dependency of path loss, power delay profile, small-scale fading distribution are examined.The small-scale fading fits to m-Nakagami distribution with m-parameter range from 0.8-1.1. The results are helpful to model the the UWB propagation channel in such environment. [C371]

"A very low cost experimental setup for MIMO systems: How to build it with less than $500"

A step-by-step approach to build a very low cost automated measurement setup for MIMO systems is presented in this paper. The price of the system can be lowered to $500 by reusing specific hardware elements. The performance of the setup is also evaluated with results obtained from an indoor environment measurement campaign conducted at UCI Radiofrequency laboratory. [C372]

"Extraction of the effective propagation and attenuation constants in a cut-wire array"

We study the effective propagation and attenuation constants for wave propagation in a cut-wire array of finite metal wires. The effective propagation constant is obtained from the phase of the transmission data collected inside the array. The effective attenuation constant is then calculated by using the Kramers-Kronig relationship. The reconstructed transmission loss from the resulting attenuation constant shows good qualitative agreement with the raw transmission data. [C373]

"Directional UWB channel simulator"

Most of the existing UWB models suffer from limitations because UWB multipath propagation is frequency and antenna dependent. In this paper, a directional statistical simulator is developed. This simulator implements an extension to the IEEE802.15.3a model which incorporates the directional nature of the channel. The directional simulator allows for studying the impact of the specific antenna on the received profile. It allows for pulse shaping studies and improved receiver design. Positioning application should consider the directional impact of the channel for improved resolution. [C374]

"About IEEE RFID 2009"

The following topics are dealt with: tag circuits; measurement method; simulation method; health care; protocol; sensors; open source RFID software; privacy; security; reader design; antenna; propagation; near-field electromagnetic ranging. [C375]

"Modeling the Effects of Ionospheric Scintillation on Satellite to Earth Links"

Signals on satellite to Earth links can be affected by ionospheric scintillation which can lead to a complete loss of lock. This paper presents two scintillation models, the global ionosphere scintillation model (GISM) and hybrid model based on complex phase method and random screen method. Analyzing GPS receiver, this paper describes the effects of ionospheric scintillation on satellite to Earth links using the hybrid model, including phase noise and loss of lock probability. [C376]

"Weather and propagation effects on multi-mode seeker systems"

This paper will discuss the progression of army seeker systems from a single mode to a multi-mode configuration. This progression is in part due to the effects of weather on seeker system performance. This discussion will be based on computer simulations and climatological data and test data. The relationships between frequency and range will be explored as they interact with the weather. This effort is being conducted in the RF technology function of the Applied sensors, Guidance, and Electronics division, U.S. Army Aviation and Missile research, Development, and Engineering Center (AMRDEC) on the Redstone Arsenal in Huntsville, Alabama.While there is extensive work in this area, which is represented here in a condensed form, this paper will go into greater detail of the attenuation due to rainfall rates and cloud water content. The ground work for this effort was described in a paper "Weather and Radar Interactions. This research is a continuation of that work. The goal is to update the current trend in seeker development. The data obtained from this effort will be used to support the selection of new seeker system parameters. The effects of the weather would impact the selection of operating frequency and modes. This paper will also present some of the early test bed results of multimode seeker trials. [C377]

"Application of Code Average Method for GSM coverage prediction in different environment"

In order to estimate the signal strength accurately for mobile or wireless systems, it is important to estimate characteristics of system's propagation through a medium. Propagation analysis provides a good initial estimate of the signal characteristics. Since site measurements are costly, path loss prediction models have been developed as a low cost technique to predict at certain area. In this paper, well-known propagation path loss model Okumura-Hata and free space path loss model were used as basis to analyze the coverage of GSM system in different propagation environment (free space, rural, suburban, urban and dense urban). The code average method (CAM) was used to optimize the model to predict the path loss of propagation according to type of environment. Using CAM approach with grid system, it produced an effect in the path loss coverage form. Finally the simulation and analysis results show the effect of CAM in the path loss coverage prediction for different type of environment. [C378]

"A Radar Terminal Descent Sensor for the Mars Science Laboratory mission"

The soft-touchdown, ldquosky-cranerdquo concept employed by the 2009 NASA Mars Science Laboratory mission requires an order-of-magnitude improvement from previous missions in the sensing of vehicle velocity and altitude. This paper describes the development of a new radar ldquoTerminal Descent Sensorrdquo that provides decimeter-per-second velocity accuracy while also providing better than 2% range accuracy on six unique beams. This sensor design uses a millimeter-wave center frequency (Ka-band) and pencil beam antennas to achieve the required velocity precision and to overcome the problems that angle-of-arrival errors can cause in velocity reconstruction. Included are discussions of the design concept, driving requirements, hardware architecture, and results from a high fidelity performance simulation. [C379]

"Radio irregularity problem in wireless sensor networks: New experimental results"

A key design issue in wireless networks is represented by the irregular and dynamic radio coverage at each node. This is especially true for wireless sensor networks, which usually employ low quality radio modules to reduce the cost. It results in irregularity in radio coverage and variations in packet reception in different directions. Due to its likely impact on the upper layer protocols, many services, such as localization, routing and others, needs to be resilient to the irregular and dynamic radio propagation, and to include mechanisms to deal with these problems. As such, accurate models of radio propagation patterns are important for protocol design and evaluation. In this paper, measurements of radio propagation patterns have been carried out using the motes themselves. With empirical data obtained from the Mica2 platforms we were able to observe and further quantify such phenomena. The results demonstrate that the radio pattern is largely random; however, radio signal attenuation varies along different direction, and more importantly, is time-varying while stationary. [C380]

"On human body ultra wideband channel characterizations for different wave polarizations"

Ultra wideband (UWB) is a promising technology for wireless body area networks (WBANs). This paper investigates the wave propagation in the frequency range of 1-6 GHz for non-line-of-sight (NLOS) channels from front to back of a human body by considering different wave polarizations: perpendicular and tangential with respect to the body. Time domain electromagnetic (EM) simulation using the anatomical model of a human body assuming frequency dependent tissue properties is conducted. A significant enhancement of the on-body communication link is identified by exploiting the transceiver antennas at the perpendicular to body polarizations. As the results, the radiograph of the energy density and delay spread of the NLOS channels with different antenna polarizations are presented. [C381]

"Optimized implementation of the 3D MR-FDPF method for indoor radio propagation predictions"

With the widely acceptance of WiFi networks, and the highly regarded development of new indoor technologies like distributed antenna systems and femtocells, propagation models that take accurately into account the indoor channel characteristics are necessary for the purpose of network planning. Due to the complexity of such indoor environments made of obstacles causing numerous reflexions and diffractions, full 3D indoor propagation models are required. The MR-FDPF was recently proposed for indoor radio coverage but suffered from high complexity when trying to extends this model to 3D. That is why in this paper a solution to reduce the complexity of the MR-FDPF method is provided. In this new approach, the size of the matrices to be inverted is reduced, by neglecting the propagation modes that have low influence on the resulting coverage. It can be shown that propagation matrices of large MR-nodes can be divided into two classes, i.e. standard flow matrices and return flow matrices, each one having its possible simplifications. This new model allowed us to run full 3D simulations on a 3-floored building, with a RMSE of about 4dB between simulation and measurements. [C382]

"Satellite-to-indoor broadband channel measurements at 1.51 GHz and 5.2 GHz"

To investigate the satellite-to-indoor wave propagation channel for navigation applications the German Aerospace Center conducted broadband channel sounder measurements using a mobile crane as transmitter platform with the receiver being placed indoors. Using this setup, measurements were performed for L-band at 1.51 GHz and C-band at 5.2 GHz with a broadband signal of 100 MHz bandwidth. Results are given in terms of power delay profile, root-mean-square delay spread and mean delay. [C383]

"Application of FDTD to the analysis of indoor coverage"

Application of FDTD (with companion UPML) to the coverage analysis of empty and filled (with wooden desks) indoor scenarios is explored and results compared, both in time and frequency domains, with those obtained via ray tracing along with UTD field calculations. Results of FDTD simulated coverage of an usual office space, locus of an ongoing digital TV experiment at 804 MHz, further illustrate the potentiality of the method. [C384]

"Medium wave field strength spatial variability in urban environments"

This paper presents the results obtained from three extensive field trials of medium wave DRM (digital radio mondiale) which were carried out in Madrid (Spain), Delhi (India) and Mexico D.F. (Mexico) using different transmission frequencies. The aim of the paper is to provide the first approach to medium wave field strength spatial variability empirical parameters in urban environments. A methodology to study the empirical spatial variability is defined and finally the paper includes attenuation values according to urban features such as width of streets and height of buildings and provides statistics for different occasional field strength fading occurrences in urban environments. [C385]

"Algorithmic complexity of FDTD and ray tracing method for indoor propagation modelling"

Growing interest in providing and improving radio coverage for mobile phones and wireless LANs inside buildings has recently emerged. The need of such coverage appears mainly in office buildings, shopping malls in very complex environment. Although the three dimensional FDTD method has shown great promise, the calculation time is very environment dependent and exceeds the calculation time of ray tracing or ray launching in most cases. In this article, we focus on the theoretical estimation and comparison of FDTD and ray methods in aspects of the algorithmic complexity. [C386]

" WiMAX Near LOS Measurements and Comparison with Propagation Models "

Worldwide Interoperability for Microwave Access (WiMAX), as an open standard IEEE 802.16, offers a low cost wireless broadband access suitable for the emerging countries in the Latin America market. This paper analyzes the challenges imposed by the RF propagation environment, through field measurements, when using high frequencies such as 3.5 GHz, to a non line of sight (NLOS) WiMAX transmission condition, and suggests the importance of understanding the Near LOS conditions, as the transition region between LOS and NLOS, comparing with existing propagation models. The measurements where carried out in Brazil and in Mexico during 2008, and portrait the WiMAX propagation channel in typical suburban environment in Latin America. [C387]

"Propagation over a valley: Asymptotic results"

Prediction of radio signal strength for signals propagating over valley to a mobile receiver in terrestrial clutter, such as trees and buildings, is addressed. Starting from first principles, an accurate asymptotic approximation is found that describes the propagation as a combination of the usual two-ray component, and a ldquowhispering galleryrdquo mode that results from guided propagation over the valley, leading to a signal which is over 20 dB higher than would be observed in the case of flat terrain. This extends previously known flat terrain propagation models to include this sort of variable terrain. [C388]

"Aspects and results of numerical methods and wave propagation integrated into system simulations"

Navigation, radar and communication systems rely on radio signals. Objects in the vicinity of these systems can create distortions. This paper describes the advanced system simulation by the integrated scattering analysis by numerical methods. The simulation procedure and the criteria for a suitable method are described. Two practical cases are outlined. [C389]

"New smart antenna algorithm applied to autonomous area control for mobile radio network"

In this paper, we proposed applying smart antenna technology to AAC and the proposed AAC-SA method, which is a new antenna pattern control algorithm suited to AAC. The simulation results show that the proposed method automatically generates a high quality area even when the BS arrangement is random. The quality level is even equal to that when the BS arrangement is regular. In addition, the effectiveness of the method in an office environment was investigated based on a ray-tracing simulation of the propagation characteristics. [C390]

"Development of ground equipment for atmospheric propagation assessment from 10 up to 90 GHz"

The ldquoatmospheric propagation and profiling systemrdquo (ATPROP) advanced ground-based microwave radiometer, for radiowave propagation assessment at Ku, Ka, Q/V and W bands has been developed. The design of ATPROP is based on the requirements of SatCom, SatNav systems and Space Science Missions. ATPROP consists of two independent subsystems, operating at Ka band, near the 60 GHz oxygen absorption band and at 15/90 GHz. ATPROP has a full non-GEO satellite tracking capability and uses switched Dicke references to improve stability. Its performance allows to accurately derive atmospheric attenuation, sky noise, wet delay, and cloud, vapor and air temperature profiles. [C391]

"Cellular phone coverage in urban vegetation areas"

Although the propagation of radio waves in vegetation environments has been widely studied, the actual situation is that mobile phone systems coverage appears to be clearly poor in vegetation than in open places within urban areas. Large measurement campaigns results are presented in this work, providing numerical data that could be useful to correct the radio network planning when parks or groves are around the base stations. Both median and other statistics are provided. [C392]

"An Intelligent Ray Launching for urban prediction"

With the increasing need of accuracy, deterministic propagation models have been widely adopted in site-specific wireless applications. Compared to empirical models, they are usually more accurate, but time-consuming. Several acceleration techniques have reduced the simulation time and yet the computation of typical scenarios remains complex. In this paper, a novel 3D model, namely IRLA (intelligent ray launching algorithm) is presented to predict a huge number of receiver pixels (few millions) in a large scenario (few square kilometers) within few seconds, which is beneficial to relevant academics and industries. [C393]

"Use and development of climatological and experimental databases for radiowave propagation modelling in SatCom and SatNav systems"

This paper presents a review of the databases currently used for the assessment of radiowave propagation effects in satellite communication (SatCom) and satellite navigation (SatNav) systems. This presentation focuses on tropospheric effects but relevant effects are also due to the ionosphere and to the environment around the receiver (i.e. multipath) for mobile and navigation systems. The discussion includes both climatological (i.e. statistics of meteorological parameters averaged over a period of time lating up to several years) and experimental databases (including both radiowave propagation parameters and atmospheric remote sensing measurements). The paper illustrates examples of numerical weather prediction data, products from satellite Earth observation systems and the databases which are currently recommended or considered by ITU-R Study Group 3. [C394]

"Break point analysis and modelling in subway tunnels"

The time constraints in network developments inside tunnels require a characterisation of canonical tunnels in terms of propagation path losses and developing a slope model which is usually represented as a two slope model. One of the problems arisen when the canonical model tries to predict the propagation path losses inside the tunnel is to determine the distance where the slope of the propagation path losses changes. This paper analyses two of the most common approaches to determine that distance and their behaviour in different scenarios in order to clarify the radio propagation mechanisms which define the break point distance. [C395]

"Path loss pattern prediction in Tokyo City based on deterministic ray tracing and stochastic multi-parametric approaches"

This study is related to investigation of two planning tools based on the deterministic ray tracing model, as direct computations of numerous rays arriving at the receiver, and the stochastic multi-parametric model, as combination of statistical description of the built-up rough terrain, and of radio propagation accounting for multiple reflection, scattering and diffraction. Comparison between these two theoretical predictors is done for description of the total path loss pattern in urban environment and is shown that simple engineering formulas, obtained from the stochastic multi-parametric model, have vivid physical and mathematical form converted in the ldquostraight linerdquo equations. [C396]

"Development of measurement-based ray tracer for multi-link double directional propagation parameters"

This paper introduces a new method for combining high resolution parameter estimates with ray-launching based wave propagation prediction. The idea behind the proposed measurement-based ray tracing tool is to use measured data as the input for a ray-launching algorithm. With the developed tool, it is possible to identify dominant propagation phenomena and relate them with the objects in the physical environment. A core function of the tool is the identification of the scattering points of the multipath components by utilizing the measured multi-link double directional parameter estimates. The obtained knowledge is essential in developing a multi-link MIMO channel model. [C397]

"Direction of arrival measurements for outdoor-to-indoor channel characterization"

A channel model should include information about the angle of multipath arrivals in order to characterize the propagation channel. In this paper, we present results from a large set of direction of arrival (DOA) measurements performed for both line-of-sight (LOS) and non-LOS (NLOS) conditions. The aim of this paper is to establish channel models by characterising the propagation in outdoor-to-indoor case at 3.5 GHz. These models will be used to simulate a WIMAX system. A description of the measurement system developed and used throughout the experiments is made. [C398]

"Beam tracing for multipath propagation in urban environments"

We present a novel method for efficient computation of complex channel characteristics due to multipath effects in urban microcell environments. Significant speedups are obtained compared to state-of-the-art ray-tracing algorithms by tracing continuous beams and by using parallelization techniques. We optimize simulation parameters using on-site measurements from real world networks. [C399]

"Electromagnetic propagation at frequencies above 50 GHz: The challenge of the atmosphere"

This contribution is intended to provide a preliminary quantification of the expected atmospheric impairments suffered from a radio wave at frequency above 50 GHz, as it could be theoretically derived by extrapolating the present theoretical and experimental knowledge. We have addressed the role of gases, clouds, scintillation and rain (with emphasis also on the impact of the hydrometeor size distribution) on the attenuation level, the melting layer characteristics and the depolarization of the electromagnetic waves travelling through the atmosphere. [C400]

"Modelling and synthesis of dense multipath propagation components in the angular domain"

It is acknowledged that the description of mobile radio channels that includes only Specular Components (SC) is insufficient. In order to overcome this, Dense Multipath Components (DMC) have to be taken into consideration. But a measurement backed model of the angular properties that would be needed for a comprehensive description of DMC is not yet available. The paper on hand will, therefore, examine the angular distribution of data obtained using channel-sounding measurements. Furthermore, it will present a simple model of this distribution, as well as methods for the estimation of its parameters. [C401]

"Study about electromagnetic wave propagation and scattering in random media accomplished by Xidian University: An overview"

Over past twenty years, the main work about electromagnetic wave propagation and scattering in random media that we have done can reduce to four topic areas: Propagation and scattering properties in discrete random media; Effect of optical wave propagation in atmosphere turbulence; Scattering properties of rough surface; Ionosphere properties and effect on radio propagation. [C402]

"Propagation measurements inside different civil aircrafts and comparison with EM techniques"

This paper presents results of a narrowband measurement campaign conducted in a two different civil aircrafts. Inside a Boeing 737-400 and in an Airbus A340-300 aircraft, the objective being the development of a propagation prediction model which can be used in the deployment of in-cabin wireless networks. The measurements were conducted at three different frequency bands: 1.8, 2.1 and 2.45 GHz, representative of several wireless services. The path loss factor was found between 2.1 and 2.3 inside Boeing and between 3.3 and 3.6 inside Airbus. The average K-factor in the Airbus aircraft corridors was found between 9.5 and 10.1 dB, for LoS conditions and between 3.7 and 5.0 dB for NLoS cases. In respect the K-factor inside the Boeing corridor ranges between 12.1 and 12.6 dB. Propagation prediction technique based on Physical Optics was applied to the Boeing 737-400 cabin scenario to obtain comparison of theoretically predicted values and measurements. [C403]

"Modelling of MIMO vehicle-to-vehicle fading channels in T-junction scattering environments"

In this paper, a new wideband multiple-input multiple-output (MIMO) fading channel model for vehicle-to-vehicle (V2V) communications is proposed. The MIMO V2V channel model, called for brevity T-model, captures the propagation effects that occur if vehicles move towards a junction with a side road and corner buildings. The starting point for the derivation of the T-model is a new geometric T-junction scattering model, where both single- and double-bounce scattering mechanisms are assumed. Our geometry-based channel model takes into account the exact relationship between the angle-of-arrival (AOA) and the angle-of-departure (AOD). The statistical properties of the T-model are studied under the assumption of non-isotropic scattering. An analytical solution is provided for the space-time-frequency cross-correlation function (STF-CCF) from which several other important characteristic quantities like the temporal autocorrelation function (ACF) can directly be obtained. The achieved theoretical results are illustrated for a typical T-junction propagation scenario. This research work provides designers of MIMO V2V communication systems an important tool in form of a wideband spatial channel model enabling the performance analysis of new high data rate transmission schemes under propagation conditions occurring at T-junctions. [C404]

"Experimental study of propagation characteristics for wireless communications in high-speed train cars"

This paper describes the measurement results of propagation loss characteristics in high-speed train cars. We focus on the propagation loss in intra-car communications using a 2-GHz band and inter-car communications using a 5-GHz band. The measurement campaign is carried out using real train cars under both running and non-running conditions. The measurement results for intra-car communications indicate a waveguide effect in a closed space environment, and based on the results, we clarify the maximum propagation loss expected in intra-car communications. The measurement results for intercar communications indicate that the propagation loss is greatly affected by waves re-entering the car through train windows, and we evaluate the influence of the re-entering waves on the variance in the propagation loss between the train cars. [C405]

"Monitoring rain rate with data from networks of microwave transmission links"

Monitoring microwave attenuation (20 to 45 GHz) of directional transmission links is a method to derive rain rate at high time resolution and in near-real time. Raindrops falling through a propagation path of a microwave link attenuate the transmitted signal quasi linearly with rain rate, allowing the estimation of path-averaged rain intensity. These data are valuable for meteorology, hydrology, agriculture, flood control, and others. The application to entire networks of commercial links would be a cost-effective method to fill data gaps where precipitation-radar data are either distorted or missing, such as large cities, valleys in mountain areas and developing countries. We will review the feasibility of the method and report on activities for setting up a project in Switzerland. [C406]

"A new propagation campaign in tropical areas: The Ka-band propagation experiment over India with the GSAT-4 satellite"

An opportunity has been proposed recently by the Space Applications Center (SAC) of the Indian Space Research Organization (ISRO) to carry out a propagation experiment at Ka-band over India. To this purpose, the GSAT-4 satellite will board two propagation beacons at 20.2 GHz and 30.5 GHz in linear polarization. The objective of this paper is to present the GSAT-4 propagation experiment. In a first part, the main objectives of the campaign are described. Afterwards, a presentation of the specifications of the propagation beacons to be boarded on GSAT-4 are given. Finally, the ground segment with all instruments planned to be distributed over India during the campaign are detailed and illustrated with an example of link budget. [C407]

"New Czech rain data and methods applied to radiowave propagation"

Continuous rain rate measurement in the Czech Republic is analysed by a new original method. Many useful parameters from rain statistics are evaluated (CD of rain rate, rain event and inter-event duration, correlation coefficient between 2 sites, rain attenuation, site diversity gain etc.) A way to use it in rain attenuation prediction is shown. [C408]

"Inverse problem solution of radio-waves scattering on soil by minimization of regularizing functional"

To determine an one-dimensional continual permittivity profile of layered medium with a scale of inhomogeneity in 1 cm has been considered a data processing procedure of waves reflection from a half-infinite medium with heterogeneous permittivity that depends on a depth. This procedure is based on the regularizing algorithm minimization of the generalized discrepancy between the measured frequency dependence of the reflection coefficient and its theoretical model. The sum of theoretical dependence of the reflection coefficient from frequency into range 0.4-2 GHz and random error with the uniform law of probability distribution was used as a measured data of the reflection coefficient from a natural soil. [C409]

"Short-term prediction of atmospheric attenuation in Q band from Ka-band measurements on earth-to-satellite links"

Fade mitigation techniques on Earth-satellite links require the estimation of channel propagation conditions. This is generally done by using downlink measurements at a lower frequency to derive the channel uplink propagation conditions at higher frequencies. Moreover, when atmospheric conditions are changing, the ground stations have to change their own configuration (increase or decrease transmit power and/or data rates for example). These changes involve estimating the uplink propagation conditions in advance. The proposed algorithm allows the margin to be estimated a few seconds in advance from the downlink so that a given percentage of availability of the uplink is reached. For that purpose, we have used a recently developed prediction method based on an ARMA/GARCH model (de Montera et al., 2008) and scaling frequency models. From the downlink attenuation,

first the attenuation is first predicted with a prediction horizon ranging between 2 and 30 seconds. The contributions of gases, clouds and rain are then estimated using a neural network (Barthes et al., 2006) and scaled using specific scaling factors. Finally, the attenuation and its variance for the uplink are estimated and the margin is derived. This algorithm allows an accurate upper-bound of the future attenuation to be estimated in real time, which minimizes the cost of fade mitigation techniques and therefore enables the communication system to reach an appropriate percentage of availability. After a presentation of the method, we describe results obtained from the Syracuse 3 EHF measurements (20/44 GHz). We show that the method gives good results for a prediction horizon in the range 2-30 seconds. We conclude the paper by showing that for a prediction horizon of 10 seconds and for attenuations greater than 5 dB the error due to frequency scaling is larger than the prediction error, so that future improvements should focus on scaling frequency models. [C410]

"Investigation of polarization in on-body propagation channels"

A measurement campaign to investigate the polarisation behaviour of on-body communication channels using a dual polarised antenna is reported. The antenna is a combination of a monopole and loop antenna, which yields the required vertical and horizontal polarization respectively in the XY plane. Measurements were done using this antenna on the body in indoor environment. The collected data has been processed and the results are presented. [C411]

"Effect of the indoor environment on the UWB on-body radio propagation channel"

This paper presents the effect of the indoor environment in the UWB on-body radio channel. A measurement campaign was performed in the anechoic chamber and in an indoor environment for comparison. The propagation along the front part of the body and around the trunk are analyzed. Path loss model, time delay parameters and pulse fidelity are extracted from measured data. A statistical analysis on the root mean square (RMS) delay shows that Nakagami distribution is the best for modeling the propagation along the front part, while normal is the best for propagation around the trunk. Results have proven that the propagation around the trunk is less affected from the multipath effect. [C412]

"Application of Bertoni's work to propagation models used for the planning of real 2G and 3G cellular networks"

Many path loss prediction models developed by Henry Bertoni and his students are an integral part of propagation models used in today's radio network planning tools. This contribution describes how his models have been integrated into, extended and applied to a propagation model used by a mobile network operator for the daily radio planning process. The performance of the model at 900 MHz and 1800 MHz is analysed by comparing the predictions with measurements from an extensive measurement campaign at 29 representative sites in Germany. [C413]

"Recent progress of research on tropospheric propagation in China"

The troposphere, have important effects on the performance of radio systems, e.g. rain attenuation is the main impairment for radio communication systems operating at frequencies above 10 GHz, and tropospheric delay is one of the major error sources for satellite navigation systems (such as GPS), etc. Therefore for the proper planning of radio systems it is necessary to have appropriate tropospheric propagation data and prediction techniques. In this paper, recent research advancements are introduced on radio meteorology, radio wave propagation and remote sensing in troposphere in China. [C414]

"PO and UTD solutions for multiple-diffraction analysis in radiowave propagation prediction"

Prof. Bertoni's contributions in over-building radiowave propagation in urban environments have been used by other researchers to compare or introduce new formulations, either based on PO or the UTD. In this paper, a review of various PO and UTD solutions, used to analyze multiple-diffraction over buildings, is presented. [C415]

"Study on the ionospheric weather and radio propagation in CRIRP"

In this paper, we summarize the progress in ionopsheric weather and radio propagation in China Research Institute of Radiowave Propagation, including the ionospheric observations, the studies of ionospheric physics, ionospheric mapping, ionospheric modelling and artificial ionospheric modification, the ionospheric radio propagation studies, and ionospheric services. [C416]

"The satellite communications network of excellence "SatNEx": Channel modelling and propagation

impairments simulation activities"

SatNEx aims to rectify the fragmentation in satellite communications research by bringing together Europe's leading academic institutions and research organisations in a cohesive and durable way. The resultant pan-European network provides a collective grouping of expertise and state-of-the-art laboratory facilities that would otherwise remain dispersed throughout Europe. This paper gives a brief introduction to the SatNEx project and to the activities related to channel modelling. [C417]

"Fading correlation measurement and modeling on the front side of a human body"

In this paper, measurement results for narrowband channel fading along the front side of human body at 2.45 GHz are presented. A simple propagation model corresponding to the investigated scenario is also introduced. The comparison between simulation and experimental results shows a reasonable similarity. [C418]

"Propagation and radar measurements performed in Spino d'Adda and the Italian planning for the Alphasat TDP5 scientific experiment"

This paper gives a summary of some propagation- and radar-measurements carried out (or to be carried out in the next future) in the Spino d'Adda station (near Milano) with particular emphasis on the ones utilizable to support some of the future advanced techniques known as propagation impairment mitigation techniques (PIMT) that will see the light in the next decade. In the past some measurements finalized to the PIMTs realization were mainly collected within the Italsat experiment (mm waves beacons, radar, raingauges) while, for the future, a campaign of measurements (to be performed in the frame of the Alphasat experiment) has been planned specifically with the purpose to enlarge the experimental basis of this activity, as absolutely necessary. [C419]

"Adaptation of terminal to base station assignment to terminal activities and rain event in Broadband Fixed Wireless Access systems"

In point-multipoint systems the signal to interference plus noise ratio highly depends on the assignment of terminal stations (TS) to base stations (BS). The broadband fixed wireless access (BFWA) systems operate at high carrier frequencies, i.e. microwave domain. In this frequency range wave propagation is highly influenced by precipitation, especially rain. Applying site diversity can mitigate rain attenuation effects, when downlink signal level decreases below a threshold, terminal station can be assigned to an other base station, though in point-multipoint systems this base station re-assignment can raise uplink interferences at other terminals. Present contribution provides a special diversity method which adopts genetic algorithm to dynamically optimize TS-BS assignments in BFWA service area from interference point of view. Efficiency of applying various objective functions are compared considering different aspects. [C420]

"Pattern diversity versus polarization diversity in UMTS mobile phones"

In this paper, we describe the design of a novel two-antenna UMTS mobile phone structure able to either radiate vertically or horizontally polarized electric fields in the azimuthal plane of the phone depending the relative phase of the input signals of each antenna. Then, we introduce a structure where the two UMTS PIFAs are positioned in the same manner, but are neutralized to enhance their port-to-port isolation. This last structure is able to radiate vertically-polarized electric fields in the azimuthal plane of the phone with two slightly different pointing directions depending which antenna is fed. Then, we compute the diversity metrics of those two prototypes in different ideal and realistic propagation environments. It is especially revealed that the polarization-diversity scheme is not necessary the best solution for optimum performance. [C421]

"Studies on the Schumann resonance frequency variations"

Schumann resonances are the resonant frequencies of electromagnetic radiations from lightning propagating in the earth-ionosphere wave-guide. It is generally around 8 Hz and it's higher harmonics are also present (Sentman, 1987; Roldugin et.al, 2004). The recorded data of Schumann resonances at Dharali in Himalaya at an elevation of 2591 m above sea level were used for the present study. The horizontal electric field components Ex(North-South direction) and Ey(East-West direction) were obtained by measuring the voltage drop between pairs of non-polarizing electrodes deployed in electrical contact with the soil. Induction Coil magnetometers were used to measure the horizontal Hxand Hycomponents. A description of the instruments is given by Israil et.al (2008). The measurements were made in frequency range 1 to 30 Hz for the present study, which was sufficient to cover first three resonance modes. It has been found that power spectrum shows maximum during noontime and minimum during nighttime. The frequency shifts in X and Y components of electric and magnetic fields are not in the same phase. Frequency changes in different components vary from 1.9 to 2.6%, 1.8 to 3.2% and 1.4 to 3.3% respectively in first three Schumann resonance modes. Ionospheric anisotropy resulting in the frequency

splitting in the X and Y magnetic field components of the Schumann resonance modes were also observed at a spectral resolution of 0.03 Hz. [C422]

"Underground wireless sensor networks"

In this paper the possibility to construct wireless sensor networks buried in the terrain is discussed. Advantages and drawbacks are pointed out, and an analysis of the most efficient method to evaluate the effect of radio-link parameters on radio propagation is provided. As it is unsuitable for fixed monitoring applications, because of the need to power the equipment, this technological solution may become effectively convenient, when the sensor is mobile and its permanence in the ground is time-limited. For all these reasons, the solution becomes attractive, applied to detect breaks and reveal unknown tracks in water distribution networks, monitoring the pressure of the fluid flowing in the pipe and tracking the path of the sensor through the conduits. [C423]

"Applicability of sea clutter models in nonequilibrium sea conditions"

This paper presents the comparative analysis between the sea clutter models and the recorded data to evaluate the limitations of the models. The availability and applicability of these models in nonequilibrium sea conditions are discussed. The results show that these models underestimate sea clutter scattering coefficient in upwind and downwind conditions. In the strongly local crosswind conditions, the TSC model can obtain good match results by inputting separately parameters of wind speed and wave height instead of sea state number. [C424]

"Wedges Modelling for Electromagnetic Fields Diffracted by Two Horizontal Edges with Arbitrary Angle"

In order to have an effective utilization of the radio wave resources, it is important to estimate propagation path in the urban area. In our previous work, we have examined the diffracted fields by two horizontal edges with an arbitrary angle. In this paper, the diffracted fields by two edges which are in different and same heights are analyzed. The numerical calculation is carried out for two wedges and a building-like double-wedge on perfect conductor, concrete and earth wedges. The results show that when the angle between two edges increases, relatively strong orthogonal polarized wave components appear to the incident wave. [C425]

"The Accuracy of Propagation Models for Distance Measurement between WSN Nodes"

The accuracy of RF propagation models for distance measurement between WSN nodes using received signal strength indicator (RSSI) was studied. We implemented two simple propagation models, the free space log-normal model and 2-ray ground reflection model. The results show, that first model is not very precise in closed space (rooms). The second model gives quite well agreement with experimental RSSI measurements for greater distances between transmitting and receiving nodes. [C426]

"An empirical analysis for evaluating the link quality of robotic sensor networks"

This paper presents a comprehensive metric to evaluate the link quality for the distributed control of robotic swarms to maintain the communication links. The mobile robots dynamically reconfigure themselves to maintain reliable end-to-end communication links. Such applications require online measurements of communication link quality in real-time and require a connection between link quality and robot positions. In this paper, we present the empirical results and analysis of a link variability study for an indoor and outdoor environments including received signal strength indicator(RSSI), active throughput and packet loss rate(PLR) using the off-the-shelf software and hardware. RSSI is adpoted to reflect the basic performance of link quality in robotic sensor networks. Throughput acting as a decaying threshold generator is used to estimate the critical point for smooth and stable communication. Meanwhile, The metric PLR is adopted to reckon the cut-off point in end-to-end communication. The assessment of link quality acts as a feedback for cooperative control of mobile robots. The experimental results have shown the effectiveness of evaluation for the link quality of robotic sensor networks. [C427]

"Efficient point-to-area electromagnetic field calculation using tube tracing method"

A new method is proposed to calculate the field or power distribution on a grid plane of receivers called receiving plane, with arbitrary height in an urban scenario using tube tracing algorithm. Receiving plane is divided into small cells according to the resolution requirement. As opposed to checking all cells for possible reception of the ray tubes, it is first checked the intersection of the ray tube with that plane. It is illustrated that the existing three-dimensional shooting-and-bouncing ray methods, dealing with point-to-area problem, have some errors to find the true illuminated cells except in limited cases. Here, several new techniques are employed to determine all cells illuminated by the ray tube at different cases, exactly. Then, the field related to each illuminated cell is

determined by an accurate backtracking method. The memory consideration of the method is also addressed. Moreover, a solution is presented to avoid the multiple counting of tubes fitting into the tube tracing procedure. Finally, comparison with measurements in an urban scenario illustrates the efficiency and accuracy of the proposed method. [C428]

"Impact of bandwidth, center frequency and spatial position on the results of ultra- wideband power delay profile measurements and accuracy of predictions"

The dependence of power delay profile upon bandwidth (temporal resolution) and center frequency is systematically studied using ultra-wideband measurements. The necessary measurement parameters for wideband channel models construction, validation and construction of precise site-specific propagation prediction models and investigation of propagation mechanisms have been detected. Ray tracing and Finite Integration Technique numerical Maxwell's equation solver accuracy has been estimated and compared on the basis of delay profiles. [C429]

"Radio wave propagation path loss in the irregular terrain environments"

This paper proposes an efficient, full-wave computation technique to investigate the radio wave propagation with irregular terrain environment, this methodology is based on the parabolic wave equation (PE). A split-step transform algorithm is used to solve the PE; a staircase terrain modeling is used to approximate complex terrain. It is used to calculate the reflection and interference mechanism in the standard atmosphere and successfully applied to model the field in the presence of knife edge and smoothness hill terrain. The results are validated by the comparisons with hybrid methods in AREPS. [C430]

"Approximate technique for calculating attenuation factor of ground-wave propagation over the inhomogeneous surface"

Characteristic of ground-wave propagation and approximate calculation technique of electric field intensity over the inhomogeneous surface is investigated. The attenuation factor of ground-wave propagating along two kinds of mixed path is calculated, the consequences is also compared and analyzed. Finally, guidance is given for the appropriate selection of geology in the area where transmitting and receiving antenna are installed. [C431]

"Shortwave Propagation over Oceans and HF Propagation Prediction Model"

The characteristics of rough seas' propagation in HF band are analyzed in this paper. Sketch of the transmission model and characteristics of HF band are firstly introduced. The ground-wave propagation is particularly investigated and the sky-wave propagation model is introduced marginally. After the sky-wave transmission path was detailed and analyzed. The simulation results of ICEPAC (Ionospheric Communication Enhanced Profile Analysis and Circuit Prediction Program) show that HF prediction model built with correct settings outputs the general communication situations of China rough sea in HF band and improve the receiving communication reliabilities. [C432]

"Static and dynamic measurement of the UWB distance dependent path loss"

Residential indoor measurements of the line of sight (LOS) and non-LOS (NLOS) distance dependent path loss are analysed from 10 MHz to 4.5 GHz. For these measurements, a time domain sounder is used to interrogate the propagation channel in two ways: static, and dynamic. For the static measurements, the transmit and receive antennas are located at predefined locations and the sounding premises vacated before capturing channel impulse responses (CIRs). For the dynamic measurements, a person displaces the receive antenna over predefined paths while the sounder stores CIRs at specific time intervals. The measurements are compared and analysed, and a modelling scheme is proposed for the continuous simulation of the distance dependent path loss. [C433]

"An efficient error concealment method for mobile TV broadcasting"

Nowadays, TV broadcasting has found its application in mobile terminal, however, due to the prediction structure of video coding standards, compressed video bitstreams are vulnerable to wireless channel disturbances for real-time transmission. In this paper, we propose a novel temporal error concealment method for mobile TV sequences. The proposed ordering methods utilizes continuity feature among adjacent frames, so that both inter and intra error propagation are alleviated. Combined with our proposed fuzzy metric based boundary matching algorithm (FBMA) which provides more accurate distortion function, experiment results show our proposal achieves better performance under error-prone channel, compared existing error concealment algorithms. [C434]

"Optimal design of wireless local area networks (WLANs) using simulation"

In this paper, we introduce a wireless LAN design framework for optimal placement of access points (APs) based on detailed coverage area and capacity requirements in the operational environment. The framework provides a combination of optimization algorithms that place APs for maximizing coverage and capacity, while minimizing interference and deployment cost. The framework accurately models RF propagation effects and leverages OPNET ModelerГ‚В® 's discrete event simulation (DES) capabilities to validate the output of the optimization algorithm. The algorithm can be executed iteratively incorporating recommendations from DES results to provide verifiable and optimal AP placement. [C435]

"Electromagnetic radiation and conducted susceptibility diagnosis and analysis of vehicle electronic circuit using mixed-mode S-parameter method"

In this paper, the radiated emission and the conducted susceptibility of vehicle electronic circuit to external radio frequency (RF) disturbances are studied using mixed-mode S-parameters method. The analytic method adopting mixed-mode S-parameters developed in this paper can be used to illustrate noise-converting phenomenon and verify successfully by the bulk current injection (BCI) test procedures. The far-field measurement and the susceptible experiment were proved by BCI test and the mixed-mode S-parameters are obtained from four-port vector network analyzer. From the verified results, the correlation of the BCI test agrees very well with the mixed-mode S-parameters method. [C436]

"Analysis of signal propagation path modeling of UWB through-the-wall radar"

The propagation of ultra-wide band (UWB) signals in the environment of through-the-wall (TW) is an important issue with significant impacts on the development of UWB TW radar technology. Ray method is a traditional modeling method and it doesn't consume much computer memory or calculation time. However, it cannot demonstrate very well the way of wave propagation such as diffraction and pulse distortion. 3D-FDTD method can be used to simulate the propagation of wave through the wall and model path error of TW radar. In this paper we compare the performances of ray method and FDTD method. The accuracy of these two models is analyzed. The effects of the dispersive properties of the wall materials on ranging error are discussed. We also propose a method to improve traditional ray method. [C437]

"Ultra Light Carbon Phantom hand for RF performance evaluation of mobile terminals"

Measurement of radio frequency (RF) radiation performance has been investigated for mobile terminals including the influence of the human body. Recent studies have shown that the user's hand has a greater influence on antenna radiation performance than the head. Therefore, a hand phantom needs to be included in the evaluation of the RF performance of a mobile terminal. We developed a lightweight tissue-equivalent phantom, ultra light carbon phantom (ULCPГ‚В®), consisting of a head and upper body, for application to three-dimensional (3-D) RF radiation measurement. In this paper, the development and evaluations of the hand of the ULCP is presented. The RF performances of a dipole antenna and a mobile terminal with the ULCP hand are evaluated in comparison with a number of human test subjects. Finally, it is confirmed that the ULCP hand is useful for mobile terminal tests including the influence of the human hand. [C438]

"Simulation and analysis on the performances of combined-GEO-IGSO satellite constellation"

The combined-GEO-IGSO constellation is the combination of GEO (geostationary earth orbit) satellite and IGSO (inclining geostationary synchronized orbit) satellite. The combined-GEO-IGSO constellation can integrate the advantages of GEO and IGSO to achieve regional coverage. The simulation results show that: the combined constellation can reach higher multi-sat coverage and higher communication elevation in China and surrounding areas; the Doppler shift, delay and propagation loss of this constellation have little impact on the system. As regional coverage constellation, the combined-GEO-IGSO is feasible. [C439]

"Theoretical analysis on local mean signal power for wireless field strength coverage"

The estimation of local mean signal power in wireless field strength coverage is of utmost importance in the planning of base stations in wireless mobile cellular communications systems. Many related topics about the estimation of local mean signal strength are based on Lee's law, which has some restrictions in the real implementation. While, in the construction of our native railway, a 4 cm sampling interval is adopted in the engineering implementation. However, there is no any theoretical basis for this sampling value. In this paper, theoretical analysis and simulations are carried out in determining the statistical interval, sampling interval, confidence degree and confidence interval. Theoretical value for the variance is derived when the sampling points are correlated with each other. The establishing basis for confidence degree is proposed. Some important

conclusions about the determination of local mean power are drawn through simulations and corresponding analysis. [C440]

"Interactive Volume Visualization for Electromagnetic Environment on 3D Globe"

3D visualization on electromagnetic environment (EME) is one of the most important research fields in virtual battle space. This paper presents a novel approach on visualizing the 3D EME by direct volume rendering on 3D globe. 3D power volumetric data is calculated based on the Longley-Rice radio propagation model(Irregular Terrain Model, ITM), which takes into account the effects of irregular terrain and atmosphere, and the data are rendered on 3D globe by assigning different color and opacity depending on user's interactive input with color picker. We also propose an interactive method to show detailed information of EME at given place. This approach provides excellent decision supporting and plan-aiding for users. [C441]

"Range estimation of tactical radio waveforms using Link Budget Analysis"

Multiband tactical communication modems must employ different waveforms to meet various demands in quality and nature of data. Range maximization, high data throughput and power conservation requirements are usually not fulfilled by a single waveform. To effectively deliver tactical multimedia data including coded audio, text, video, map and navigation information using radio, multiple choice of frequency bands exist. These include: HF, VHF and UHF. However, along with the effective delivery of quality data, the maximization of transmission range under hostile propagation environments-especially under terrain blockage in ground-to-ground (GTG) communication scenario-is of utmost importance. This paper discusses the results of link budget analysis performed for the estimation of maximum delivery range using variety of data rates for three typically different waveforms-high frequency waveform (HFW), very high frequency waveform (VHFW) and OFDM based wideband network waveform (WNW). Center frequencies of 27 MHz, 60 MHz, and 500 MHz respectively were used for the simulations. Results show that HFW produces the longest range, followed by VHFW and the WNW-which delivered the highest data rate. [C442]

"A Systematic Approach for UWB Channel Modeling in Aircraft Cabins"

The Saleh-Valenzuela multipath channel model (SVmodel) is often used for the modeling of communication channels in confined environments . The model assumes multipath components (MPC) arriving at the receiver in clusters. Instead of identifying clusters from the power delay profile (PDP) via visual inspection as proposed in, this paper proposes a systematic algorithm for cluster identification in a large wide-bodied aircraft cabin. The performance of the SV model implemented with the proposed best fit algorithm is compared in empty and occupied aircraft cabin scenarios. [C443]

"Characteristic of EM-wave anomalous propagation in marine evaporation duct"

Based on the atmospheric modified refractivity, the difference between the evaporation duct and the standard atmosphere is analyzed. The propagation path and the transmission loss of the EM waves are calculated respectively by ray-tracing technique and Fourier split-step method of the parabolic equation in standard atmosphere and evaporation duct. The simulation results show that evaporation duct can trap some radio rays to extend the propagation distance of EM wave and result in the appearance of radar blind zone. The characteristic of the EM wave anomalous propagation in marine evaporation duct can help to improve the radar over-the-horizon detection performance. [C444]

"A new approach to solve angular dispersion of discrete ray launching for urban scenarios"

Ray-based methods such as ray tracing and ray launching have been increasingly used in radio wave propagation modelling. Ray tracing is used for point-to-point multipath prediction (for few receivers) while ray launching, being more adaptable, is more suitable for multi-point prediction. However, ray launching suffers from angular dispersion which causes rays to miss pixels when the distance from the emitter increases. Several solutions such as beam tracing or ray splitting have been proposed to resolve this, but this paper presents a new approach, which is suitable for discrete ray launching, to avoid the problem. Results show that by this approach, discrete ray launching is suitable for radio wave propagation modelling. Significant speedups are observed compared to traditional ray-based models via parallelization techniques such as multi-threading and distributed computing. Complex channel characteristics due to multipaths in the urban environment can be obtained via this method. [C445]

"SAR analysis in human head model exposed to mobile base-station antenna for GSM-900 band"

Friis transmission equation combined with Finite Difference in Time Domain (FDTD) method has been used to

carry out investigation on Specific Absorption Rate (SAR) inside the human head model exposed to a 100 Watt GSM Base Station Antenna (BSA) at GSM-900 band. Maximum local SAR (MLSAR) has been calculated at 925 MHz, keeping distance between head and BSA in the range of 0.5 m to 5.0 m. The human head is modelled as an inhomogeneous sphere of diameter 21.0 cm. The objective of this study is to estimate MLSAR induced in the human head model by BSA and compared with recommended values. [C446]

"A subject-specific radio propagation study in wireless body area networks"

This paper presents a study of subject-specific radio channels in wireless body area networks (WBANs). The simulation tool is based on a parallel finite-difference time-domain method (FDTD) and is well suited to model radio propagations around complex, inhomogeneous objects including human bodies in WBAN. It is found from our study that radio channel characteristics in WBAN are subject specific when the received signal mainly contains the contribution of creeping waves around the human body. [C447]

"Designing FSS for wireless propagation control within buildings"

This paper reports some of the findings in a collaborative project between the Universities of Kent and Manchester in the UK and Auckland in New Zealand. An objective of the work has been to establish how to create FSS capable of influencing signal strength within buildings, especially if the FSS panel is small with respect to the total wall area, and also finite with respect to wavelength. Results are given illustrating the effects of truncating FSS to electrically small size and mounting the arrays in apertures in conducting screens. The roll-off is modified by using dual layer designs. Element sizes are reduced by the use of convoluted patterns and possible methods for the realistic fabrication of FSS suitable for the building industry are discussed. Finally, an initial study is reported from Auckland where FSS panels in apertures have been introduced in a small screened room. [C448]

"Arm movements effect on ultra wideband on-body propagation channels and radio systems"

This paper presents experimental investigation of ultra wideband on-body radio channel in both the anechoic chamber and indoor environments including effects of time varying movements of various body parts on the the channel characteristics. Measured data are used to extract radio propagation channel parameters and investigate the influence of body movements on derived channel models. These models are applied in conjunction with different modulation techniques commonly used for impulse radios to evaluate the system performance of on-body UWB radio systems. Bit error rate and signal-to-noise ratio studies show that careful considerations need to be taken when choosing the modulation technique for optimal ultra wideband body-centric systems. [C449]

"Measurements and characterization of ultra wideband propagation within spacecrafts"

Ultra wideband (UWB) propagation was measured and characterized within spacecrafts, with a view to partly replacing onboard data buses with wireless connections. Spatial distributions of UWB and narrowband propagation in frequency (from 3.1 to 10.6 GHz) and time domains were measured with a microwave vector network analyzer. While narrowband resulted in a number of dead spots (deep fading points) within the conductive enclosures, UWB yielded none. This implies the UWB systems have an advantage over narrowband ones from the viewpoint of reducing fading margins. It was also found that delay spreads can be suppressed by partially panelling a radio absorber on the inner surfaces to facilitate high data rate transmission. [C450]

"Consideration on wave propagation in underground dielectrics"

We present a study of underground wave propagation in dielectrics. We have determined the influence of the impurities of the propagation medium, of the polarization of waves and the effect that reflections have on the transmitted power. As the antennas as borholed in cavities, we have also presented the influence of the dimensions of the drilled cavity and the role of the medium that fills it. [C451]

"Finite Integration Technique capabilities for indoor propagation prediction"

3D finite integration technique (FIT) has been applied to radio propagation calculations over areas up to 400 m2with computing time of less than 3 hours on a single-processor computer and frequency range of up to 1 GHz. Numerical effort of FIT Maxwell's equations solver in time domain increases at a slower rate with the problem size than other commonly employed methods, thus larger and more complex structures may be analyzed. Measurements have shown a high accuracy of the method for field level prediction: error was in the range 2-3.7 dB with spatial detailing of prediction at wavelength scales, for a complex indoor environment, various transmitter locations and frequencies. The method also demonstrated quite accurate prediction of wideband channel characteristics (power delay profile envelope). [C452]

"A lift based mobility model for short range link state assessment in Ad hoc networks"

Using 802.11b as a bearer this paper presents a simple one dimensional mobility model for the evaluation of fall-back communications protocols in medium range point to point communications systems. The technique provides link state data and is based on radio communication between carriages in a lift. Example throughputs for 802.11b are presented. Applications are Ad-hoc networks and in particular machine to machine radio propagation and assessment of link state assess probabilities in ad-hoc. [C453]

"Computed field distributions within a passenger vehicle at 2.4 GHz"

Numerical simulation has been carried out to assess the effects of different source antenna locations on electric field distribution within a vehicle cabin at 2400 MHz. Only fixed onboard antennas mounted within the vehicle cabin are considered. The car model contains only metallic parts and ignores dielectric furnishings. Localised electric field visualizations within the vehicle cabin are obtained using simulated 2D cut-planes. They are complemented by histograms describing the distribution of electric field amplitudes within the vehicle cabin volume relative to a 1 W power source. The averaged electric field levels obtained were used to compare the effectiveness of the source antennas placed in various locations within the vehicle. [C454]

"Optimization schemes for scattering of periodic structures"

Combining conventional radar absorbing material with periodic patch array structures, say frequency selective surface (FSS) type absorbers, have more freedom of degrees and so can be designed to be more efficient than the conventional radar absorbing material. In this paper, three optimization schemes such as parallel particle swarm optimization (PPSO), binary-coded genetic algorithm (BGA) and decimal-coded genetic algorithm (DGA) are investigated in the design of FSS type absorber. The goal functions are set up based on spectral moment method. Efficiency of three optimization schemes are compared each other. Numerical results showed that PPSO has a much better convergence than DGA and BGA. [C455]

"A higher order ADI-FDTD method for EM propagation in plasma"

A second-order in time and fourth-order in space, alternating direction implicit finite difference time domain (ADI-FDTD) scheme is presented for radio-wave propagation in a isotropic collisionless plasma. At the same time, the unconditional stability of the higher order ADI-FDTD formulation for plasma is analytically proved. By analysis of the growth factor, the numerical dispersion relation is derived. In addition, the numerical dispersion errors are investigated. From the error analysis and phase velocity data, it is argued that the proposed approach will significantly minimize the dispersion errors compared to the ADI-FDTD method. [C456]

"3D representation of electromagnetic environment on irregular terrain"

3D representation of the electromagnetic environment is one of the most important research fields in virtual battle space. This paper presents a novel approach on visualizing the 3D electromagnetic environment by rendering multiple layers of isosurfaces. The Longley-Rice radio propagation model, which takes into account the effects of irregular terrain and atmosphere, is used to calculate the 3D power volume data. Then the multi-layer isosurfaces are extracted from the power volume data. In order to improve the performance, this approach uses Graphic Process Unit (GPU) to accelerate the multi-layer isosurfaces extraction simultaneously. At last, the multi-layer isosurfaces are rendered on irregular terrain by assigning different color and opacity to each isosurface depending on the viewpoint. This approach represents not only the 3D electromagnetic environment on irregular terrain, but also the inner detail of power volume data which the traditional single isosurface rendering method did not show. Thus it provides excellent decision supporting and plan-aiding for users. [C457]

"Polyphase based VLBI wideband digital SSB converter of random IF signal"

With the further development in astronomy and deep space exploration, the incremental improvements to be expected in the VLBI is real-time, high sensitivity, high reliability and wider frequency coverage. The VLBI data acquisition backend plays an important role in the VLBI station. Recently, based on advances in digital hardware like ADC (Analog-to-Digital Conversion), DSP (Digital Signal Processing), FPGA (Field Programmable Gate Arrays) and so on, it has become practical to sample and digitally process the intermediate frequency signal directly. DBBC (Digital Base-Band Converters) will replace ABBC (Analog Base Band Converters) in the VLBI data acquisition backend. A wide band digital VLBI Digital Backend using polyphase filter banks segments each 512 MHz IF into 2n Adjacent frequency channels spanning the 512 MHz IF bandwidth, which exits blind frequency zone inevitably. This paper analyzes this limitation and presents a sequence of simple modifications to sampled data structures based on the analog prototype system to obtain the poly-phase structure in the VLBI

data acquisition backend which can eliminate the blind frequency zone. The theoretical principles of digital SSB converters are discussed in detail. The approach adopts multi-rate signal processing for the designed filters in a digital SSB converter which is carried out by virtex-4 FPGA chips. [C458]

"Segmental analyse and numerical verification on radar scattering characteristics of reentry capsule"

During the reentering process, the RCS of the reentry capsule of Shenzhou spacecraft changed violently because of plasma sheath and wake. The change in turn affected the ground-based telemetry radar. Based on the actual measured data of C-band radar, this article analyzed the mechanism of the sudden increase and reduction of RCS of the reentry capsule and demonstrated the theory in WKB method. [C459]

"Experimental characterization of radio signal propagation in indoor environments with application to estimation and control"

We study radio signal propagation in indoor environments using low-power devices leveraging the Zigbee and Bluetooth specifications. We present results from experiments where two robots equipped with radio signal devices and enabled to control and localize autonomously in an indoor hallway and laboratory environment densely sample RSSI at various times over several days. We show that simulated RSSI measurements using existing radio signal models and experimentally gathered RSSI measurements match closely, suggesting that for robotics applications requiring predicted RSSI, low-power radio signal devices are a well-posed sensing modality. [C460]

"Real-time propagation forecasting for Earth-space communication"

The use of frequencies in excess of 20 GHz for Earth-space communications is significantly impaired by the effects of the weather phenomena in the troposphere. The main contributing factor is attenuation due to rainfall but at higher frequencies (Q- and V-band 40/50 GHz) cloud attenuation can also be significant. Although small fades can be overcome by adapting the physical layer through changes to modulation, coding scheme and through power control, fades can be so deep that the link is lost. Knowledge of these conditions can help schedule and manage network resources and help reduce interference. This paper discusses the use of propagation models allied to numerical weather prediction and weather radar data to produce real-time and forecast prediction of fades. These can be used to both design and drive instantaneous fade-mitigation techniques. [C461]

"A Deterministic approach to evaluate path loss exponents in large-scale outdoor 802.11 WLANs"

Accurate network planning is critical with deployments of large outdoor wireless networks. Propagation and path loss considerations are key factors in predicting performance of wireless networks. We are currently studying large-scale wireless networks for US railway environments. In this study, both theoretical and measurement based propagation models indicate that the average received signal power decreased logarithmically with distance. The average large-scale path loss is expressed as a function of distance between the transmitter and the receiver by using a path loss exponent n and the close-in reference distance d0. However, it is very important to select a suitable space reference distance that is appropriate for a specific propagation environment. In this paper, a deterministic approach is proposed to select an appropriate reference distance for a given propagation environment. Also a minimum mean square error (MMSE) based method is introduced to compute path loss exponents. Furthermore the comparison between the site specific measurement data collected from our testbed and the estimated values verifies the accuracy of our proposed method. [C462]

"The affection on radio propagation of attenuation index in troposphere over Wuhan"

Transmitting characteristics of radio wave are determined by the medium in space. All of the Earth-space transmitting is influenced by the unionized atmosphere (especially troposphere) for its large density, high humidity, violently changed temperature and humidity, which can be seen from attenuation index. By analyzing the radiosonde data from Wuhan (30.5Г,В°N, 114.4Г,В°E) weather bureau, we find out the temporal variation of the tropospheric attenuation index. The attenuation index decreases fast with altitude increasing, and the attenuation index of oxygen reaches its maximum value and minimum value in summer and winter, separately, showing a inverse trend of that of water. The attenuation index of oxygen is bigger in the morning than in the evening, which is different with that of water, either. A typical case for intensive attenuation disturbance and the yearly variation of attenuation for weak attenuation frequency at special altitude are discussed to show the impaction of attenuation on radio propagation. [C463]

"The radio propagation affected by variation of refractive index"

Affected by the medium, radio wave shows different characteristics when transmitting in space. All of the earth-space transmitting are influenced by the unionized atmosphere (especially troposphere) for its large density, high humidity, violently changed temperature and humidity, which can be seen from refractive index. By analyzing the radiosonde data from Wuhan (30.5Г,В°N, 114.4Г,В°E) weather bureau, we find out the variation of the tropospheric refractive index, which reached the extremum in summer and winter. There also exist a weaker difference between the morning and the evening. The gradient of refractive index showed similar variation and the visual distance violently changed with refractive index, especially when the elevation angle is lesser. [C464]

"Alignment of probe antennas for spatial channel emulator"

OTA (over-the-air) performance of MIMO (multiple-input multiple-output) mobile terminals employing multi-antennas must be evaluated using the spatial channel emulator which reproduces the multi-path propagation environment around the mobile terminal. Antenna properties of an antenna correlation in addition to the branch power should be adequately evaluated in the spatial channel emulator. In this paper, we investigate based on the calculation the alignment of probe antennas for a spatial channel emulator considering the power angular spectrum of cluster model taking an antenna correlation that has a substantial impact on MIMO performance as the criterion and we clarify that probe antennas should be appropriately aligned, in terms of spacing and numbers, depending on an intended angular spread of arriving waves. [C465]

"Nonparametric Obstruction Detection for UWB Localization"

Ultra-wide bandwidth (UWB) transmission is a promising technology for indoor localization due to its fine delay resolution and obstacle-penetration capabilities. However, the presence of walls and other obstacles introduces a positive bias in distance estimates, severely degrading localization accuracy. We have performed an extensive indoor measurement campaign with FCC-compliant UWB radios to quantify the effect of non-line-of-sight (NLOS) propagation. Based on this campaign, we extract key features that allow us to distinguish between NLOS and LOS conditions. We then propose a nonparametric approach based on support vector machines for NLOS identification, and compare it with existing parametric (i.e., model-based) approaches. Finally, we evaluate the impact on localization through Monte Carlo simulation. Our results show that it is possible to improve positioning accuracy relying solely on the received UWB signal. [C466]

"Indoor Localization Using Improved RSS-Based Lateration Methods"

Location estimation is a critical step for many location-aware applications. To obtain location information, localization methods employing received signal strength (RSS) are attestative since it can reuse the existing wireless infrastructure for localization. Among the large class of localization schemes, RSS-based lateration methods have the advantage of providing closed-form solutions for mathematical analysis as compared to heuristic-based localization approaches. However, the localization accuracy of RSS-based lateration methods are significantly affected by the unpredictable setup in indoor environments. To improve the applicability of RSS-based lateration methods in indoors, we propose two approaches, regression-based and correlation-based. The regression-based approach uses linear regression to discover a better fit of signal propagation model between RSS and the distance, while the correlation-based approach utilizes the correlation among RSS in local area to obtain more accurate signal propagation. Our results using both simulation as well as real experiments demonstrate that our improved methods outperform the original RSS-based lateration methods significantly. [C467]

"The eta-lambda-mu: A General Fading Distribution"

In this paper, a novel general small-scale fading model for wireless communications, that describes the nonhomogeneous nature of the propagation medium, is introduced. Its probability density function (PDF) is given by a simple, exact, and closed-form expression. Namely, the Г,Вї-Г,Вї-Г,Вї includes the Г,Вї-Г,Вї, the Г,Вї-Г,Вї, the gamma, the exponential, the Hoyt, the Nakagami-m, the Rayleigh, and the one-sided Gaussian distributions as special cases. Field measurements and Monte Carlo simulation have been used to validate the proposed distribution. An outperformance has been shown among the widely known fading distributions by fitting to the experimental data. [C468]

"A Comprehensive Spatial-Temporal Channel Propagation Model for the Ultra-Wideband Spectrum 2-8 GHz"

Despite the potential for high-speed communications, stringent regulatory mandates on Ultra-Wideband (UWB) emission have limited its commercial success. By combining resolvable UWB multipath from different directions,

Multiple-Input Multiple-Output (MIMO) systems can drastically improve link robustness or range. In fact, a plethora of algorithms and coding schemes already exist for UWB-MIMO systems, however these papers use simplistic channel models in simulation and testing. While the temporal characteristics of the UWB channel have been well documented, surprisingly there currently exists but a handful of spatial-temporal models to our knowledge, and only two for bandwidths in excess of 500 MHz. This paper proposes a comprehensive spatial-temporal model for the frequency spectrum 2-8 GHz, featuring many novel parameters. In order to extract the parameters, we conduct an extensive measurement campaign using a vector network analyzer coupled to a virtual circular antenna array. The campaign includes 160 experiments up to a non line-of-sight range of 35 meters in four buildings with construction material varying from sheetrock to steel. [C469]

"Iterative Node Deployment in an Unknown Environment"

We consider the problem of deploying relay nodes to achieve connectivity with minimum cost in a sensor network of unknown radio propagation characteristics. For a network where a certain number of targets or sensing nodes have already been deployed in fixed and known positions, we aim at efficiently adding communication or relay nodes to guarantee connectivity with minimum cost, between any sensor node and a base station. The communication cost of a wireless link is defined as the expected number of retransmissions over that link and is modeled using an underlying Gaussian process (GP) between the nodes. We propose an iterative sensor deployment approach that learns the parameters of the underlying GP while deploying the additional nodes in the best positions possible at each step. Our deployment algorithm is more powerful with respect to the ones found in literature since: 1) we do not assume fixed communication range, i.e., we do not assume that nodes can perfectly communicate within a fixed range and will not communicate at all outside that range (this assumption is not realistic for the wireless channel); 2) we do not assume the existence of a pilot deployment aimed at learning the radio propagation characteristics because of the high cost of the deployment process and of the sensor nodes themselves. [C470]

"Comparison between electromagnetic scattering by a rain induced sea surface roughness and field data"

Scattering cross-sections for a rough sea surface in presence of wind and rain are simulated at oblique incidences and for various environmental conditions. They are compared with Ku-band radar signatures available from the literature. [C471]

"The atmosphere influence to AMSR-E measurements over snow-covered areas: Simulation and experiments"

In satellite passive microwave measurements, the sky brightness temperature is a function of frequencies, sensitive to parameters such as water vapor content, liquid water (cloud and precipitation), oxygen, hydrometeors and atmospheric temperature. In order to investigate the atmospheric influence to the retrieval of snow parameters quantitatively, firstly, we combined the HUT (Helsinki University of Technology) snow emission model (except the atmosphere parameterization) and an atmosphere model to do theoretical simulation estimations. We indicate that the C and X band atmospheric influence could be ignored, while the atmosphere is a non-negligible absorber and emitter of microwave radiation at frequencies higher than 19 GHz. We also launched a 13-day experimental measurement in winter time over SodankylaГ‚Вї, Finland, with synchronous satellite (AMSR-E) and tower-based radiometer measurements, together with extensive in-situ atmospheric measurement dataset. The evaluation result indicates that the atmosphere plays a relative positive contribution (about 20K for 36.5GHz and 89.0/94.0GHz). The difference between satellite observation and point experiment comparison suggests conducting more physical model work with atmosphere contribution. [C472]

"Investigation of ionospheric scintillation over South Africa and the South Atlantic Anomaly using GPS signals: First results"

Transionospheric radio communications and radio signals reflected from the Earth's ionosphere can be degraded when irregularities in the electron density of the ionosphere cause rapid variations in the amplitude and phase of such signals. Signals from GPS satellites which undergo scintillations can be used to characterise the location and extent of ionospheric scintillations and improve models for the prediction of ionospheric scintillations. The region in the South Atlantic Ocean where the Earth's magnetic field is weakest, known as South Atlantic Magnetic Anomaly (SAMA), is potentially a region where ionospheric scintillation may be more severe due to the precipitation of high energy particles from the Earth's radiation belts. This paper presents some of the first ionospheric scintillations observed by means of GPS signals received by dedicated scintillation monitors deployed in the mid-and auroral latitudes of the Southern Hemisphere since 2007. [C473]

"Experimental analysis of statistical properties of underwater channel in a very shallow water using narrow and broadband signals"

Time-varying environment makes it difficult to describe channel impulse responses in the ocean. Therefore, statistical approach has been tried to characterize propagation channel especially for high frequency. Although theoretical analysis proves that probability density function(PDF) of received signal may have Rayleigh or Rician distribution, it is hard to assure that complicated ocean channel has the same distribution all the time. In this paper statistical properties of shallow water channel is analyzed based on measured data at a sea trial. The data is gathered by transmitting pure tone and broadband sound with changing frequency components as well as transmitter location. Omni-directional transducers are used for both the transmitter and receiver. The results of pure tone signal show that PDF can be fitted as Rayleigh or Rician distribution and statistical parameters are dependent on frequency and range. Analysis of broadband signals verifies that each propagation path has its own statistical properties. [C474]

"A novel radio propagation radiation model for location of the capsule in GI tract"

In this paper, we discuss the influence of the antenna orientation radiation pattern in localization algorithm based on Received Signal Strength Indicator (RSSI). We also improve the empirical model of signal propagation by building the path loss function of the human gastro-intestine (GI) tract. The novel model includes information of both the distance and azimuth angle variables. The numerical electromagnetic analysis with the finite-difference time-domain (FDTD) is applied to model the vivo radio propagation channels by using a dipole antenna suitable for the model related to the human body. The proposed propagation model is compared with empirical model, and the simulation results show that the compensated model is more accurate by calculating the azimuth radiation attenuation. It demonstrates that the often overlooked antenna orientation has the dominant effect on the signal strength sensitivity. [C475]

"Radio quality prediction based on user mobility and radio propagation analysis"

The increasing number of wireless communications applications in mission critical tasks and lifeline areas demand increased wireless communications reliability. Radio quality prediction for mobile terminals will play a key role in enhancing this reliability. Time-series radio quality prediction (TSRP) methods, which predict future radio quality based on past radio quality measurements, have been proposed in the past. However, TSRP methods are difficult to apply to urban areas where fluctuations of radio quality are too large to make long-term predictions. On the other hand, movement of people is easier to predict because people tend to move toward certain destinations along streets. We propose a mobility-based radio quality prediction (MBRP) method that predicts future radio quality based on user mobility and radio propagation analysis. Evaluation results in single-hop and multi-hop wireless environments show that MBRP can achieve a prediction period more than two times longer than TSRP. We also introduce a prototype system that demonstrates the feasibility of MBRP. [C476]

"UWB channel parameters in a C130 airplane"

The objective of this study is to obtain a comprehensive understanding of UWB propagation in a Hercules C-130 military airplane. An extended measurement campaign took place in the body of the airplane and many interesting results were extracted. In particular, we initially present results for the path-loss factor that expresses the distance dependence for various bandwidths in the frequency band allocated by FCC for UWB signals (i.e., 3.1GHZ to 10.6GHz). Then, we evaluate time dispersion parameters, namely, maximum excess delay, mean excess delay and r.m.s. delay spread and we present the behaviour of these parameters versus the distance of transmit and receive antennas. Moreover, we provide information on the number of significant multipath components and the percentage of the total energy they carry. Finally, we model the dependence of the number of multipath components on the delay spread of the channel. [C477]

"Analysis of radio wave scattering processes for indoor MIMO channel models"

In this paper radio wave scattering processes in an indoor hall environment are reported by analyzing double-directional multiple-input-multiple-output (MIMO) channel sounding data at 5.3 GHz. The pathways and scattering processes of the dominant propagation phenomena were identified using a measurement-based ray tracer (MBRT) software. It is shown that the dominant propagation phenomena included a line-of-sight (LOS) or obstructed LOS component, single, double, and triple bounce scattering processes from walls and ground. The proportion of power carried by each identified pathway was studied. The number of active pathways varied between 3 and 8, which indicates that the multipath environment changes significantly during the measurement route. [C478]

"Application of wavefront decomposition to ray tube tracing"

This paper applies the method of decomposition of wavefronts to ray tube tracing model. Energy ray tubes which are emitted from the source are modeled by three rays and the method of decomposition of wavefronts iteratively improves the accuracy of ray tracing. Comparison with applying the method of decomposition of wavefronts to conventional ray tracing is made afterwards. It is observed that by applying the method of decomposition of wavefronts to ray tube model, the accuracy of ray tracing can be improved much more efficiently and the simulation time decreases to almost a half. [C479]

"MIMO channel capacity measurement in the presence of spatial clusters using a fading emulator"

This paper presents a radio frequency (RF) controlled spatial fading emulator for the evaluation of a handset MIMO antenna. The RF-controlled fading emulator can control RF signals directly in the spatial domain to produce an accurate radio propagation channel model, which includes the uniform and non-uniform angular power spectra (APS) in the horizontal plane. Fading correlation and MIMO channel capacities of a quasi-dipole array, in the case of up to three spatial clusters, are measured by using the emulator. From agreement between the measured data and theoretical values, the effectiveness of the emulator was confirmed. [C480]

"A model for radio propagation loss prediction in buildings using wide-angle parabolic equations"

This paper propose a model to calculate the path loss propagation in an indoor environment using parabolic equations. To solve the parabolic equation a mixed Fourier transform was used. The impedance boundary conditions, wide-angle relative to paraxial direction of propagation and complex refractive index for the medium were considered. A campaign of measurements was carried out in two environments in 900 MHz and 2.4 GHz frequencies. Simulations with the proposed model showed good agreement with the experimental data and with model of UWB Propagation Channels. [C481]

"Antenna placement for sensing buried objects by radio frequency lateral waves"

In this paper, we investigate radio wave propagation in proximity to a planar air-ground interface for the purpose of analyzing and improving the sensing of objects buried in the ground. We consider non-resonant electrically small electric dipole antennas as well as moderately directional resonant electric dipole antennas, both of which are analyzed in a variety of configurations. The ground is modeled as a uniform dielectric of finite conductivity. Our findings suggest that transmitting from beneath the ground plane can introduce significantly more complex wave propagation in contrast to transmitting from above the ground plane, by allowing the lateral and ground wave to mix. We also find that a directional sensor located just above the ground with the beam steered parallel to the ground interface is a good choice for sensing buried objects at a lateral distance due to the low loss of the lateral wave near the interface. [C482]

"Search and rescue in a forest environment"

The problem of search and rescue in a jungle environment is discussed in this paper. Depending on the relative position between the unknown radio station and the searcher equipment, three propagation mechanisms should be considered in the analysis of the radio path: (a) Both equipments immersed in the jungle; (b) The searcher equipment in a plane or helicopter (ground-to-air link); (c) The searcher equipment on the ground outside the jungle. Once the first two cases are well known, emphasis is given to case (c) where a mathematical model to evaluate the radio wave attenuation is proposed. [C483]

"Signal-subspace-partition event filtering for eigenvector-based security system using radio waves"

This paper proposes signal-subspace-partition event filtering for the event detection system with signal subspace spanned by eigenvector in [3][4]. To detect an event with small changes of signal subspace components, we emphasize the changes of signal subspace components by selecting an appropriate component of signal subspace with signal-subspace partition. In addition, to detect an event in the presence of the changes of signal subspace components due to some undesired movements, such as by a pet, we mask or attenuate the changes of signal subspace components by selecting an appropriate component of signal subspace with signal-subspace partition. In the proposed method, firstly, we estimate direction of arrival (DOA) to obtain the basis of the signal subspace. Next, we make the parted signal subspace by combining each base of the signal subspace. The parted signal subspace is used as the filter. The experimental results reveal that the proposed method can emphasize or mask or attenuate events using signal-subspace partition. [C484]

"Experimental study for polarimetric measurement of RFID transfer function with in an indoor environment"

Radio Frequency Identification (RFID), is unlicensed industrial, scientific, and medical (ISM) band at 2.4 GHz. The same principle as that used in long-range radio communication links. The reader's antenna generates a propagating radio wave use far-field communication, which is received by the antenna in the tag. This paper, the microstrip patch antennas used both for transmitter antenna and receiver antenna likewise the reader antenna and tag antenna, simple patch antenna of this type radiates a linearly polarized wave. We investigated the transmission loss the RFID short range systems. Furthermore, we believed our studies can be designed the antennas for RFID systems. [C485]

"Atmospheric water vapor effects on spaceborne interferometric SAR imaging: Comparison with ground-based measurements and meteorological model simulations at different scales"

Spaceborne Interferometric Synthetic Aperture Radar (InSAR) is a well established technique useful in many land applications, such as monitoring tectonic movements and landslides or extracting digital elevation models. One of its major limitations is the atmospheric variability, and in particular the high water vapor spatial and temporal variability, which introduces an unknown delay in the signal propagation. On the other hand, these effects might be exploited, so as InSAR could become a tool for highresolution water vapor mapping. This paper describes the approach and some preliminary results achieved in the framework of an ESA funded project devoted to the mitigation of the water vapor effects in InSAR applications. Although very preliminary, the acquired experimental data and their comparison give a first idea of what can be done to gather valuable information on water vapor, which play a fundamental role in weather prediction and radio propagation studies. [C486]

"Transmission through multiple layers in UWB and narrow band communications"

In this work we describe a model taking into account transmission through multiple layers which are a consequence of the inhomogeneity of the building materials our indoor environment is made of. Our model enables the analysis of a communication channel for both the narrow and wide band cases between adjacent rooms. We use our model to predict UWB behavior and obtain a very rich propagation pattern. Finally we compare our analysis with real world measurements performed in our laboratory and obtain an adequate correspondence between our model results and the measurement. [C487]

"Asymptotic analysis of propagation over cluttered parabolic ridges"

Analysis of radio propagation over varying, clutter-covered terrain was carried out aiming at prediction of power received by a terminal immersed in clutter, with the transmitter placed above clutter. The need for such prediction arises, for example, in planning and assessing coverage and interference in radio communications. Following a general formulation of the problem, particular solutions were found when the terrain has constant curvature. Asymptotic evaluation yielded compact expressions for parabolic ridges. Ray-optical term dominated for short ranges, while a single mode dominated at large ranges. Ridges produced strong blockage beyond the Г‚Вїhorizon Г‚Вї, in contrast to strong focusing reported to occur in valleys. The resulting procedure for predicting pathloss over varying terrain is therefore to apply the formulae using the terrain curvature extracted from terrain files. [C488]

"Equivalent effective p.u.l. parameters for reduced order circuit of SWCNT bundle interconnects"

The radio-frequency signal propagation along SWCNT bundle interconnects is analyzed comparing the results obtained applying the exact multiconductor transmission line model and the equivalent single conductor approach. The accuracy and computational effort of different formulations of the effective per-unit-length parameters are assessed and discussed. [C489]

"Internal successive reflection model for indoor UWB communication"

Different propagation mechanisms of the transmitted signal take place from the surrounding objects in an indoor scenario. The prediction of the reflection phenomenon is one of the important parameter of the ultra wideband (UWB) channel modeling. This paper presents a model of wave propagation in indoor environments for multiple reflections of UWB signal inside the building wall. The main objective of this work is to provide an analytical approach for obtaining the non-line of sight (NLOS) components reflected through the wall structure. The reflection of UWB signal in varied scenarios of indoor environment is investigated under different thickness and electrical parameters of the wall. [C490]

"Reaching consensus in wireless networks with probabilistic broadcast"

Reaching consensus in a network is an important problem in control, estimation, and resource allocation. While

many algorithms focus on computing the exact average of the initial values in the network, in some cases it is more important for nodes to reach a consensus quickly. In a distributed system establishing two-way communication may also be difficult or unreliable. In this paper, the effect of the wireless medium on simple consensus protocol is explored. In a wireless environment, a node's transmission is a broadcast to all nodes which can hear it, and due to signal propagation effects, the neighborhood size may change with time. A class of non-sum preserving algorithms involving unidirectional broadcasting is extended to a time-varying connection model. This algorithm converges almost surely and its expected consensus value is the true average. A simple bound is given on the convergence time. [C491]

"System-level modelling of optimal ultra wideband body-centric wireless network"

Given the trend towards a user-centric concept in mobile communications, body area networks have received increasing attention within the wireless personal area community. Ultra wideband (UWB) radio channel propagation model with the inclusion of dynamic body environment is derived and applied to investigate the performance of potential radio systems to be used in body area networks. System-level modelling of potential UWB impulse radio is conducted and system performance is measured using bit error rate (BER) and signal-to-noise ratio parameters corresponding to modulation techniques such as pulse position modulation and bi-phase modulation. Impact of movements on system performance is investigated and degradation in system performance due to movements shows the importance of considering the dynamic channel statistics when designing optimal UWB system for body-centric wireless communications. [C492]

"Analysis of microwave over-the-horizon Propagation on the sea"

Microwave over-the-horizon propagation on the sea is very valuable for some applications such as radar detection and communication with long distance. Evaporation ducts and troposphere scatter conditions of microwave over-the-horizon propagation environments on the sea are analyzed. The requirements of the antenna gain for over-the-horizon microwave communications systems as an example under different conditions are calculated. [C493]

"Measuring coverage quality for femtocell and macrocell broadband data services"

This paper presents the results of field trials conducted to measure and compare indoor airlink data rates from femtocells to indoor coverage from macrocells and concludes that operators can expect to see significant (3-5x) improvement in average airlink data throughput relative to the existing macrocell network. Tests were conducted in a number of single family and multi-unit residences. The paper concentrates on UMTS/HSDPA measurements and presents the methodology used in tests and offers summary results. It shows that the case for using femtocells for broadband data services is stronger than for voice based services. [C494]

"Deterministic method of information transmission channel prediction in multipath environments"

The results of prediction using radio propagation models typically represent physical characteristics of a radio channel. The commonly exploited use of these characteristics as a metric in network planning, instead of rigorous system-level channel parameters, may lead to non-satisfactory results for modern communication and broadcast systems. In the current contribution, a general method for prediction of system-level channel characteristics (BER, data rate, etc.) is proposed, based on site-specific propagation models, deterministic system models and spatial statistical generalization. Validation of the method with direct measurements in a complex indoor environment (for BPSK, QAM, OFDM QAM) has shown its high accuracy (below 21 % RMS error of local mean channel capacity prediction). Another subject of the current work is the experimental investigation of the dependence of system-level characteristics prediction accuracy upon spatial detailing of prediction, which demonstrated the considerable enhancement of accuracy with a decrease in detailing. The proposed method may be directly applied to network planning: it provides means for metric calculation and coverage maps estimation. [C495]

"Radio propagation modeling in complex environments for wireless communications"

In this paper, we will first review the ray-tracing algorithms developed in our group; then examples of the exploitation of geospatial data for radio propagation and its benefits will be presented. We will discuss the techniques to extract three dimensional (3D) building structures in urban propagation environment using 2D images in cyberspace. Finally, a real-time ray tracer will be briefly described. [C496]

"Effects of solar eclipse of July 22, 2009 on VLF signals and atmospheric electricity parameters over Kolkata"

Some experiments on July 22, 2009, the day of solar eclipse, were undertaken at Kolkata (latitude: 22.56Г‚В° N, longitude: 88.5Г‚В° E) to observe the effect of solar eclipse on various parameters of the atmospheric electricity which are directly related to global thunderstorm activity and solar irradiation. Significant changes are observed in their values during the eclipse period than their ambient values for the same period in the adjacent five days, which will be presented here along with their interpretation. [C497]

"Exploiting the loss-frequency relationship using RF communication in Underwater communication networks"

This paper presents detailed description of the graphical relationship between propagation characteristics of electromagnetic waves; skin depth, total path loss and frequency for different values of distance and conductivity of the water medium for the purpose of Underwater communication. The main challenge of this type of communication is how far we can communicate without much degradation of main signal strength. Radio frequency is one of the means, which can be used for signal transmission purposes most sophistically. Major factor of this communication system is loss of RF energy due to the propagation of waves in water medium. Mainly path loss depends on transmission distance, signal frequency & conductivity of the medium. Finally our analysis shows that optimum propagation distance under water can be achieved by proper selection of the signal frequency. [C498]

"Geometric model for minimizing node discovery load in network simulators for large ad hoc networks"

The area of wireless ad hoc networking has been receiving increasing attention among researchers in recent years. NS2 is the most common simulator which is used to simulate wireless ad hoc networks. But, NS2 does not scale the simulation well, where there are a large number of nodes in a simulation area. In this paper a geometric approach is proposed targeting the optimization of the area that exists between the approximated area for processing and the area outside the coverage area of a transmitter. Thus, this proposed algorithm reduces the number of unaffected nodes (considering the transmission signal range), which are currently considered by the NS2 simulator for checking, whether the node resides inside the transmission area or not. The current version of NS2 uses a block based optimization but the algorithm, proposed here, reduces the coverage area of the blocks near the boundary of the transmission range, targeting the improvement of the performance of NS2 for the simulation of large ad hoc networks. These theoretic assumptions have been followed by extensive realistic test conditions for generating a set of sensible result-set for achieving the optimum from the proposed physical propagation model to facilitate NS2 with a faster simulation performance for larger wireless ad hoc mobile network. The proposed approach saves the coverage area from at least 12.5% upto 78.15% than in existing solution. [C499]

"Modeling and validation of GPR wave scattering with the Semi-Analytic Mode Matching algorithm: Choosing optimal coordinate scattering centers"

Choosing the coordinate scattering centers (CSCs) for the Semi-Analytic Mode Matching (SAMM) algorithm is a critical and heretofore unexplored aspect of this method, necessary for the ultimate goal of simulating full 3D scattering. Establishing the locations at which modes originate is essential for accurate modeling of electromagnetic fields with SAMM. Six test scattering objects are investigated, and the CSCs are found for each by considering the radii of curvature at each Г‚ВїfittingГ‚Вї point on the objects' perimeters. Additional CSCs are needed for scattering objects which have long Г‚ВїflatГ‚Вї regions. Excellent results are found comparing SAMM and Finite Difference Frequency Domain (FDFD) for 2D scattering objects several wavelengths in size. [C500]

"UAE mapped attenuation at RF frequencies (UAE-MARF)"

This paper develops both theoretical and experimental models for the prediction of attenuation and reflectivity of satellite signals at Ku-band in the UAE. The theoretical model gives a detailed study on the effect of the attenuation and the reflectivity due to the increase of the frequency or the density of different hydrometers. The experimental model, which is based on actual measurements obtained from NASA, was used to extract the required precipitation radar (PR) products. By applying the image analysis techniques on the PR data for one whole year (2000), a graphical representation of attenuation at Ku-band in the UAE was obtained. Results of this paper are vital for the successful design of satellite TV broadcast systems in the UAE operating at Ku-band. [C501]

"n-Rayleigh distribution in mobile computing over flat-fading channel"

Characterization of temporal variations in wireless channel impairments plays an important role in the design of a

reliable and efficient mobile communication system. Such channels are termed as fading channels since various random phenomena in the propagation path result in fading of the received signal envelope. The exact probability density functions (pdf) and distribution functions (cdf) of a product of independent Rayleigh distributed random variables. The case n = 1 is the classical Rayleigh distribution, while n Г‚Вї 2 is the n-Rayleigh distribution that has recently attracted interest in wireless propagation research. The distribution functions are derived by using an inverse Mellin transform technique from statistics, and are given in terms of a special function of mathematical physics. Series forms of the distribution function are also provided for n = 3, 4, 5. [C502]

"Study of propagation along a lift shaft in UHF band by channel measurements and 3-D simulation"

This paper presents wideband channel measurement results for radio propagation along a lift shaft in UHF military band. Propagation mechanisms associated with the lift shaft are studied. Moreover, simulation has been conducted and comparison between measurement result and simulation result is made to further discuss the propagation mechanism. [C503]

"An enhanced AODV protocol for VANETs with realistic radio propagation model validation"

In this paper we evaluate V-AODV a version of AODV (Ad-hoc On-demand Distance Vector) especially created for Vehicular Ad-hoc NETworks (VANETs). V-AODV is designed to run with a complex cross layered metric based on both delay from node to node and Bit Error Rate (BER) coming from the physical layer. We conducted simulations with the NS2 simulator taking in account a realistic environment tool called Communication Ray Tracer (CRT). Our results show that the basic propagation models usually in use with NS2 are not suitable for VANETs simulations. We also show that when using a routing metric based on delay and BER, the first parameter is more relevant in terms of QoS than the second one. [C504]

"Optimizing channel simulation for dynamical scenarios in railway transport"

In this paper we propose to analyze the impact of the facets, constituting a railway dynamical environment, on the electromagnetic wave propagation mechanisms. This study allows reducing the computation times of a radio wave propagation simulator based on ray tracing. The obtained results drive to gain in computation time higher than five. [C505]

"Measurements and simulations comparisons of radio wave propagation in arch-shaped tunnels for mass transit applications"

Wireless communication systems are deployed for train to infrastructure communication needs related to guided transport applications (train, metro, tramway). These systems have to be operational in all transport environments and particularly in tunnels. Realistic tunnels geometries are generally of rectangular cross section or arch-shaped. Furthermore, they are mostly curved. This paper presents measurement results realized in a straight arch-shaped tunnel at 2.4 GHz and 5.8 GHz. The influence of transmitter-receiver location is studied. A statistical analysis in terms of slow and fast fading is realized. The measurement results are compared to simulation results with a modified Ray Launching method in order to validate the modeling approach proposed. [C506]

"Performance evaluation of IR-UWB D-Rake receivers over IEEE 802.15.4a multipath fading channels with Narrow-Band Interference"

In this paper, we analyze the performance of a simple receiver architecture for impulse radio (IR) ultra wide band (UWB) systems. The receiver makes use of a differential binary phase shift keying (DBPSK) modulation, and a differential rake (D-Rake) receiver that does not require channel estimation. The performance study is conducted by considering the recently standardized IEEE 802.15.4 a channel model, as well as narrow-band interference (NBI) co-located in the same transmission band of the UWB signal. The analysis will be performed with and without frequency and timing synchronization errors, in order to identify the design constraints of the synchronization unit to guarantee the proper operation of the receiver over realistic propagation environments. The results will show that (i) NBI can significantly worsens the performance of the receiver, (ii) the maximum tolerable frequency offset should be less than 10 KHz for a UWB signal with center frequency equal to 4.5 GHz, and (iii) the maximum tolerable timing offset should be much less than 4.2 ns for a pulse with width of 10 ns (500 MHz of transmission bandwidth at -10 dB with respect to the spectrum peak) and a chip time with duration of 85.3 ns. [C507]

"UWB propagation channel experimental measurement and analysis"

In order to apply UWB technology to a communication system, channel measurement and analysis of UWB

signals in the 3.1~10.6 GHz frequency-band become necessary. This paper presents the propagation measurement results for the devices based on the Direct Sequence Ultra Wideband (DS-UWB) technology, which includes the open-space channel, emulated conditions for channels inside an aircraft, as well as measurements inside a large aircraft. The measurements and performance evaluations focus on the BER vs. power level, data-rate, coding parameter and range. The set of collected parameters from our experiment results may be used to develop realistic models for a range of UWB channel. [C508]

"Time Reversal: Impact on the performance of an UWB location system"

This paper deals with the impact of the time reversal (TR) processing on the performance of an ultra wide band (UWB) location system. In a first part, we describe the topology of the UWB location system we have developed. In a second part, we present the enhancement of UWB radio channel characteristics by applying a TR algorithm. We have considered an impulse response of the (UWB) radio channel corresponding to severe propagation conditions: TR signal processing is described and its benefits on the characteristics of the UWB channel impulse response (CIR) are detailed. A third part presents first results on the reduction of the error location due to UWB multipath propagation. [C509]

"Characterization of NLOS wireless propagation channels with a proper coherence time value in a continuous mode stirred Reverberating Chamber"

The rapid growing of new wireless communication systems looks for test site able to emulate the time variability of real propagation channels for wireless device performance and signal propagation testing. The emulation of real propagation environments is very challenging because of the time varying nature of the frequency dispersiveness of the wireless propagation channels. The coherence time is the most useful parameter for describing this frequency dispersiveness in the time-domain. This paper presents a simple but effective employment of the reverberating chamber (RC) as emulator of wireless propagation channels characterized by a proper coherence time value. In particular, it is shown how it is possible to physically emulate in the RC real propagation channels with a desired coherence time value, by means of a properly tailored modulation of the stirrer velocity. The coherence time values from experimental results are used in a channel simulator and the constellation of a Global System for Mobile Communication (GSM) signal from measurements are compared to the ones obtained from the Non-Line-of-Sight (NLOS) channel simulators. A visual and a quantitative analysis shows a good agreement between measurements and simulations. [C510]

"A hybrid method for modeling satellite communication in urban environment"

This paper introduces an efficient method for predicting mobile signal reception in satellite communications. The radio wave propagation between a satellite and a land receiver leads to two kinds of fading: slow-fading due to shadowing effect and fast-fading due to multipath effect. In order to model these fluctuations in the received signal and take into consideration the local area specificities, this paper propose a novel approach combining statistical and deterministic properties of radio propagations. For slow-fading, we use an efficient estimation of the local mean based on signal's coherence distance; for fast-fading, the principal parameter of Nakagami-m model can be estimated according to multipath nature, i.e., combination of electromagnetic interactions (reflections and diffractions) between radio wave and environment. The simulations in urban scenarios are based on Ergospace software. [C511]

"Multipath propagation model for High Altitude Platform (HAP) based on circular straight cone geometry"

A geometric model that describes a multipath propagation for a fixed wireless communication system between a high altitude platform and a fixed terrestrial user is presented. The model describes the propagation of the reflected signals that are able to reach the receiver as a consequence of all the scatterers located inside the system coverage area. The establishment of a particular geometry characterizing the system coverage area allows the behavior of the multipath phenomenon effects to be modeled accurately. [C512]

"Cross-layer study for resource management in DVB-S2 with mobile users"

Recently there has been a renewed interest on mobile communications via satellite. Therefore, the DVB-S2/-RCS standard has been updated with some countermeasures to combat fading effects of the mobile scenario. The focus of this paper is on multimedia traffic management on the DVB-S2 forward link to collective terminals on trains. In our study, we consider ACM, PHY margins, and LL-FEC coding to counteract the time-varying propagation conditions in Ku-band that are very critical for the railway scenario. A multi-layer optimization study is performed in order to maximize TCP goodput by jointly tuning LL-FEC coding and the PHY layer margin. It is

shown how, using appropriate parameters, LL-FEC coding can improve the performance of the system. Moreover, the performance of the proposed UBMT scheduler is evaluated in managing CBR and FTP traffic flows. This study has permitted to determine the maximum capacity of CBR flows (guaranteeing a given quality of service level) in the presence of FTP flows. [C513]

"Ultrawideband spatio-temporal area propagation measurements and modeling"

Ultrawideband (UWB) spatio-temporal area propagation measurement and modeling was performed for accurate characterization of spatial UWB channels. The area propagation measurement acquires as much channel data as possible in one specific environment, e.g., in an office room, to characterize the variation of the dominant scattering process against antenna position displacement. The spatio-temporal channel modeling includes propagation path detection, parameter estimation, and path tracking. A simple spatio-temporal beamforming was considered for path detection and parameter estimation. The path tracking is capable of distinguishing meaningful propagation paths from insignificant ones, and also of clustering propagation paths. The modeling results agreed very well with physical scattering processes, and therefore, the method was proven to be reliable. [C514]

"UWB joint TOA and DOA estimation"

This paper deals with the simultaneous estimation of Time of Arrival (TOA) and Direction of Arrival (DOA) in UWB systems considering multipath propagation. The estimation is performed in the frequency domain by computing a two dimensional power delay-angle spectrum based on the periodogram because of its low computational complexity. High accuracy is obtained in the estimation of both parameters, TOA and DOA, based on the wide bandwidth of the UWB signals. [C515]

"Directional channel model for ultra-wideband indoor applications"

In this paper a hybrid ray tracing/statistical channel model for the ultra-wideband (UWB) frequency range is proposed. The conventional ray tracing model is complemented with randomly distributed point scatterers placed on the surface of large objects like walls. The wave propagation in such scenario is calculated in a deterministic way. The parameters of the scatterers are derived from the measurements of reflection from typical indoor walls. [C516]

"Determination of pulse signal radiation sources with known coordinates in the radio ether"

The way for determination of presence of sources of radiation of pulse signals (SRPS) with known co-ordinates in the air by means of a three-position small-base passive system for measurements of differences of times of a signal arrival (TDOA method) is developed. On the basis of simple ratios between co-ordinates of system reception centers and the purpose, following from geometry of their mutual disposition, analytical expressions for highly informative (with the big relation parameter/interference) determinations of a difference of differences of times of a signal arrival and the adaptive criterion fixing with certain accuracy a true value of inclined range to the purpose, are received. Mathematical modeling is carried out at various trajectories of a target movement and laws of distribution of errors of measurement of differences of times of a signal arrival. [C517]

"Spatial structure effect on MIMO communication systen capacity"

The mobile communication system designed on MIMO principles is discussed. Radiowave propagation is considered in conditions of line of sight (LOS). In the case of LOS a considerable benefit is obtained. Effective spatial structure of transmitting and receiving systems is proposed for the LOS channels. [C518]

"A novel high-Q cavity resonator for reconfigurable WPAN applications at 60 GHz"

A novel silicon micromachined high-Q cavity resonator at 60 GHz is presented in this paper. The concept of the high-Q resonator is introduced. The novel realization of the cavity resonator is demonstrated through silicon micromachining techniques. Full wave simulations are conducted to verify the propagation mode and the resonant frequency. The resonant frequency of the cavity resonator can be tuned by changing the length of a planar stub shunted to a current probe in the cavity. Experimental results validate the simulation and show great Q factors which are over 320 at the resonances for the WPAN applications. [C519]

"Efficient ray-launching analysis for indoor propagation including multiple reflection effect inside walls"

This paper proposes an efficient modification of 2D ray-launching method, by including multiple reflection effect

inside wall for indoor environment. An efficient approximation is carried out to bundle or collect the internal multiple reflected rays into the primary one. This approximation is called collective ray approach. We here focus on the derivation of the approximate solution for H (or Vertical) polarized incident case. Resultantly, it is confirmed from the detailed considerations that the present collective ray solutions can be confidently utilized in particular when the internal reflections strongly contribute to the propagation characteristic of the considered indoor environment. [C520]

"Interference characterization and UWB channel measurements for wireless intensive care patient monitoring"

The electromagnetic environment in a hospital is characterized by means of a measurement campaign. This serves as a basis for the evaluation of best-suited future technologies to be used for wireless patient monitoring, where highest quality of service is required for sensors recording vital data. Results show that the UWB band features equal dynamic ranges as the ISM band but allows operation at a significantly lower power level, which is crucial for Body Area Networks where low power consumption is highly required. Furthermore UWB channel measurements are done in order to specify main propagation paths for scenarios with a volunteer in a bed. Multi-path propagation with reflections at the ceiling and the bedside monitor could be identified as main propagation paths beside the Line-of-Sight link. The impact of these propagation paths on the system performance were evaluated in system simulations using a non-coherent UWB system. [C521]

"Terahertz radiation from electrically-biased tenuous plasmas"

Theoretical investigations show a dc bias in plasmas can efficiently produce terahertz radiation with the frequency, amplitude, polarization, and initial phase controllable. The radiation is strengthened considerably for the bias at the plasma frequency. [C522]

"Performance of angle-and-range-based localization of wireless sensors"

In wireless sensor networks, the accuracy of localization information deteriorates significantly after relaying multiple hops due to accumulation of errors. Techniques exist to enhance the localization information by employing redundant measurements available in networks with high connectivity or from a large number of reference nodes. However, it is challenging to obtain accurate localization information in deployment environments with: 1) unfavorable radio-propagation characteristics that degrade measurements, or 2) sparse topologies that limit the redundancy. One such example is underground tunnels. In this paper, we study the performance of localization techniques that are applicable to such sparse networks. Particularly we focus on the COBALT method, which is based on cliques of nodes in the network and uses angle of arrival and range estimates. For different techniques, we show the influence of the connectivity among sensor nodes on the accuracy. Our results show that the COBALT method outperforms other general-purpose localization techniques. [C523]

"Wave interference effect on the shape of solar microwave bursts"

Scintillation of a radio signal passing through solar corona is considered. The expression describing a time profile of these scintillations on the basis of multibeam propagation of radio waves is derived. It is determined that the time profile of scintillations caused by multibeam propagation may appear as impulses of emission or absorption or may have sawtooth form. The assuming of the specific emission source features is not the only way to explain the shape of impulses, since the effect of multibeam propagation of radio waves through solar corona and interplanetary space yields a simple explanation of the phenomenon discussed. [C524]

"Space research in Kharkiv Radiophysical Observatory of V. N. Karazin National University"

Radio instrumentation is developed for a remote probing of the near-Earth environment (MF radar, spaced-antenna drift radar, HF Doppler radar, differential navigation-satellite radiobeacon receivers, digisonde, and magnetometer). This instrumentation allows solving of a number of fundamental questions such as Sun-Earth connections and applied research of the following problems: ionosphere and disturbance modeling, a monitoring of the near-Earth environment, the earthquake predictions and the forecasting of a radio propagation. [C525]

"Bistatic radar system using radio signals of geostationary satellites for hydrometeors parameters determination"

Bistatic systems offer an opportunity to install a transmitter, where they have no influence on a human being and environment and allow receiving signals in some advantageous positions. In this paper geostationary signals are proposed as probing ones. Primary purposes of the system are to determine hydrometeors parameters and to

diagnose hazardous occurrences, such us: showers, hail formations, lightings, turbulences, etc. [C526]

"TCP performance on a railway satellite channel"

High-speed rail is emerging in the world as an increasingly popular and efficient means of transportation used by a lot of people, who may also need a broadband Internet connection while travelling for their business and leisure. Satellite systems for their intrinsic characteristic, such as global coverage, reduced impact of Doppler effect due to link geometry and flexible bandwidth management, represent an excellent solution to provide broadband services in the identified scenario. Some problems specific of the railway propagation channel such as frequent signal outages due to the periodic electrical trellises, tunnels and steel covered bridges affect TCP/IP performance due to frequent packet losses occurring in bursts. In this paper, performance of TCP-based applications and error recovery mechanisms are investigated and the use of a new transport protocol named TCP-Noordwijk is introduced. TCP-Noordwijk leverages on a burst transmission and is particularly suited for the harsh satellite links. Results show that TCP-Noordwijk outperforms the other analyzed TCP versions. [C527]

"Propagation Model and Performance Analysis for Short Range Microwave Passive RFID Systems"

RFID systems are an important technique in short range wireless communication. This study explores link budget and performance limitations of microwave passive RFID system. Site-specific model and statistical model are proposed for mean path loss. The key parameters affecting the performance are studied, including reader limitations, tag limitations, multi-path propagation environments, and antenna polarization. The optimal work conditions are given for short-range microwave passive RFID systems. [C528]

"Congestion Propagation in Multihop Wireless Networks"

Multihop Wireless Networks (MWNs) are expected to expand the area of wireless access networks, which consist of multiple access points in the area of a wireless LAN and connect these access points with wireless links. However, the MWNs still have many issues to provide good quality of service. For example, it is not clear about traffic characteristics over the MWNs. In this paper, therefore, we investigate the characteristics of MWNs based on the congestion propagation between wireless routers reported in wired networks. Furthermore, we show the impact of the congestion propagation on the network performance in various network parameters by means of simulations. [C529]

"Absorption of radio transmissions near the geomagnetic equator at medium frequencies: (Part 2) A propagation case study"

Electromagnetic waves entering the ionosphere are usually split by the geomagnetic field into two "characteristic waves", the ordinary wave (O-wave), and the extra-ordinary wave (Xwave) which suffers heavy absorption across the medium frequency (MF) band. According to magnetionic theory, transmissions in the E-W direction from a vertical monopole near to the geomagnetic dip equator should couple almost entirely to the X-wave and suffer heavy absorption. However information recently obtained from Jicamarca observatory in Peru suggests that E-W transmissions from a medium wave transmitter under the dip equator could propagate by scattering from field aligned irregularities in the E layer, caused by plasma instabilities induced by the Equatorial Electrojet (EEJ). A case study is made based on a new station close to the dip equator using a frequency at the top of the MF band where absorption is a minimum. Magnetoionic absorption is investigated, and compared with measurements taken at three locations, during a quiet solar period, during the dry season to minimise skynoise, and also to reduce the risk of thunderstorm intensified sporadic E (Es) [1]. [C530]

"Ultra wide bandwidth radio channel indoor propagation and path loss analysis based on measurements"

In this paper, based on a set of UWB Channel measurements some features of channel are investigated. The measurements are provided in frequency domain over a channel bandwidth 6 GHz (from 3 to 9 GHz) in indoor, at Eurecom Institute. A vector network analyzer is used to measure the frequency channel response of the frequency bandwidth of interest. An omni-directional antennas are used for both the transmitter and receiver antennas. Probability Density Function (PDF) and Cumulative Distribution Function (CDF) of received signal, power variation and path loss fluctuations are evaluated in frequency domain. An investigation of path loss shows no dependency between frequency and the path loss. Other features of this approach also are outlined. [C531]

"Cross-layer optimization for wireless networks: top-down or bottom-up design?"

Summary form only given. In this talk, we discuss the cross-layer optimization issues in wireless networks by

investigating the impact of physical (PHY) layers on the media access control (MAC) and higher protocol layers, or vice versa. In particular, we explore the benefits of cross-layer design for multi-user multi-input multi-output (MU-MIMO) cellular mobile networks, wireless local area networks (WLAN), and wireless sensor networks (WSN).In the first part of this talk, from the standpoint of the top-down design, i.e. from MAC layer to PHY layer, we introduce the concept of "soft coverage" in MU-MIMO cellular mobile systems. Specifically, the MAC layer multi-user scheduling algorithm is designed to improve the coverage of MIMO cellular mobile systems without increasing transmission power in the PHY layer. Next, we show that the multi-user scheduling algorithm can also simplify the design of MIMO receiver as well. It will be demonstrated that a simple zero-forcing MIMO receiver combined with appropriate multi-user scheduling algorithm can achieve the performance of the optimal MIMO receiver. In the second part of this talk, from the viewpoint of the bottom-up design, i.e., from PHY layer to higher protocol layer, we first discuss how radio propagation channels affect the design of rate adaptation schemes of WLAN. Specifically, we show that it is not necessary to adopt the complete eight modulation and coding (MCS) modes specified in IEEE 802.11 WLAN for various transmission rates in a Rayleigh fading. An efficient joint power and rate-adaptive IEEE 802.11 WLAN based on the concept of reduced-mode MCS will be discussed, which can avoid using inefficient MCS transmission modes by taking account of PHY layer effects. Next, for the power-sensitive WSN, we discuss how to develop a PHY/MAC/Network cross-layer analytical approach to determine the optimal number of clusters with minimal energy consumption in various radio propagation channel conditions. [C532]

"Joint Estimation of Position and Channel Propagation Model Parameters in a Bluetooth Network"

Wireless sensor networks are a promising solution for indoor location systems. However, many of these systems rely on algorithms that use parametric models of channel propagation where the parameters can be time variant. This paper introduces a new technique based on a Bayesian filtering method that estimates network node positions at the same time that propagation model parameters are extracted. Experimental results show the location estimation improvement of the proposed technique. [C533]

"Propagation modeling-a CSP approach"

Radio wave propagation models are extremely important in radio network planning as well as in interference planning, for the frequency range between 500 MHz and 5 GHz. This is because of the fact that an accurate propagation model enables efficient prediction of the coverage area of a cell and efficient resource reallocation in the form of better coverage prediction at the desired area. A certain model is usually applicable to limited distances and other parameter values. The simplest approach to the prediction of the field strength in urban scenarios is empirical models. The empirical models are very fast but they are not very accurate. Each of these models can also be viewed as a constraint satisfaction problem (CSP). In general, each propagation model involves a large number of variables such as frequency, base station antenna height, mobile station antenna height, distance etc. Each variable has a well-defined domain for a particular mobile environment under consideration and the constraint can be defined on the term representing the path loss. Therefore, the constraint satisfaction problem can be well utilized to model the propagation phenomenon. In the present work, the objective is to analyze the propagation modeling using CSP algorithms. There are five CSP algorithms such as backtracking, backjumping, conflicted directed backjumping, backmarking, forward checking and their hybrids. In our work backtracking CSP algorithm are used to compute the path loss against various parameters for Okumura-Hata and Walfisch-Ikegami models and analyze their behaviour at higher frequency ranges. [C534]

"Poster abstract: On the spatial characteristics of the gray region for 802.15.4 radios"

Packet loss and energy consumption in sensor networks depend critically on the quality of the network's wireless links. In turn, link quality depends on the environment in which the RF signals propagate and the locations of the link's endpoints. Experimental results have shown that a low-power wireless link can be in one of three states or dasiaregionspsila, as the inter-node distance increases: connected, transitional (gray), and disconnected. The gray region is characterized by extreme variability, whereby small differences in distance or end-point locations can lead to pronounced differences in loss rates. However, not all is lost. This work investigates the spatial characteristics of the gray region and experimentally shows that one can efficiently identify links with low loss rates within the radio's gray region. One of the possible applications of this finding is in the design of sparse, yet low-loss network deployments. [C535]

"Probabilistic neural network and Polynomial Fitting Approach used to determine radio field strength under power lines in radial network"

A new model based on Probabilistic neural network (PNN) and Polynomial Fitting Approaches (PFA) for radio field strength prediction has been developed. This paper researches the radio field strength, related to the

service of a radio system for the operation of set points in the radial networks. The service uses radio propagation to dispatch messages to set points. In order to estimate the radio field strength, we performed some realistic measurements related to set points. Then, the data was analyzed using a combination of Probabilistic Neural Network and Polynomial approximations to estimate the radio field strength, and to create a new optimal model specific to the needs of radial networks. [C536]

"Propagation channel modeling for emerging wireless communication systems"

This paper describes some latest developments in the area of propagation channel modeling for new wireless access technologies. A brief overview of current wireless communication systems is presented and the principles of emerging technologies as MIMO, UWB, and 60 GHz systems are introduced. The characterization, modeling, and simulation of the propagation channel are particularly critical in the design of these systems. Recent research results concerning possible integration of these techniques in future wireless systems are presented. [C537]

"Cramer-Rao Lower Bound for Non-coherent TOA Estimation with Impulse Signal"

The non-coherent time-of-arrival (TOA) estimations are applied in impulse location for its simplicity. However, the multipath propagation of the narrow pulse results in complicated performance analysis. By fitting the output envelope of energy detection into a exponential decay, we approximately deduce the closed-form Cramer-Rao low bound (CRLB) of TOA estimation. Simulations with non-coherent TOA algorithms, such as threshold crossing (TC) and maximum energy selection (MES), validate the analysis. Furthermore, the integration window and multipath delay spread in ultra-wideband channel are considered to obtain a referable bound. [C538]

"ViMobiO: Virtual Mobility Overlay for static sensor network testbeds"

To streamline the development of protocols and applications for wireless sensor networks with mobile elements, we propose the use of a virtual mobility overlay (ViMobiO). Using an idea from mobile ad hoc network research, physical nodes are seen as possible locations of logical nodes, whose motion is simulated with a state transfer between physical nodes. To maximize flexibility, state transfers are performed over the radio rather than over the wired backchannel, enabling testbed users to choose their mobility strategy within the constraints of network connectivity and to build on top of ViMobiO with no need to modify the testbed management software. Though the vagaries of low-power wireless propagation must be accounted for to ensure successful state transfers, our approach returns meaningful mobility profiles and adds a new dimension to large-scale experiments with wireless sensor networks. [C539]

"A mobile propagation measurement system"

This paper describes a mobile-to-mobile propagation measurement system that is currently being developed at the Institute for Telecommunication Sciences under the sponsorship of the Office of Spectrum Measurement. This system uses a fixed transmitter truck and a moving receiver van to characterize radio-frequency channels of selected urban and rural environments. The transmitter and receiver architectures are described, and selected time- and frequency-domain measurement results are presented. The results obtained so far are very promising and demonstrate the versatility and effectiveness of this measurement system. [C540]

"Performance analysis of outdoor localization systems based on RSS fingerprinting"

In the recent years the Location Based Services (LBS) are grabbing the attention of telecommunication actors since they are sources of new services and new revenues. The main challenge in the LBS domain is the localization of the mobile terminals within a certain accuracy. To this end, several radio positioning techniques have been introduced, one of which is the Location Fingerprinting. Although location fingerprinting has been investigated in some previous works, however there are only few studies that analyze its performance according to physical parameters of the underlying environment. In this paper, we present a performance analysis of the outdoor location fingerprinting systems. We propose a radio propagation model which allows us to introduce some spatial correlations for the shadowing effect and to include the temporal fluctuations of the radio signal. Based on our model, we examine the impact of different physical parameters on the system performance, and thereby we provide a framework which may be useful in the design and implementation of fingerprinting positioning systems. [C541]

"Comparative study of fade margins with hard and soft handoff in CDMA based microcellular systems"

In this work, an analytical approach is used to study the quantitative performance regarding the fade margins

improvements, as well as cell coverage issues with hard- and soft handoff for the reverse link of a CDMA based microcellular system. To determine the required fade margins for different outage probabilities and different soft handoff scenarios, the Manhattan-like street pattern is considered. Since the analysis presented here involves the comparison of propagation losses among two or more base stations due to macroscopic selection diversity used on the reverse link, the generally accepted two slope propagation model, includes a cross-correlated shadow fading component, which allows taking into consideration the dependence between two shadowing components affecting different propagation paths, since they could experience many of the same obstructions in the path profile as has been observed in field test. From numerical evaluations, it is observed that the shadowing cross-correlation is determinant in the accuracy of handoff analysis and some suggestions regarding the fade margins are proposed for planning CDMA based microcellular systems in Manhattan environments. [C542]

"Measuring high and low waves with HF radar"

HF radar measurements are presented focussing in particular on the estimation of wave parameters in both high and low sea conditions. In high sea conditions theory suggests that low radio frequencies are needed in order to make wave measurements whereas in low sea conditions, higher radio frequencies are required. The theory is reviewed and measurements used to demonstrate the impact of these theoretical limitations. Work in progress aimed at improving the accuracy of wave measurement in both high and low seas is discussed. [C543]

"The design of a terahertz metamaterial absorber basing on LTCC technology"

Using CST, a LTCC (low temperature co-fired ceramics) technology basing design of the metamaterial absorber in terahertz region (MM) is proposed. The metamaterial absorber is constructed by silver plane and a specially designed ERR structure. The investigation to the electric field, surface current and absorption power density distribution indicates that the metamaterial absorber we design is somewhat different from the ones have been proposed, the reason of which is thought to be the wide line width comparing to the working wavelength, however, the working mechanism is consist with the one we has reported. And we have also pointed out the EM characteristic and thickness of the isolation layer is crucial in obtaining the unit absorption. [C544]

"The Optimal Radio Propagation Model in VANET"

There are many parameters that affect the performance of vehicular ad hoc networks (VANETs) applications and protocols. To test the new applications and protocols on a real setup is very difficult and very costly. Most researchers use simulation tools to study and analyze VANETs. The simulators usually use simple radio propagation models that did not take into account all the obstacles in the environment. In this paper we analyze different radio propagation models that have been introduced in the most popular network simulator (ns2) and predict the radio propagation model that best characterize the vehicular environment. [C545]

"A Performance Evaluation of a Grid-Enabled Object-Oriented Parallel Outdoor Ray Launching for Wireless Network Coverage Prediction"

The use of parallel technologies to solve complex scientific problems has gained increased popularity. The ray optical methods are deterministic propagation approaches that are based on geometrically searching paths between emitter and receivers. They offer higher accuracy than empirical models, but suffer from slow calculations on exhausted rays that have to be searched. In this paper, an object-oriented scheme based on POP-C++ for parallel objects to accelerate outdoor ray launching is described. Performance evaluation is presented to show that this parallel scheme is promising in outdoor wireless propagation modeling. The possibility of running this model in the distributed grid environment is also discussed. Results have shown the great potential of using such a parallel model to predict accurate outdoor wireless propagation scenarios within a short time. [C546]

"FPGA-Accelerated Baseband Design and Verification of Broadband MIMO Wireless Systems"

The design of communication systems has become more challenging as product complexity and cost pressures have increased and time-to-market has shortened more than ever before. Performance verification of the physical layer (PHY) of wireless communication networks under various radio propagation conditions is a computationally-daunting process. Bit-true software-based simulation of the PHY layer on workstations is becoming prohibitively time-consuming. This makes hardware-accelerated prototyping and verification of the PHY layer an increasingly attractive alternative. This paper presents a bit error rate tester (BERT) for baseband performance verification of multiple antenna (MIMO) systems over accurate radio propagation channel models. This BERT integrates all of the required modules of a typical PHY layer onto a single field-programmable gate array (FPGA). The proposed BERT system significantly decreases the test time compared to conventional software-based verification, hence increasing designer productivity. [C547]

"The degrees of freedom of wireless networks"

It is shown using electromagnetic wave theory and without relying on stochastic fading channel models, that the number of independent information channels available in planar wireless networks embedded in a three-dimensional propagation environment is limited by the spatial size of the cut that divides the environment into two parts. Specifically, in the case of propagation inside a cylinder of height h and base area n, containing n communicating source-destination node pairs, the number of available channels is at most proportional to hradicn and hence, as the number of nodes increases, the per-user information capacity must follow an inverse square-root of n law. [C548]

"Modeling heterogeneous signal strength characteristics for flexible WLAN indoor localization"

To develop a flexible indoor localization system which is hardware independent, it is necessary to accommodate the diversity of mobile units in the installed WLAN infrastructure. The diversity of mobile units induces the diversity of signal reception bias terms. To deal with the signal reception bias, this paper proposes an extended signal propagation model and two new localization algorithms. A simulation result verifies the performance of the proposed algorithms. [C549]

"A short range measurement using RF signal's propagation time based on vernier effect"

To recognize the position of moving objects, facilities or important equipments has been regarded as a hot issue in the future environment which needs ubiquitous characteristics. Furthermore, it is indispensably needed to acquire location data in order to realize an infrastructure of sensor network system. Namely, to get distance data is the preliminary information to complete localization of a moving object in local area. Even though there have been several researches on it, there are however still much amount of problem to get precisely exact distance data. Out of them, the research on using TOF (time-of-flight) is very few as well as could be thought of as a cutting-edge technique. Moreover, it is very difficult to get minutely RF signal's TOF for getting short distance data; that is, very complicated signal processing skills are requested for realizing it. In this paper, we present a new methodology of RF short ranging technique based on the vernier effect due to the use of heterogeneous operating clocks. [C550]

"Two Ray or not Two Ray this is the price to pay"

Simulation is essential to evaluate the performance of large scale vehicular networks. It is logistically challenging (and prohibitively expensive) to run tests with more than a few dozens experimental vehicles. Given the critical role of simulation in the evaluation of VANET protocols in large scale scenarios, it is important to guarantee realism of the models. This paper focuses on the accuracy of urban propagation models and their impact on vehicular protocol results. In a city-based vehicular network we compare the predominant two ray model and a recently proposed Corner model. We identify a number of factors that undermine the validity of the Two Ray model, for example, the presence of buildings causing propagation disruption and the heavy weight border effects that incorrectly compensate for the presence of hidden terminals in the networks. The paper analyzes a small scale urban vehicular scenario which unveils the issues to be considered in large scale vehicular simulations. [C551]

"Consideration on radio propagation in cavities"

The paper is analyzing the radio propagation effects in cavities and the interaction with a second type of media, with other dielectric properties. The radiated power is theoretically analyzed and some numerical results are presented. [C552]

"A History of the IEEE Antennas and Propagation Society"

In 1949 Dr. Lester C. Van Atta and 55 others signed a petition to form the IRE Professional Group on Antennas and Propagation, the third of the professional groups of the IRE. By 1953 there were 1100 members, and the Transactions started under Editor John Smyth. Participation in annual meetings began in the early 50s, and in 1963 the first of the current series of international symposia was held in Boulder, Colorado. There are now over 70 AP-S chapters worldwide. The IEEE Antennas and Propagation Society continues today in its role of communicating developments in the field begun by James Clerk Maxwell and Heinrich Hertz. [C553]

"Internal Antenna Handset with Ni/Ag/Ni Hetero Structure"

An internal antenna handset with the sputter-deposited Ni/Ag/Ni hetero structure has been extended for the first

time to the domain of wireless mobile propagation device. Efficiency distribution image for optimized at 870 MHz and 1990 MHz, total efficiency result are 47% and 55% in par field condition, respectively. From CST results the simulated current distribution densities are 98.8 A/m and 39.8 A/m at 870 MHz and 1990 MHz, respectively. Main objective of this research is characteristics comparison with VSWR and S11also include radiation pattern performance. [C554]

"A ray tracing based method for coarse coordinate registration in HF skywave OTH radar"

Over-the-horizon (OTH) radars use the refractive properties of high-frequency radiowave propagation through the ionosphere for wide-area surveillance at long ranges. Target detection is accomplished by tracking returns in slant range, Doppler and azimuth. Moreover OTH radar performances are affected by several types of frequency dependent factors, mainly due to propagation and ionospheric absorption, but also related to the background noise. Coordinate registration (CR) is the process of localizing the target by converting the slant coordinates Rginto ground coordinates Rgrfor all the frequencies used in transmission. The CR method here presented is based on a ray tracing algorithm which provides the ground range distance reached with a specific transmission frequency and elevation angle. The ray tracing approach here adopted uses an electronic density profile estimated by using the latest revision (2007) of IRI (International Reference Ionosphere) model. Errors in the estimated down-range ionospheric parameters introduce as a consequence a degradation of target localization accuracy. The goal of this work is that to show a technique to determine the coordinate registration by jointly using ray tracing and Breit and Tuve theorem. [C555]

"A simplified bi-state channel model for radio propagation in the Land mobile Satellite System"

In this paper, a simplified channel model for land mobile satellite systems (LMSS) is proposed, which makes use of Ricean fading for the line-of-sight (LOS) scenario and composite Nakagami-m/Gamma fading for the shadowed scenario. The closed form expressions for the probability density function (pdf) and the moment generating function for the signal strength are derived. The proposed model is shown to compare favorably to existing models. Furthermore, the proposed model offers an effective and tractable technique to access performance of digital communication system for LMSS channels. [C556]

"Enhanced system architecture for rugged wide band data transmission"

In this paper, an enhanced architecture for wide band data transfer based on a true differential modulation is presented, showing extremely high resistance against dispersion and fading due to multi-path propagation. The proposed system operates well with minor frequency stabilizing requirements and is characterized by a low part count. Since the modulation is based on the phase difference between two propagating modes, spread spectrum techniques are easily implemented. Experimental results of a transmission over a distance of 45 m with a single carrier frequency using noise to spread the spectrum are presented for a data rates of up to 25 MBit/s. Furthermore, the system is resistant against Doppler shifts and small banded jamming, so that it can be used to improve data transfer rates in mobile systems. [C557]

"Maximal ratio combining receivers for dual antenna RFID readers"

Radio frequency identification (RFID) systems at ultra high frequencies operate in an environment exposed to fading. While state-of-the-art RFID readers utilise multiple receive antennas with antenna multiplexing in order to deal with the multipath propagation environment, this contribution proposes maximal ratio combining at RFID reader receivers. A dual receive antenna RFID reader is presented in this paper. The composition of the receive signal and the constellation in the I/Q plane on each antenna is analysed and discussed thoroughly. With that knowledge, we design a receiver estimating the channel coefficients and realising maximal ratio combining of the received signals, thus achieving the optimum combination of receive signals in terms of SNR maximisation. Underlying assumptions on the receive signals at the RFID reader for the design of the receiver have been cross-verified with measurements. Furthermore, the receiver has been implemented on an FPGA and functionally verified. [C558]

"Characterization of langasite as a material for SAW based RFID and sensing systems at high temperatures"

For langasite, a piezocrystal used as substrate material for SAW-based ID tags and sensors operating at high temperatures, the parameters of SAW propagation have been determined as a function of temperature. These parameters are the phase velocity, propagation loss, and electromechanical coupling coefficient. Two crystal cuts have been studied, with Euler angles (0deg, 138.5deg, 26.6deg) and (0deg, 30.2deg, 26.6deg). The SAW parameters were obtained from the measurements of transfer functions for delay lines on langasite chips at frequencies ranging from 150 MHz to 1 GHz and at temperatures from room temperature up to 750degC. [C559]

"Characterization of radio propagation at 60 GHz channel"

The 60 GHz band is of much interest since this is the band in which a massive amount of spectral space (5 GHz) has been allocated worldwide for dense wireless local communications. This paper gives an overview of 60 GHz channel characteristics. A propagation model for indoor wireless communication at 60 GHz is developed using electromagnetic theory. In dense multi path environments, the signal strength is expected to drop off more rapidly due to high penetration loss. An exponential increase in loss with distance in an area populated densely with obstacles has been observed at the lower frequency bands. [C560]

"Compatibility analysis between cognitive radio and DVB-T system"

Since IEEE802.22 is required to reuse the fallow TV spectrum without causing harmful interference to the incumbents (i.e., the TV receivers), Cognitive Radio (CR) techniques are of great importance to get access to the TV bands opportunistically. Meanwhile, the opportunistic spectrum access (OSA) model provides an approach to allow the compatibility between low-power cognitive devices and the incumbents on certain geographical regions. In order to offer a technical guidance for the future CR network construction, British Telecom's (BT) mobility research center concentrates their works on measuring and analyzing the interactive interference between CR transmitters and DVB-T (digital video broadcasting-terrestrial) receivers in the mainland of the UK. In this paper, we show the preliminary research result. Based on the ITU-R REC.P.370 radiowave propagation model and report of DVB-T system from European Radiocommunications Committee (ERC), we establish a compatibility scenario in OXFORD, modify the propagation model and simulate the scenario in MATLAB to obtain the interference power at DVB-T receivers on different operating frequencies and different locations within the coverage. In addition, we also present the safe distance that CR users should keep away from DVB-T receivers as a function of frequency difference in the simulation results. [C561]

"Scatterer based airport surface channel model"

Based on measurements at Munich airport and the observation of the spreading function, this paper analyzes different types of scatterers which occur in the spreading function and their temporal behavior. The scatterer analysis reveals the non-stationary character of the airport surface channel and is useful for stochastic modeling. The proposed geometry-based, stochastic channel modeling approach may be realized by either randomly placing reflecting objects based on the scatterer analysis or utilizing an appointed airport environment. The proposed channel model yields a spreading function characteristic for the apron area. [C562]

"The propagation model of RFID systems in ETC"

The propagation model of RFID system in the ETC scenario is different from other wireless systems. In this paper, an Г‚ВїN-RayГ‚Вї propagation model that mainly considers the multipath effect is established specialized for RFID systems in ETC. Then simulations are made and the results prove that the model is reasonable. [C563]

"EMC considerations in deployment of RFID systems"

Radio frequency identification (RFID) systems are part of modern life. They are revolutionizing the way companies run their businesses, cars pay tolls and employees access an office in a building. RFID devices are also making their way quickly into other industries including health care where they are used in remote of monitoring equipment, as tiny chips that identify items in inventory, or are even embedded in surgical sponges for tracking during an operation. Although in many regions RFID regulations are very strict and operators must adhere to the standard, the unpredictable environmental effects on radio propagation can change the way that these devices operate. This paper offers a review of important EMC information relevant to RFID system deployment. It also examines the sources of error in simulations reported in some other publications. [C564]

"Estimating uncertainty in calculated ambient RF field levels for hazard assessments"

Just as for measured evaluations, the calculation of ambient levels of radiofrequency (RF) electric and magnetic fields for hazard assessments can entail random uncertainty, the extent of which depends on: how well the method of analysis approximates the governing electromagnetic equations (i.e. Maxwell's equations); how closely the modeled object represents its real counterpart in form and composition, and; computational round off error. While uncertainty estimates are commonly required for RF measurements, they are rarely provided for calculated assessments. In this paper, a process for calculating uncertainty for calculated assessments is proposed. It incorporates a series of validation tests which are used to gauge the uncertainty in the computational technique and round off error. The comparator in the validation tests must be independent of the technique (e.g. measurement of antenna gain) and may vary for different types of analyses (e.g. full wave solutions vs ray

tracing methods). Variational targets are set for the validation tests, and the uncertainty estimate for computational uncertainty diminishes as more tests are passed. Once determined in this way, the standard uncertainty for computational technique is then combined in a multiplicative model with standard uncertainties for other influence quantities such as forward power to the antenna and field scattering effects of nearby objects. By using the proposed approach, it will be possible to provide systematic corrections and uncertainty estimates for calculated assessments as they are for RF measurements, thereby allowing meaningful comparisons between them. [C565]

"A big picture on localization algorithms considering sensor logic location"

Wireless sensor networks (WSNs) have been applied in areas such as military surveillance, environmental monitoring, habitat and structural monitoring, domotics, battlefield surveillance and robotics. The aim of this survey is to present the state-of-the-art in localization algorithms which consider the combination of different factors such as localization schemes, propagation models, communication protocols, traffic patterns analysis and sensor logic location. The latter represents the inherent characteristic of the object to which the sensor is attached to. We believe that the precision of the localization algorithms can be improved when these factors are considered as whole rather than isolated effects. A classification and the main solutions for each factor are presented. The advantages, performance issues and the relation of the solutions with the other factors are discussed. The article concludes with opened research questions and possible further research directions. [C566]

"Localization of Wireless Sensor Network using artificial neural network"

In wireless sensor networks (WSN), location estimation is important for routing efficiency and location-aware services. Traditional received signal strength based localizations using propagation-loss model are often erroneous for the low-cost WSN devices. The reason is that the wireless channel is vulnerable to so many factors that deriving the appropriate propagation-loss model for the low cost WSN devices is not possible. Hence, we propose a flexible model based on neural network and grid sensor training phase for accurate localization of sensors. Simulation results show that the location accuracy can be increased by increasing the grid sensor density and the number of access points. [C567]

"Polarimetric transmission loss of RFID antenna at 2.4 GHz for short range systems"

Radio Frequency Identification (RFID), The operated in 2.4 GHz RFID systems is energy and data transmission using propagating radio signal (E-field transmission). This is exactly the same principle as that used in long-range radio communication systems. The reader's antenna generates a propagating radio wave use far-field communication, which is received by the antenna in the tag. In this paper the microstrip antennas used both for reader antenna and tag antenna and simple patch antenna of this type radiates a linearly polarized wave. We investigated and analyzed to the vertical and horizontal polarization arranges in RFID communications link. Furthermore, the power delay profile and bit error rate shows. This technique, can studies sufficiently researches and designed the antennas independent. [C568]

"Multipath Characterization of Micro and Macrocellular Environments for Mobile Radio Systems"

A factor in designing the future personal mobile radio systems is undoubtedly a comprehensive knowledge about propagation characteristics over different types of environments. Propagation studies are therefore essential as these studies will lead to channel models and statistical parameters which could be used to design intelligent systems. The transmitted signal most often reaches the receiver through more than one paths resulting in a phenomenon known as multipath fading. If we characterize the channel well, the sitting of the transmitter can be selected to achieve good propagation performance and better connectivity along-with appropriate equalizers at the receiver end. In this paper we studied the multipath in a micro and macrocellular environment using channel sounding method for characterization creating a power delay profile of a communication channel. [C569]

"Path loss revisited using computer simulation"

In this paper, we propose a computer simulation model for the study of the large-scale effects on narrowband wireless transmission systems. The development of the path loss model is based on the ray tracing technique. This study concentrates on the first-order scattering effects, namely each multipath signal is a two-hop signal that involves a single scattering object. The first hop is directed toward the scatterer from the transmitter; and the second hop goes from the scatterer to the receiver. For each hop the signal is described using a two-ray model accounting for wave propagation along the direct path and along the ground-reflected path. The simulation results are consistent with the empirical models that are derived from measurements, including the Hata model and the Lee model. More importantly, two key observations are made: First, the path loss is affected by the number of scattering objects, their radar cross sections, and the ground reflection. Second, coherent multipath

signals can cause the path-loss exponent falling below 2, which corresponds to free-space propagation. [C570]

"Empirical calculation of shadowing deviation for complex indoor propagation topologies at 2.4 GHz"

This paper presents an empirical calculation of shadowing deviation for complex indoor propagation topologies at 2.4 GHz. Based on measurements acquired in a complex indoor propagation environment (the premises of wireless telecommunications laboratory) at 2.4 GHz, a site-specific validation of indoor RF models was conducted. Expanding this recent work, the shadowing deviation is calculated (in dB) based on the losses caused by all different types of walls and floors interfering in the signal path. These losses are acquired by the multi-wall-floor model that provides significant precision regardless of the complexity of the indoor topology in question. The calculation of the shadowing deviation is therefore established in a concrete manner. This method is not limited at 2.4 GHz but can be applied in any other frequency as well, as long as the losses for all types of walls and floors that come into consideration will be provided or empirically calculated. [C571]

"Radio noise measurements in medium wave band"

This paper presents a study of radio noise levels in the Medium Wave band based on field tests. The planning of the measurement campaign, discussion about the methodology, the process of registered data and results are explained. [C572]

"Theoretical model of the electromagnetic disturbances caused by explosions in the ionosphere"

A new analytical solution of the snowplow model of explosion in the rarefied gas has been obtained. This solution has been compared with Stuart's and Holway's numerical models and with experimental data obtained by the SPOLOH experiment. The comparison shows the solution corresponds to these models with good accuracy and allows calculating the main hydrodynamic characteristics. These characteristics were used for evaluating of the electric current and the electromagnetic field occurring by explosion in the ionosphere. Our calculations show the electromagnetic disturbance propagates mainly along magnetic field. Such result agrees with the data obtained by experiments TOR, Trigger and Ariel. Presented model allows calculating electromagnetic and hydrodynamic disturbances caused by active impacts and rocket engines disasters. [C573]

"Lorentz reciprocity and the apparent phase centre of ultra-wideband antennas"

The transmission and reception properties of an antenna can be expressed using two characteristic transfer functions that describe the directional and dispersive behaviour. From these functions an apparent phase centre may be determined based on either the transfer function for transmission or reception. Using the Lorentz reciprocity principle, which expresses a symmetry of Maxwell's equations, a simple relation between the two transfer functions can be established. Based on this relation, it is shown that the phase centres for transmission and reception are equal. Furthermore, a definition for a delay domain phase centre is proposed. [C574]

"Time domain versus frequency domain in ultra wideband"

When during the last years the regulating authorities worldwide made an ultra wide spectrum license free available for indoor applications, the only limitation was the spectral power density, limited at -41.3 dBm/MHz, R&D activities almost exploded everywhere. Two scientist fractions grew up, the time domain and the frequency domain enthusiasts. Each one claims up to now to be working and fighting for the better usage and options. In this paper the advantages and drawbacks of each technology are examined and compared in the RF domain, i.e. antennas, radiation and propagation channels. For the argumentation typical applications are cited, e.g. communications, radar and sensors. The outcome of this comparison is quite simple; each technology has its favorite applications, where it is more advantageous than the other one. [C575]

"Hybrid numerical scattering field analysis embedded into simulations of complex radio based systems-Examples, capabilities and limitations"

Navigation, radar and communication systems rely on radio signals. Objects in the vicinity of these systems can create distortions. This paper describes the advanced system simulation by the integrated scattering analysis by numerical methods and the adapted system signal processing. The simulation procedure and the criteria for a suitable method are described. Practical cases are outlined. [C576]

"Propagation prediction in rough and branched tunnels by the ADI-PE technique"

The study of radiowave propagation in tunnels is important for the development of telecommunication systems.

The vector Parabolic Equation (PE) and the alternate direction implicit (ADI) technique are used to study radiowave propagation in branched tunnels and in tunnels with rough walls. Previous work has shown that the ADI-PE method can accurately predict transmission loss in straight tunnels with smooth walls and with known electrical parameters. We extend the analysis of this method by including the realistic cases of branching tunnels and tunnels with rough walls. We briefly discuss the boundary conditions used in each case as well as compare our results with known numerical or analytical models. The numerical results obtained for the branched tunnel case were compared with the results produced by HFSS and the results for the rough wall case were compared with known analytical loss factors. The results show excellent agreement in both cases. [C577]

"Analysis of X-pol propagation in microcellular environment"

The behavior of radio propagation in cross-polarization (X-pol) in urban environment is studied with the aid of both MIMO measurements and ray tracing simulation. Several microcellular scenarios are considered in the paper (LOS, NLOS, street corner), and the behavior of X-pol discrimination (XPD) as a function of the distance is analyzed. Results show that typical XPD values fall between 8 and 10 dBs, and are nearly independent of link distance. [C578]

"Vector spherical harmonics antenna description for IR-UWB ray tracing simulator"

This paper presents a 3D-RT simulator which allows indoor radio wave propagation modeling for multi-standard systems, including UWB. It focuses on the issue of simulation of deterministic radio channel with realistic antenna behavior. Vector Spherical Harmonics (VSH) expansion of antenna radiation vector function is used to have efficient data access, good compression factor, and fast waveform reconstruction. [C579]

"Influence of Dimension Change on Radio Wave Propagation in Rectangular Tunnels"

Based on the propagation modal and the software simulation method, characteristics of radio wave propagation in rectangular tunnels are studied from the view of the size shift of the tunnel width and height. The results show that the influence of the height change on the vertical polarization mode is greater than on the horizontal polarization mode; that of the width change on the vertical polarization mode is less than on the horizontal polarization mode. [C580]

"Wireless Channel Model of UWB for Underground Tunnels in Coal Mine"

In this paper, the radio propagation of ultra wide band (UWB) in coal mine tunnels is analyzed according to channel path loss. The transmitted pulse and modulated method of UWB system are selected in allusion to its propagation characteristic. We present the method of improving time-variant finite impulse responding filter model to a trapped delay line channel model with specific center frequency and multipath resolution. The Improvement for a typical UWB pulse has been done, and the statistic characteristics of the modified channel model have been analyzed. The simulation results show that the multipath delay characteristics of the improved channel model well match the measured results of coal mine tunnels. [C581]

"Study on Wireless Detection in Condition of Evaporation Duct"

Evaporation duct is a layer of air just above the sea surface which can trap wireless energy. It is created by the rapid decrease of humidity with height just above the sea surface. Owing to it, the path of wireless wave is changed remarkably, the wireless detection range will be increased to realize the phenomenon of OTH (over-the-horizon) detection, so it is very important in wireless detection over the ocean. This paper uses actual evaporation duct height data measured in recent years to choose better one of two widely used evaporation duct models in sea areas, and the better model is applied to PEM (parabolic equation method) as input to calculate wireless detection range. The wireless detection experiment result presented in this paper describes that actual wireless detection range coincides with the prediction result based on evaporation duct model and PEM. [C582]

"Effect of Space-Time Correlation on the Capacity in MIMO-OFDM Channel"

MIMO-OFDM system is the main technology to the future wireless system. In this paper, to model multipath propagation and spatial-temporal fading correlation in frequency-selective channel, we propose a fading-correlated MIMO channel model. The channel is abstracted as a cluster-based double bounce model with multiple taps. Both transmitter and receiver are considered. The expressions of correlation coefficient and MIMO-OFDM channel capacity are derived, respectively. The effect of spatial temporal correlation on the capacity is investigated for different physical parameters. Increasing delay spread taps and cluster angular spread can increase the capacity. Two typical scenarios are simulated for indoor and outdoor environments. [C583]

"A unified full-waveform method for modeling ground penetrating radar and electromagnetic induction data for non-destructive characterization of soil and materials"

We propose a unified full-waveform method for modeling zero-offset, off-ground ground penetrating radar (GPR) and electromagnetic induction (EMI) in multilayered media. Both GPR and EMI systems are set up using vector network analyzer technology. The antennas are modeled using frequency dependent, complex transfer functions, which include interactions with the medium layers. Wave propagation and induction effects are accounted for by means of three-dimensional (3-D) Green's functions. Laboratory results demonstrated the high accuracy of the GPR and EMI models. This shows great promise for non-destructive characterization of soil and materials. [C584]

"An Ellipse-Centroid Localization Algorithm in Wireless Sensor Networks"

In recent years, there has been a growing interest in wireless sensor networks(WSNs) applications. Localization in wireless sensor networks gets more and more important. Weighted centroid localization provides a fast and easy algorithm to locate devices in WSNs.The algorithm is derived from a centroid determination which calculates the position of devices by averaging the coordinates of neighbour anchors. After analyzing the radio propagation route loss model, the most appropriate Log-distance distribution model is selected to simulate the propagation of RSSI signals. Based on the centroid algorithm and the weighted centroid algorithm, an ellipse-centroid localization algorithm is proposed in this paper. The algorithm using the features of the ellipse to estimate the unknown node's coordinate. The main idea of the ellipse-centroid algorithm is the defining of the precision control factor(PCF), which can control the algorithm's localization precision. In the ellipse-centroid algorithm, the located nodes are promoted to be anchors in order to enhance the anchor density dynamicly. The simulation results demonstrate that the ellipse-centroid algorithm is more efficient in precision than the centroid algorithm and weighted centroid algorithm. [C585]

"MIRAS-SMOS antenna relative phase calibration"

SMOS is the acronym of dasiaSoil Moisture and Ocean Salinitypsila and it refers to a European Space Agency (ESA) mission aimed at providing global maps of soil moisture over land and sea surface salinity over oceans. The mission has a single payload, the Microwave Imaging Radiometer with Aperture Synthesis (MIRAS), which is an L-band radiometer using an interferometric technique to synthesize high resolution beams. It is formed by 69 antennas evenly distributed on a Y-shaped mechanical structure. The instrument was manufactured by EADS-CASA Espacio (ES) and was delivered to ESA for testing in May 2007. The payload is now integrated with the platform and ready for launching in November 2008. [C586]

"Scattering of Brillouin precursor fields from objects inside water"

The feature which is common in figs. 2(a) to (d) is the bell shape of all the curves. The maximum appears at the sampling point which is closest to the object and the energy decreases as the sampling point moves away from the object. As expected, comparing the figures shows that the scattered field energy is higher for objects with bigger sizes. The figures also show that the scattered energy for double Brillouin pulse is larger than the reference Gaussian pulses under identical conditions in terms of the location and size of the object. In other words, the double Brillouin pulse has a better performance than the corresponding Gaussian pulse. We have also compared the double Brillouin pulse with modulated rectangular and sinusoidal pulses in terms of the energy of the scattered field. The simulation results show that the double Brillouin pulse also has superior performance with respect to these pulses in terms of the energy of the scattered field. These results will be discussed in the presentation. [C587]

"Through-wall building image improvement via signature-based CLEAN"

The radar signal processing involves post-processing of the received radar echoes to extract target information. There is an increasing interest to employ radar signals for information gathering and imaging of selected objects with the environment. A more focused interest relates to imaging of concealed items and through-wall imaging fits that category. The challenge faced in through-wall radar sensing relates to the attenuation and distortion of signals propagating through one or more walls prior to interacting with objects of interest. In addition, radar images obtained by near-field sideby scanning are heavily dominated by the scattering of the exterior walls and thereby obscuring the interior details which are of primary interest. This is illustrated in Figure 1. [C588]

"The performance of on-body wearable antennas in a repeatable multipath environment"

The performance of antennas designed for on-body channels is usually evaluated in an anechoic environment. However, it is also appropriate to determine their performance under multipath conditions since the presence of

off-body paths may significantly improve on-body links for some antennas. This was investigated by considering the on-body performance (|S21| path gain) of a range of wearable antennas in the repeatable multipath environment of a reverberation chamber using a tissue-equivalent experimental phantom, representative of human muscle tissue at 2.45 GHz. These results were compared with the equivalent measurements taken in an anechoic far-field chamber. The study shows that antennas which radiate tangential to the body surface, supporting a surface wave propagating mode, perform favorably in both environments, which is advantageous in reliable system design. [C589]

"Effects of supporting structure on wireless SAR measurement"

The effect of the supporting structure for SAR measurements of wireless handsets has been investigated experimentally and numerically. A phone with a quarter wave monopole antenna was used for this investigation. Various dielectric slabs were tested as the supporting structure and configurations that resulted in a significant change in the SAR values were identified. The SAR values were obtained by both measurement and simulation with and without the dielectric support structure. There is good agreement between the measured and computed differences in the SAR values with and without the support in both bands. In the 900 MHz band, the resonance frequency is shifted by 18% and the SAR is reduced by 30%. In the 1900 MHz band, the resonance frequency is reduced by 35% and the SAR is decreased by 56%. [C590]

"Design and implementation of a low cost portable material analyzer"

Site-specific wave propagation simulators used for wireless channel characterization have shown promising results in the last decade. However, accuracy of predicted results by such tools relies on their input data about the environment (i.e. geometry and material properties). A low cost and portable/handheld device capable of estimating the material properties of the objects could provide valuable data about the environment for a site-specific simulator. One such device is described in [1]. The idea is to monitor the change in the reflection coefficient of an antenna when holding it against the object of interest and to transfer the measured data to a laptop for post processing and estimation of the objectpsilas material (epsivr, sigma) and thickness, as appropriate. When such data is combined with a building database, the geometry can be analyzed to produce a site-specific wireless channel model. Toward this vision, this paper presents the magnitude and phase measurement capability achieved by a system of directional couplers, an IC capable of measuring gain and phase and a ZigBee radio for wireless data transfers between portable material analyzer and a laptop. Its accuracy is verified with a commercial Vector Network Analyzer (VNA). [C591]

"Guided mode propagation in tunnels with non-circular cross section"

We have presented a perturbation analysis for evaluating the characteristics of the dominant modes in uniform tunnels with cross sections that deviate from the circular shape. So, simple forms are thus obtained for the propagation parameters of the modes in these tunnels. The compact FDTD numerical method is used to assess the degree of accuracy of the proposed perturbation analysis. [C592]

"UWB propagation channels within an aircraft and an office building environment"

Path loss at higher distances is much higher for NLOS in the office due to solid walls in the propagation path. In LOS, the results are converging with increasing distance. In our indoor campaign, these large distances can only be found on corridors. At small distances the path loss is about 10 dB less in the aircraft than in the office for all frequencies, which can also be observed in PL0. The delay spread is higher in the aircraft but converges with the LOS configuration in the office. However, the maximum excess delay is smaller for indoor LOS. This leads to the conclusion that the UWB channel in the aircraft fuselage is comparable to an indoor corridor with one important difference: there are much more relevant multi path contributions in the received signal than in office environment mainly caused by metal structures in the aircraft cabin. Strong reflecting environments lead to a limitation of data rate in single carrier systems. It can be exploited best by OFDM- and MIMO technologies with an appropriate system design. So UWB technology would be very suitable for this environment. [C593]

"Interpolation of perimeter wireless channel measurements into the measurement region"

The work presented here demonstrates the feasibility of interpolating perimeter wireless channel measurements throughout a planar region. The outdoor diffraction measurements have shown that, by applying the modified CWE to a pair of closed contour measurements, one may attain an accurate approximation to the true channel without having to tediously measure everywhere in the region. Thereby, this interpolation technique allows for an accurate acquisition of the wireless channel in a fraction of the time typically required. The interpolated channel may be used as additional measurements for developing stochastic channel models or as a 2-D electric field map for investigating the physical mechanisms underlying real-world radiowave propagation. [C594]

"A novel hybrid propagation model"

A proposed approach in this paper presents a potential model for predicting both path loss, RMS delay spread, and decay characteristics of a room propagation power delay profile. Several parameters are needed to construct the model, including the room volume, surface, and the average power reflected. A roompsilas average or total absorption rate is found using the impulse response sounder system based on high speed, high throughput RF detector circuit, a digital oscilloscope and a wireless sensor network. With this approach, a time efficient means for predicting a roompsilas path loss, RMS delay, and decay characteristics is reached. The sensors measure the impulse response and send the data back wirelessly over the network to the main computer. The software then calculates the data received in a matter of seconds and provides an average response of a room, path loss, and the RMS delay spread, which lead to inter symbol interference (ISI) of a certain wireless system being deployed in that particular room. Because the proposed model does not require any knowledge of the environment, not only does the method provide much richer information, which is statistically more accurate about the channel but it also implement a more cost effective way to compiling this information. [C595]

"Inter-vehicle communications: Study of the integration of a 5,8GHz antenna and a radio link in the 5 GHz band"

An integrated patch antenna into a car structure operating in the 5.8 GHz frequency band has been studied numerically and experimentally in this paper. The results show that there is a good agreement between simulation and measurement. Then, the analysis of a vehicle to vehicle communication shows that the 5 GHz propagation is affected by multipath propagation. Our current work aims at establishing communications in the 5 GHz band and analyzing the performances of the link using the IEEE 802.11a protocol between two vehicles moving on roads. [C596]

"Comparison of blockage widths of ideally hard cylinders of different cross-sectional shapes"

We have computed the equivalent blockage width of ideally hard cylinders of different cross sections. We have shown that the oblong cross section is best when the physical width is larger than about 0.2square, whereas for narrower cross-sections the transverse thin rectangular cross-section is best. The latter can be strengthened by a star-shaped cross section, without significant change in the blockage width. The latter was found as a result of numerical optimization. The optimized oblong shape is explained by a smooth transition of the waves past the cylinder, which is facilitated by the GO characteristics of the hard surface [8]. The thin rectangular cross section is explained as a quasi-static solution. The cross-section is so narrow in terms of wavelengths that transverse currents cannot be induced. The star-shaped cross-section works like the transverse rectangular cross-section, because the orthogonal rectangular part making up the two other arms of the star are invisible to the wave because of their small thickness. It must be emphasized that we have treated ideally hard cylinders. This makes the results valid for metal cylinders and TE-case. The performance for TM-case depends on the realization of the PMC surface, but the results can be seen as typical performance at the center frequency. The bandwidth will normally be small, but can be up to 20-30% when the artificial magnetic conductor is realized by dielectric coatings. [C597]

"Chamber imaging using spherical near-field scanning"

We discuss recent measurements performed at the National Institute of Standards and Technology (NIST) that were used to characterize the incident fields within a test volume and to produce images of the test chamber. The probe (figure 1), on a roll-over-azimuth mount, was scanned over a spherical surface enclosing the test volume. A ladder with a small metal plate (figure 2) and a bicycle (figure 1) were both included in the scene. Illumination was alternately provided by standard gain horns mounted on the wall and on a tripod (figure 3) in the first measurement setup and a cassegrain dish mounted on the wall and a circular waveguide on a tripod in setup 2. In setup 1, we used a probe with a gain of about 7 dB, while in setup 2 we used a probe with a gain of about 22 dB. [C598]

"Development of rain attenuation and rain rate maps for satellite communications system design in Greece"

Using six (6) years of point rainfall data from several locations in Greece, which were obtained from the National Hellenic Meteorological Service (NHMS), the statistics of rainfall for various percentages of time for the average year are derived. Using the originally derived rainfall statistics, accurate rain rate and attenuation maps are developed for facilitating satellite communications systems design in Greece. [C599]

"Rainfall characteristics for radiowave propagation studies in Greece"

Using six recent years (2000-2005) of point rainfall data from several locations in Greece, the rainfall rate exceeded for 0.01% of the average year is derived. The originally reported resultsa, allow radio systems engineers to evaluate more accurately the effects of local climatology to wireless communications systems installed in Greece. [C600]

"Range of an IEEE 802.11b/g system in industrial environments based on site survey measurements and propagation models"

In this paper, the wireless range of an 802.11b/g site survey measurement system in an industrial environment is investigated. A measurement procedure for executing site surveys has been developed. The range resulting from the site survey measurements has been compared to an existing industrial propagation model through calculation of a link budget, and generally good agreement is obtained. Deviations between site survey range and link budget range are attributed to attenuation by large obstacles. [C601]

"Chirp sine and cosine transforms for a split-step propagation algorithm"

Split-step propagation algorithms are widely used to model the propagation of fields in complex environments. Typically one of the slowest steps in such an algorithm is the computation of the forward and inverse transforms. Chirp versions of the sine and cosine transforms were derived, to allow modification of the number of points used in the transforms according to the detail needed in a particular region. [C602]

"Influence of animal body on ingested wireless device before and after death"

This paper measured the radiation characteristics of antennas inside the ingestible wireless devices (IWDs). Three monopole antennas were designed and put in two positions of the intestine of an adult female pig at the weight of 80 kg. The return losses of the antennas were measured when the pig was anesthetic and after euthanasia within one hour. The results demonstrate that the frequencies drift greatly from 2.78, 2.17, and 4.29 GHz at the free space into 1.42, 1.0, and 2.2 GHz when the antennas are put in the top position of the intestine of the anesthetic pig and the frequency will increase to 1.62, 1.15, and 2.85 GHz after the pigpsilas euthanasia within one hour. The frequencies increase from 1.5, 1.03, and 2.3 GHz to 1.67, 1.13, and 2.8 GHz when the antennas are put in the bottom position of the intestine of the pig after its euthanasia within one hour. The dead body of the pig absorbed less radiation energy than the living body. Our measurement results further validate the decrease of the dielectric properties of the animal tissues after death. These differences need to be taken into account in electromagnetic modeling for simulation, and should be taken into account before the design of ingested antennas. [C603]

"Short-distance and near-ground signal measurements in a car park of wireless sensor network system at 433 MHz"

The short-range and near ground measurements of signal attenuation in the UHF band are performed to study radio wave propagation in a car park for a wireless sensor network application. The measurement setup is based on the radio wave propagation along the row of a parking lot (full of cars) by varying heights of server antenna. In the application, a small antenna and a compact antenna are employed at the server antenna and the sensor antenna respectively, by radiating horizontal polarization. The test points are located under cars and above ground. The transmitter is radiated at 433 MHz with 120 cm, 180 cm and 240 cm of antenna height. The propagation models, such as the two-ray model and the free-space model, are compared with measurement results. These results can be used to approximate the signal level in practical planning of wireless sensor network systems in car parks. [C604]

"Omni-Directional Antenna for Wireless Access Point"

The rapid growth of wireless communications and its pervasive use in all walks of life are changing the way we communicate in some fundamental ways. Most important, reliance on radio propagation as the physical mechanism responsible for the transport of information-bearing signals from the transmitter to the receiver has endowed communications with a distinctive, namely, mobility. Wireless LAN networking provides many benefits to network computing by eliminating the cost and effort required for traditional cabling and making network connectivity easier and more mobile. The standard for wireless LAN networking is the family of IEEE 802.11 specifications, which describe the PHY layer and MAC sub-layer for wireless data encoding, signaling, and sending wireless frames. Researchers procreated the wireless access point equipments with nominal frequency band of 24 GHz, 3D omni-directional antenna in the coverage area of 200 meters. The product is for

interoperable implementation on 802.11 g. The results found that with the equipments designing of direct and ommi direction antenna; there is the marked increase in throughput and efficiency achieved by this technique. [C605]

"Analysis of electromagnetic wave propagation characteristics in rotating environments"

During the parameter acquisition of rotating components, wireless data transmission is an efficient way to resolve data transmission problem in rotating environments, and the design of wireless data transmission system is based on EMWP (electromagnetic wave propagation). In this paper, EMWP characteristics in rotating environments are preliminarily studied in order to provide a strong theoretical support for developing high-performance rotating component radio monitoring system. In particular, the Doppler frequency shift and the EMW polarization characteristics in rotating movement are fundamentally analyzed. Finally, a test bench of rotating component is built to test EMW propagation characteristics of both stationary transmitter and rotating transmitter. [C606]

"Simulation of near-ground long-distance radiowave propagation over terrain using Nystrцm method with phase extraction technique and FMM-acceleration"

Propagation of radiowaves over complex irregular terrain profiles at near-grazing angles is studied using an efficient numerical solver. In supporting signal coverage prediction for such specialized systems in which the transmitter and receiver are in extreme proximity to the ground, available studies have been limited to the dependence upon site-specific, empirical-based models. The usefulness of these models is restricted as they cannot be applied to general radio configurations and propagation environments. Propagation over irregular terrain surfaces remains to be a challenging open problem demanding ongoing analysis; the unique properties of near-earth propagation such as surface wave propagation, non-plane wave propagation, and higher order reflection and diffraction phenomena pose additional constraints that often beset the validity of classical analytical ray tracing and physical optics techniques and their heuristic extensions. As such, when improved solution accuracy is required, full-wave simulation routines, despite their computational inefficiency, are employed to assess near-earth propagation parameters. A new 2D surface integral equation-based Nystrom solver in which a phase extraction technique is utilized to reduce the number of surface unknowns is described. As forward scattering is the dominant mechanism at the near-ground region, the associated rapidly-varying phase components of the integral equation kernel and solution unknowns are deduced and isolated in advance and subsequently built into the solver. It is shown that by applying this method, as few as one to two average unknowns per wavelength is adequate in obtaining accurate solutions. This significantly reduces the memory storage and computational expense for the simulation of long-distance propagation effects. The efficiency of this method is further improved by incorporating it into the framework of the fast multipole method (FMM). The full details of the algorithm are discussed; solution--convergence comparisons with the regular Nystrom solver for terrain surfaces are also presented. [C607]

"Simplified ray-launching analysis for indoor propagation including multiple reflection effect inside walls"

This paper proposes a simple accuracy improvement of the ray-launching analysis by efficiently including the multiple reflection effect inside lossy wall. The Green's function problem in the presence of a lossy dielectric slab, to derive the transmitted ray component with the internal multiple reflections is considered. Here, so as to realize the appropriate ray shooting inside lossy material, alternative real refraction angle is introduced, instead of the conventional complex refraction angle. The true angle presents easy execution of the ray-launching scheme in lossy material for precisely calculating the transmitted ray component. The validity of the improvement is finally confirmed by some numerical experiments for both small and large lossy walls' cases. [C608]

"Highway and rural propagation channel modeling for vehicle-to-vehicle communications at 5.9 GHz"

In this article, we have reported experimental studies of signal strength as a function of vehicle separation for outdoor vehicle-to-vehicle propagation at 5.9 GHz. Statistical measurement campaigns were conducted in highway and rural driving environments. These measurements were used to obtain parameters for a dual-slope log-normal propagation model. The effects of antenna pattern variations for passing vehicles were also discussed. [C609]

"ASTRO-G/VSOP-2 off-set cassegrain telescope"

Following the success of the first VLBI Space Observatory Programme (VSOP), a satellite of a next space VLBI

project, ASTRO-G/VSOP-2, is being designed. Very long baseline interferometry (VLBI) is a technique to achieve very high angular resolution imaging of celestial radio sources by combining the signals from widely separated radio telescopes. Space VLBI extends the separation beyond the Earth by placing one telescope on a satellite. [C610]

"Investigation of radar propagation in buildings: A 10 billion element Cartesian-mesh FETD simulation"

In this paper large scale full-wave simulations are performed to investigate radar wave propagation inside buildings. In principle, a radar system combined with sophisticated numerical methods for inverse problems can be used to determine the internal structure of a building. The composition of the walls (cinder block, re-bar) may effect the propagation of the radar waves in a complicated manner. In order to provide a benchmark solution of radar propagation in buildings, including the effects of cinder block and re-bar, we performed large scale full wave simulations using a finite element time domain (FETD) method. This particular FETD implementation is tuned for the special case of an orthogonal Cartesian mesh and hence resembles FDTD in accuracy and efficiency. The method was implemented on a general-purpose massively parallel computer. In this paper we briefly describe the radar propagation problem, the FETD implementation, and we present results of simulations that used over 10 billion elements. [C611]

"Identification of dominant propagation mechanisms around corners in a single-floor office building"

Radio wave propagation mechanisms around concrete corners in a single-floor office building have been investigated numerically using the FDTD. Penetration through and diffraction around the corner can be neglected as reflection is seen to dominate. Simulation results show that a precise knowledge of wall permittivity may not be required, as the dominant reflected component from both concrete and drywall models are of comparable size to those obtained using a PEC wall model. These results also suggest that drywall and concrete wall could be modelled as PEC with a prediction error about 5 dB and 3 dB, respectively. [C612]

"Modelling inter-floor radio-wave propagation in office buildings"

A 2D model of an office building has been analysed at 1.0 GHz using the FDTD method. Results indicate inter-floor radio-wave propagation is supported by two distinct mechanisms: direct penetration and floor-edge diffraction. The power of the direct component decreases linearly by 10-15 dB/floor penetrated, whereas the diffracted component is significantly smaller and asymptotes toward a constant value. The presence of floor-edge diffraction is a noteworthy finding, as it provides a physical basis for previously reported, but hitherto, unexplained, results. [C613]

"Propagation prediction in urban areas using geospatial data available on the Internet"

A new method is introduced for the reconstruction of 3D building structures using single-view 2D image with controlling objects setup in Google Earth. The method is based on the theory of projective geometry and the aid of GE which provides means that make it possible to set controlling objects possible. Two types of building structures and their variations and combinations could be reconstructed. It is shown that the accuracy of the reconstruction is satisfactory based on observations of some test cases. The ray tracing method is used to calculate the received power in five routes in Rosslyn, VA. Comparison with the path gain obtained using a more accurate city model shows that the new model provides good results. More details and examples will be provided in the presentation. [C614]

"Multipath propagation models for mobile line of sight conditions"

This paper studies the behavior of a multipath channel for suburban and semi-rural areas in which line of sight (LOS) or near LOS exists between the transmitter and receiver. The objective is to characterize the behavior of a broadband channel for such areas. The amplitudes and delay spread of a multipath model for such an environment are studied, based on a theoretical analysis of scattering from finite flat surfaces which model building walls. It is found that, close to a building, the reflection produces a severe degradation but, beyond a certain distance, the reflection decreases rapidly with distance. These findings, explain previously reported phenomena of very large line of sight signal fluctuations and have been confirmed with two propagation measurement trials. [C615]

"System performance enhancement using Power Path Gain Ratio for Cognitive Radio systems with diverse transmission ranges"

The interaction between two cognitive radio systems with diverse transmission ranges using different strategies is

investigated in this paper. The long range system uses a power efficiency (PE) based resource assignment that allows users to use many channels with a low modulation scheme. The short range system employs a bandwidth efficiency based scheme operating with a high modulation scheme and the smallest number of channels. Both systems share a set of OFDM channels based on a power path gain ratio (PPGR) strategy, which provides a novel and direct measurement of the impact on victim receivers from a new transmitter activation and balances it with the benefit to the transmitting system. It is shown that both schemes interact well based on the PPGR strategy. [C616]

"The model of calculating of electromagnetic field level distribution in piecewise tunnel"

Mobile communications are involved in our life strongly. And significant parameter of quality becomes continuous radio coverage. In this term subway and vehicular tunnels demand other types of antenna-fiber service due to complex radio wave propagation conditions. [C617]

"Modular wireless fieldbus gateway for fast and reliable sensor/actuator communication"

The AS-interface (AS-i) is a simple and cost-effective network solution connecting simple I/O devices to the upper fieldbus levels. A fully loaded AS-i Version I network with one master and 31 slaves has a maximum response time of 5 ms per I/O. The AS-Interface has been chosen as reference system for the development of a wireless fieldbus gateway, which will be presented in this paper. Standard modules have been employed to achieve a price-competitive solution. A high reliability level with wireless system can only be achieved if radio wave propagation characteristics and coexistence to other radio services are taken into account. Especially wireless local area network (WLAN) technologies already installed in the field can affect proper sensor/actuator network operation. Therefore bit and frame error probabilities in the presence of WLAN systems also have been investigated. [C618]

"Modeling of wave scattering from rough building surface for land mobile satellite channel"

This paper is aimed at characterization of multipath propagation in land mobile satellite scenarios. Of particular interest is the average multipath power coming from scattering of electromagnetic waves from rough building surface. Method of physical optics was implemented to model scattering from rough building facades. The results in terms of time series of the received power are used to obtain statistics of multipath power for various roughness parameters of the building faccedilade and various elevations and azimuths of the transmitter. The results obtained can be used to predict signal propagation in urban environments or as input data to time series generating models. [C619]

"Validation of rain attenuation time series synthesizers for temperate area-on the enhanced Maseng-Bakken model"

To develop and test real time fade mitigation techniques control algorithms, propagation time series are needed. An alternative to using real data collected from propagation experiments is to generate typical fading time series making use of climatological characteristics as well as geometrical and radio-electrical parameters of the link. The aim of the study presented in this paper is to validate time-series synthesisers relying on an enhanced Maseng-Bakken model for temperate areas. In the first part of this paper, the basic principles of the Maseng-Baken model are recalled and the parameterisation of this channel model is discussed for temperate climates. Then, Ka band beacon data collected in European and in North-American areas are used: on the one hand to retrieve the input parameters of the channel models and on the other hand to test them with respect to long-term statistics. The results of this testing analysis constitute the second part of this paper. [C620]

"Track initiation for blind mobile terminal position tracking using multipath propagation"

Blind localization and tracking of mobile terminals in urban scenarios is an important requirement for offering new location based services, handling emergency cases of non-subscribed users, public safety etc. In this context, we propose a track-before-detect scheme, taking explicit advantage of multipath propagation in an urban terrain by using a priori information about the known locations of the main scattering objects such as buildings. A ray-tracing technique allows the prediction of the directional and temporal structure of the received multipath components for an arbitrary transmitter position. We consider a single observing station where the direction and the relative time of arrival of the received multipath components can be estimated by an antenna array. By a likelihood function, which is algorithmically defined for a randomly distributed set of potential transmitter positions, these measurements are compared with those being expected by ray tracing. This likelihood function is the key component of a track-before-detect scheme providing initial state estimates for mobile transmitter tracking using a particle filtering technique. [C621]

"Investigation of the single equivalent model of double step-index waveguide in TE mode"

In this work, the variations of the fields in the regions of double symmetric step-index waveguide are studied and basic design parameters are calculated. The double waveguide and the single equivalent model of double symmetric step-index waveguide in TE mode are investigated. The equivalent index is found for active region and equivalent single step-index waveguide is obtained. Important parameters which are the function of normalized propagation constant for each step-index waveguide are calculated. [C622]

"A foveated passive UHF RFID system for mobile manipulation"

We present a novel antenna and system architecture for mobile manipulation based on passive RFID technology operating in the 850 MHz-950 MHz ultra-high-frequency (UHF) spectrum. This system exploits the electromagnetic properties of UHF radio signals to present a mobile robot with both wide-angle dasiaperipheral visionpsila, sensing multiple tagged objects in the area in front of the robot, and focused, high-acuity dasiacentral visionpsila, sensing only tagged objects close to the end effector of the manipulator. These disparate tasks are performed using the same UHF RFID tag, coupled in two different electromagnetic modes. Wide-angle sensing is performed with an antenna designed for far-field electromagnetic wave propagation, while focused sensing is performed with a specially designed antenna mounted on the end effector that optimizes near-field magnetic coupling. We refer to this RFID system as dasiafoveatedpsila, by analogy with the anatomy of the human eye. We report a series of experiments on an untethered autonomous mobile manipulator in a 2.5D environment that demonstrate the features of this architecture using two novel behaviors, one in which data from the far-field antenna is used to determine if a specific tagged object is present in the robotpsilas working area and to navigate to that object, and a second using data from the near-field antenna to grasp a specified object from a collection of visually identical objects. The same UHF RFID tag is used to facilitate both the navigation and grasping tasks. [C623]

"Ionospheric monitoring by ELF signals received at Moshiri station in Japan"

The observation at Moshiri (Hokkaido), Japan of ELF transmitter signals (~82 Hz) from a Russian transmitter has been described. The detection and identification, wave characteristics. etc. have been analyzed by using the ELF waveform data at Moshiri(two horizontal magnetic fields and one vertical electric field), which are subjected to the conventional FFT (fast Fourier transform) analysis, Nuttal filter etc. The wave characteristics at Moshiri at a distance (~6 Mm) from the transmitter, are compared with those near the anti-podal points, in order to compare with the ELF full-wave propagation theory. [C624]

"Subionospheric VLF/LF probing of ionospheric perturbations associated with earthquakes (earthquake prediction)"

The VLF/LF receiving network is established in Japan (and also Kamchatka, Taiwan and Indonesia) composed of seven observing stations (Moshiri (Hokkaido), Chofu (UEC), Tateyama (Chiba), Shimizu, Kasugai (Nagoya) and Kochi). At each station we observe simultaneously several VLF/LF transmitter signals (Japanese JJI (40 kHz, Fukushima), JJI (Ebino, Kyusyu), and foreign VLF transmitters (NWC (Australia), NPM (Hawaii), NLK (USA). This Japanese VLF/LF network is used to study the ionospheric perturbations associated with earthquakes, and we present a few case studies (like Niigata Chuetsu earthquake, Sumatra earthquake) and statistical studies on the correlation between ionospheric perturbations (in the form of VLF/LF propagation anomaly) and earthquakes. [C625]

"Transmitting Scalable Video with Unequal Error Protection over 802.11b/g"

We developed a simulation set-up that can test the behaviour of streaming applications over an error-prone wireless networks: 802.11b/g specifically. The application we tested is a video coder that adds unequal error protection to the scalable extension of H.264/SVC. This protection mechanism enables the recovery of lost packets. We adapted a radio wave propagation model to define Rayleigh fading which is able to model packet reception correctly for indoor environments. We investigated how the video encoder creates RTP packets and we noticed a very small payload, resulting in a high protocol overhead of 54%. We recommended the encoded designers to use UDP lite because it does not discard corrupt packets, as UDP does, but allows them to pass to the video decoder. This ensures more incoming information that can be evaluated at the application layer. The simulation of the 802.11b/g networks with bad wireless network conditions proves the correcting capabilities of the video decoder. The decoder could repair lost packets, or ensure graceful degradation. However this graceful degradation could not be maintained when the packet losses become too high, as for example when moving out of reach of an access point. [C626]

"Model of distance and bandwidth dependency of TOA-based UWB ranging error"

In this paper, a statistical model for the range error provided by TOA estimation using UWB signals is given. To this purpose, a large set of UWB channel measurements covering the bandwidth between 3.1 and 10.6 GHz has been collected and processed. By analyzing the measurement results, the range error has been modeled as a Gaussian random variable for LOS and as a combination of a Gaussian and an exponential random variable for NLOS propagation. The distance and bandwidth dependency of both the mean and the standard deviation of the range error has been investigated, and an insight in the different phenomena which affect the estimation accuracy, is provided. It is shown that both the signal bandwidth and the distance between the transmitter and the receiver, significantly affect the range error characterization. From the proposed model, the estimation accuracy achieved by TOA-based UWB ranging on the global set of measurements has been derived and compared with the data. For LOS, using the full bandwidth, the range error is at centimeter level; it increases in NLOS due to the additional delay introduced by the propagation through dielectric materials and to the more dense multipath. [C627]

"Transmission power levels Prediction for Distributed Topology Control Protocols within parameterized scenarios"

Distributed topology control protocols (DTCP) for wireless sensor networks (WSN) coordinate nodespsila decisions regarding their transmission ranges, in order to set up a network with a certain connectivity, while reducing nodespsila energy consumption and/or increasing network capacity. The key issue in DTCP is to choose the most suitable transmission power level (TPL) among those available for each sensor node in a distributed manner. We present a method to predict the TPLs for DTCP in realistic scenarios, which takes into account several propagation phenomena, such as barriers and multipath interference. To evaluate the effectiveness of our approach, we simulated the radio propagation pattern of a WSN in a scenario of multiple rooms. Our results suggested that our method allows to predict, with reasonable accuracy, the approximate TPLs distribution achieved by different DTCP approaches within a given parameterized scenario. [C628]

"Influence of multipath propagation on UWB imagery"

In this paper the influence of multipath propagation on the quality of UWB imagery is analyzed. Typical UWB imaging methods like time domain migration consider only propagation paths with one reflection at the object of interest. In most scenarios the paths of higher order are attenuated sufficiently to neglect them. However, in scenarios containing metallic objects (e.g indoor factory scenarios) multiple reflections can occur without strong attenuation of the signal. In this paper the influence of these multiple reflections on the generated image is investigated. [C629]

"Direct path DoA and DoD finding through IR-UWB communications"

In this paper, we present an algorithm that interprets the specificities of the received direct path, depending on the particular deformations due to antennas, in the context of Impulse Radio-Ultra Wide Band (IR-UWB) peer-to-peer communications. The goal is to jointly estimate direct path Direction of Arrival (DoA) and Direction of Departure (DoD). The proposed technique is mainly based on prior antenna characterisation and on the prediction of filtering effects due to direct path propagation. Simulation results are provided to illustrate the expected performance of such an algorithm in a simplified scenario. The proposed technique discloses new perspectives for DoA and DoD finding and potentially for wireless context-aware services. [C630]

"Testbed for wireless vehicle communication: a simulation approach based on three-phase traffic theory"

A testbed for wireless vehicle communication based on a microscopic model in the framework of three-phase traffic theory is presented. In this testbed, vehicle motion in traffic flow and analyses of a vehicle communication channel access based on IEEE 802.11e mechanisms, radio propagation modeling, message reception characteristics as well as all other effects associated with ad-hoc networks are integrated into a three-phase traffic flow model. Thus simulations of both vehicle ad-hoc network and traffic flow are integrated onto a single testbed and perform simultaneously. This allows us to make simulations of ad-hoc network performance as well as diverse scenarios of the effect of wireless vehicle communications on traffic flow during simulation times, which can be comparable with real characteristic times in traffic flow. In addition, the testbed allows us to simulate cooperative vehicle motion together with various traffic phenomena, like traffic breakdown at bottlenecks. Based on simulations of this testbed, some statistical features of ad-hoc vehicle networks as well as the effect of C2C communication on increase in the efficiency and safety of traffic are studied. [C631]

"New propagation model for wireless monitoring systems in the container terminal environment"

The problem of the propagation loss calculation of the mobile radio links working in container terminal areas has been analyzed. The analysis is based on the measurement investigations of the radio signal loss made for different propagation conditions of the container terminal environment. Two main types of the propagation environment have been take into account-i.e. LOS and NLOS conditions, as typical for the environment classification. New empirical formulas for the propagation loss calculations appropriate to these types of the propagation environment have been proposed. To obtain these formulas the measurement investigations have been made and the multidimensional regression analysis has been applied. The new propagation model has been verified by use of the measurement investigations. Finally, practical usefulness of the model for design procedures of the radio links in the container terminal areas has been concluded. [C632]

"Communication-Aware Deployment for Wireless Sensor Networks"

Deployment of senor nodes brings the challenging question on how to place the sensor nodes in order to achieve a particular coverage degree with optimum number of nodes. An important factor, which deployment process also should take into account is the radio signal propagation to guarantee reliable communication links among the network. In the present work, we firstly define a pre-deployment simulation framework and then propose RF signal propagation-based connectivity algorithm (RFCA) for outdoor applications. The RFCA utilizes RF signal propagation model for prediction of received signal strength (RSS). Several parameters of the system are considered for the RSS prediction: the RF frequency, the transmission power, the transmitter-receiver distance, their height from the ground and the antenna's characteristics (gain, polarization, etc.). We demonstrate that RFCA is able to find the most appropriate deployment parameters from the communication point of view (height, distance, and transmission power) for positioning of the sensor nodes. [C633]

"DVB-SH Analysis Using a Multi-State Land Mobile Satellite Channel Model"

Standardization activities on digital video broadcasting-satellite services to handheld devices (DVB-SH) have driven the need for a consolidated narrowband channel model. In the DVB-SH system, the satellite broadcasts a signal carrying multimedia services aimed directly to a variety of mobile (handheld or vehicular) and fixed terminals. A 3-state land mobile satellite (LMS) channel model that describes the narrowband propagation channel in three possible shadowing states: line-of-sight conditions, moderate shadowing and deep shadowing; was originally taken as a baseline. The channel model and assumptions made in the 3-state model were revised and data re-analysed using automatic-data-classification and parameter-extraction iterative algorithm deriving a new model based on 2-states with varying parameters more suitable to the DVB-SH. This paper starts with a high level description of the main DVB-SH system parameters and assumptions. Then the two channel models relevant for the satellite component of this system are initially compared on a statistical basis. Physical layer simulations of the DVB-SH waveform with realistic system assumptions are required with both models for equivalent scenarios. The performance of both models are discussed to show the effectiveness of the model to represent shadowed conditions and therefore its suitability for the analysis and optimal configuration of the physical and link layer parameters (namely physical layer interleaver size, link layer protection time, overall redundancy...). [C634]

"Correction of multipath effects in measured patterns by using FFT and time-gating"

The validation of the method based on FFT and time-gating to eliminate multipath contributions in antenna measurement has been extended to different types of antennas and tested in different reverberant scenarios, and some representative results have been shown. The achievable accuracy, quantified through the initial and the recovery errors, is highly satisfactory. [C635]

"A time-based approach for the synthesis of antennas for UWB communication systems"

In this paper, an innovative approach for the synthesis of antennas fitting the requirements of an UWB communication system has been presented. Such an approach allows one to design UWB antennas with distortionless propagation properties as well as good impedance matching over the whole band of interest. As expected, the use of a time-domain technique permits the accurate modeling of the antennas, the communication channel, and of the mutual interactions. [C636]

"Characterisation of the Satellite-to-Indoor Propagation Channel"

Reliable propagation models are required for the design of satellite broadcast to mobile or satellite navigation systems at S-band in the indoor environment. In particular, these models will support the development of hybrid satellite systems including complementary ground components. Apart from the effects of shadowing and

multipath encountered in LMS (land mobile satellite) urban and suburban environments, the satellite-to-indoor channel is affected by high building penetration losses, but also lower Doppler spread due to static or quasi-static situation of the user terminal. Results from a measurement campaign simulating a satellite-to- indoor link are presented. Cluster-based wideband measurements were carried out with a channel sounder placed inside several buildings (airports, shopping mall, office buildings...), receiving the signal from the transmitter located in a helicopter hovering over the building at different (azimuth, elevation) combinations in igloo configuration. The measured data has been analysed with direct methods and iterative super-resolution algorithm in order to derive building penetration losses, time spreading and angle-of-arrival information. Super-resolution techniques make it possible to identify rays and clusters of rays, and thus give added value to the development of models. The super-resolution information is effectively used for evaluation of inter-cluster and intra-cluster azimuth angle of arrival distributions. The availability of spatial information in MIMO and SIMO measurements helps developing and validating site-specific models based on ray-tracing techniques given that the measured echoes are fully characterized in terms of amplitude, phase, delay and angle of arrival. Furthermore, the parameters corresponding to a directional statistical channel model have been extracted for each scenario thanks to the availability of this type of information. The results obtained contribute to a better characterisation of the satellite-to---indoor propagation channel. [C637]

"RF Propagation Simulation in Sensor Networks"

Itpsilas rare that real-world sensor network deployments confirm the academic assumptions that are made regarding uniformly, or randomly, distributed nodes and their node-pair signal strength measurements. During simulation time, these assumptions have grave affects on network initialization time, end-to-end delay, number of connections per node, network depth, throughput and so on. This paper introduces a simple RF propagation model that accurately predicts peer-to-peer connectivity based on signal strength. We show that network simulations based on this model agree favorably with real-world deployments. [C638]

"Visible window image model of ray tracing technique for radio wave propagation"

This paper describes the implementation of an efficient algorithm, which calculates all possible ray paths in the indoor environment. The algorithm is based on the scan all visible virtual images of the transmitter for each visible segment. All reflections from the horizontal plane are assumed, and one order reflection from the ceiling and ground. [C639]

"Evaluating Indoor versus Outdoor Infrastructure for the Delivery of Broadband MIMO-OFDM Service"

This paper compares how using either indoor or outdoor base stations affects the multiple input/multiple output (MIMO) orthogonal frequency division multiplexing (OFDM) physical layer performance experienced by an indoor user. This study starts by collecting outdoor-to-indoor and indoor-to-indoor MIMO propagation measurements in a campus environment. To ensure a fair comparison, the measurement receiver is positioned at the same set of indoor locations for both sets of measurements. The propagation measurement data is then used directly in a MIMO-OFDM system simulation in order to determine whether using either indoor or outdoor infrastructure will offer a physical layer performance advantage. The conclusion of the paper is that both indoor and outdoor base stations offer very similar performance for the environment characterized by the measurements. [C640]

"A large scale, high resolution channel model for propagation impairment techniques design and optimization"

As the impairments due to rain on the propagation channel for frequency bands such as Ka or Q/V have to be compensated by adaptive fade mitigation techniques, optimized radio resource management needs to be implemented, which requires a coarse knowledge of spatio-temporal dynamic of the attenuation due to rain. In this paper a model able to emulate the space-time dynamic of the attenuation due to rain on a satellite coverage is presented. It consists of a stochastic model that is constrained by the outputs of a reanalysis model. The spatial resolution of the modeling is of 1 km and the temporal one of 0.1 h. A stochastic interpolation model is then used to get a temporal resolution of 1s more suitable to study fade dynamic. [C641]

"Hardware Simulator for MIMO Radio Channels: Design and Features of the Digital Block"

This paper presents the realization of the digital block of a hardware simulator of MIMO propagation channels for UMTS and WLAN applications. The hardware simulator must reproduce the behavior of the radio propagation channel, thus making it possible to test "on table" the mobile radio equipments. The advantages are: low cost, short test duration, possibility to ensure the same test conditions in order to compare the performance of various

equipments. After the presentation of the general characteristics of the hardware simulator, an architecture of the digital block is proposed and its accuracy is analyzed. [C642]

"Understanding the Performance Limitations of a Simulated Large Scale Wireless Ad Hoc Network"

We use a cellular automaton analogy to simulate a large scale wireless ad-hoc network. This approach combines mobility in its simplest form with some fundamental attributes of radio propagation and enables us to examine the communicative properties of the network which would not otherwise be accessible. The analysis shows that there is an optimal network density for which the throughput of the network is maximized. We examine this finding under a range of processing gain values and confirm (a) that both the maximum total network throughput and the network's sustainability increases proportionately with the processing gain and (b) that single-hop communication is always preferable to extended-hop communication. Furthermore we consider the performance of the system when communication is not limited to a single-hop. We show how processing gain can be used adaptively in order to control the transmission range and hence guarantee end-to-end connectivity in the network. [C643]

"Impact evaluation of radio propagation models on performance parameters of application layer in Wireless Mesh Backbone simulation"

In this paper we propose a VoIP study case to evaluate the impact of different radio propagation models on performance parameters of application layer in simulation studies of Wireless Mesh Backbones. For each presented model, we carried out experiments taking into account the credibility aspects suggested by simulation theory of stochastic processes. Results showed that, for the same scenario, using different propagation models, voice speech quality can switch from acceptable to unacceptable. [C644]

"Statistical modelling of wideband propagation channel in an indoor environment"

This paper concerns a statistical modelling of wideband radio propagation channel in an indoor environment. An approach of describing amplitudes and excess delays of particular multipath components by means of probability density functions (PDF) was developed. Analysed channel impulse response (CIR) realizations were obtained from frequency-domain measurements carried out in a large laboratory hall. [C645]

"A new model for the reflected wave of the ionosphere"

In order to find an effective arithmetic which can suppress the useless reflected wave of the ionosphere, a new model for the reflected wave of the ionosphere is proposed here. Using the multiple phase-screen method used for the investigation of the HF wave propagation, the amplitude scintillation and phase scintillation of the reflected wave of the ionosphere can be achieved. Using the results of the multiple phase-screen method and considering the altitudinal change of the reflect-point, a model for the reflected wave of the ionosphere is given. Then, the experimentally derived data of the reflected wave of the ionosphere are analyzed. The statistical results of the real date prove the validity of the model for the reflected wave of the ionosphere. [C646]

"DVB-S2 Adaptive Coding and Modulation for HAP Communication System"

Combining some of the best terrestrial and satellite systems' characteristics, high altitude platforms (HAPs) have recently emerged as an alternative solution for the provision of broadband services. Characterised by challenging propagation conditions in the allocated frequency bands, they require efficient utilisation of radio interface in order to make best use of the available spectrum. This paper analyses possible utilisation of DVB-S2 standard on HAPs, focusing on the performance of its adaptive coding and modulation (ACM) procedures as a mean of maximizing the link reliability and throughput. Two distinct operating scenarios are addressed, one assuming static channel conditions with the applied rain fading and the other representing mobile channel conditions along a representative railway track We show that by considering only a subset of transmission modes (MODCODs) defined by the DVB-S2 standard, the system could be optimized in terms of achievable spectral efficiency as well as in terms of implementation complexity. A procedure for optimal MODCOD subset selection is proposed, taking into account the predefined switching thresholds and round-trip time delay. [C647]

"Channel Model for Train to Train Communication Using the 400 MHz Band"

This paper presents a channel model for direct train- to-train communication appropriate for the 400 MHz band. Extrapolation of theoretical and experimental results obtained for the planning of other railway communication systems like GSM-R is not obvious due to the difference in frequencies, antenna height and absence of base stations. In this paper, the analysis of the channel model covers different radio phenomena including path loss, Doppler, fading, and delay spread. Concretely we consider three scenarios (train stations, shunting yards and

regional networks), for which the propagation channel characteristics are discussed. Furthermore, influence of special railway environments like cuttings which can be found near cities and towns, tunnels and bridges are encountered. [C648]

"Depolarization of Propagating Signals by Narrowband Ricean Fading Channels"

In many cases of practical interest, the angle of arrival distribution at the receiver is sufficiently narrow that one can use knowledge of the mean received signal levels, Ricean K-factors and the cross-correlation coefficient that characterize fading signals observed on orthogonally polarized diversity branches to predict the of polarization state dispersion. This allows one to use simple power-only measurements of narrowband polarization diversity to predict the performance of alternative polarization diversity schemes or polarization adaptive antennas in realistic environments. Moreover, our results offer a useful geometric interpretation of how decorrelation between polarization diversity branches arises: As the angular spread of the polarization state distribution on the Poincare sphere broadens, the correlation between branches decreases. However, knowledge of the angular spread alone is not sufficient to predict the cross-correlation coefficient; the Ricean K-factors on the branches must be known as well. Otherwise, the analogy to a similar relationship between the angle of arrival distribution and correlation between branches in space diversity is striking. [C649]

"Propagation Measurements inside a B737 Aircraft for In-Cabin Wireless Networks"

This paper presents a measurement campaign conducted inside a Boeing 737-400 aircraft for the development of in-cabin wireless networks. The measurements were conducted in three different frequency bands in order to provide various services. It was found that the path loss factor along the aircraft corridor varies between 2.1 and 2.3 depending on frequency. The average K-factor in the aircraft aisle was found 12.3 dB, and the dynamic range of fading between 6.2 and 7.2 dB confirming the expectation of a physically stationary channel. In the seats of the aircraft the fading statistics are increased, in comparison with the aisle, with the dynamic range to be 14.9 dB in average. The average K-factor is reduced to 7.6 dB due to the obstruction of the direct path by the passenger seat. In all cases, the fading statistics correspond very well with Rician CDF. [C650]

"On the Use of a Lower Frequency in Finite-Difference Simulations for Urban Radio Coverage"

The Finite-Difference Time-Domain (FDTD) is not just one of the most accurate propagation prediction methods but also one of the most computationally intensive models, especially when simulating big areas such as urban environments. To overcome this problem, one common approach is to perform simulations at a much lower frequency than that of the real system, and to calibrate the simulation parameters to adjust the frequency response of the materials. In this study a theoretical analysis of the consequences of applying such frequency reduction is performed. To compare the theoretical study some numerical experiments are conducted and matched to the analytical results. Finally, the error of the simulations at lower frequencies is evaluated, allowing us to obtain an explanation for the observed behavior. [C651]

"Modeling and Measurement of MIMO Relay Channels"

This paper proposes a relay channel model which takes into account the influence of relay location and antenna configuration. Simulation results show that when relay is in the line-of-sight (LOS) propagation environment, the channel capacity will degrade. To improve the performance of the channel, water-filling (WF) algorithm is used to allocate the power, simulation results shows that the WF-based relay channel outperforms the uniform power allocation channel. The radiation pattern of the relay antenna is also an importance factor which affects the channel capacity in this case. The widely used Rayleigh channel model overestimates the performance of the channel compared with our model when the location of the relay is not in the scenario where Ricean K-factor is zero. Measurements have been done at 2.53 GHz to investigate the above-rooftop and ground-level relay channels. Results indicate that above-rooftop deployment is very efficient to improve the capacity and coverage. [C652]

"Error Rate Based SNR Estimation in the Railway Satellite Communication Environment"

The potential of an SNR estimation technique for use in links subject to multipath propagation and periodic shadowing is investigated. The proposed SNR estimator relies on the bit error rate of un-coded pilot sequences. The estimator's performance in the presence of Ricean fading, periodic shadowing and rain attenuation is analyzed by means of simulations. The proposed technique is shown to provide good estimation performance with reduced complexity compared to existing techniques. [C653]

"Channel Asymmetry and Random Time Slot Hopping in OFDMA-TDD Cellular Networks"

This paper studies the performance of orthogonal frequency division multiple access-time division duplex (OFDMA-TDD) cellular networks when jointly applying dynamic channel allocation (DCA) and user scheduling under the assumption of asymmetric uplink (UL)/downlink (DL) loads. Specifically, a comparison between a fixed slot allocation (FSA) scheme, where the uplink UL/DL switching is synchronised across the network, and the random time slot opposing (RTSO) technique is made. The RTSO resembles an opportunistic interference mitigation technique. RTSO, however, does not obviate the need for user scheduling algorithms, but the combined use of RTSO and scheduling has not been studied. Therefore, two different scheduling algorithms, greedy and fair, are adapted to suit the OFDMA-TDD architecture. Their performance for various channel asymmetries under RTSO and symmetric FSA is evaluated, based on spectral efficiency and user outage. In order to account for the exposed location of base station (BS) antennas in a cellular environment, the effect of line-of-sight (LOS) propagation among BSs is considered. The results show that LOS among BSs in a system with unsynchronised switching points strongly hampers the network's performance. This effect, however, is demonstrated to be substantially offset by DL-favoured asymmetries (dominant in data-centric networks) in combination with RTSO. Furthermore, it is shown that the greedy algorithm only offers a marginal increase in spectral efficiency as compared to the fair algorithm, while the fair algorithm exhibits up to ~20% lower outage. [C654]

"V2V Wireless Communication Protocol for Rear-End Collision Avoidance on Highways"

More than 23% of annual vehicle accidents are rear-end collisions, which provides an important test-case for enhanced collision avoidance approaches based on v2v wireless communications. In this work, we propose and study the impact of a 802.11 based multi-hop MAC protocol that propagates an emergency warning message (EWM) down a platoon of cars on a highway. The design objective is to ensure reception of this message with stringent (low) delay constraints so as to provide drivers with requisite available maneuver time (AMT) to avoid rear-end collision. We provide realistic simulation studies of protocol performance within ns-2 environment for various topology (1 lane and 3 lanes) and background traffic scenarios, as well as different protocol parameter settings, to highlight the potential of this approach for effective collision avoidance or mitigation. [C655]

"Tracking of Time-Variant Radio Propagation Paths Using Particle Filtering"

In this contribution a low-complexity particle filtering algorithm is proposed to track the parameters of time-variant propagation paths in multiple-input multiple-output (MIMO) radio channels. A state-space model is used to describe the path evolution in delay, azimuth of arrival, azimuth of departure, Doppler frequency and complex amplitude dimensions. The proposed particle filter (PF) has an additional resampling step specifically designed for wideband MIMO channel sounding, where the posterior probability density functions of the path states is usually highly concentrated in the multi-dimensional state space. Preliminary investigations using measurement data show that the proposed PF can track paths stably with a small number of particles, e.g. 5 per path, even in the case where the paths are undetected by the conventional SAGE algorithm. [C656]

"Modeling the Dynamic Effects of Vegetation on Radiowave Propagation"

In this contribution we use available measurements at 2.45, 5.25, 29 and 60 GHz to study the dynamic effects of vegetation on propagating radiowaves. The complex responses of a tree to induced wind force has been studied, and used to explain different phenomena observed in measurement results. Generally, the power spectrum of the received signal through vegetation has lowpass characteristics, and the effects of swaying tree components are manifested as spectral peaks in the power spectrum of the received signal. Radiowaves scattered from these swaying tree components have a time varying phase changes which results in fading of the received signal. Furthermore, due to further dissipation of the wind energy by the interaction of tree crowns, less signal variation is to be expected from a grove of several trees than from a single/few tree(s). The Ricean K- factor for different wind conditions has been estimated from measurements. In addition, by utilizing a lowpass filter and a mass-spring system, a new simulation model for generating signal fading due to a swaying tree has been developed. Depending on the wind speed and physical characteristics of the tree, the new model can be used for simulating signal fading due to a swaying tree with similar dynamical and statistical characteristics as those observed from measurement results. [C657]

"Same Beam Tracking with the Proposed DSN Array Using Calibration Signal from Multiple Sources"

The accuracy of tracking measurements using very long baseline interferometer (VLBI) is seriously limited due to angular and temporal separation between the calibration and spacecraft measurements. Same beam interferometry, where the calibration source is in the same primary beam as the spacecraft being observed eliminates temporal affects and considerably reduces calibration errors due to reduced angular separation

between the calibrator and the spacecraft which minimizes errors due to propagation variations and uncertainty in geometry between source and baseline. With the current measurement methods this requires having a suitable calibration source of enough signal strength within the primary beam of the antennas used for the inteferometry measurements. Normally such sources are not available because of a low number density of suitable strong calibration sources. However there are many more weaker calibration sources and it may be possible to use combined signal from a number of weaker sources within the primary beam of the antennas if a single strong source is not available within the primary beam at any time. The probability of having enough combined total signal increases considerably if we accept using multiple calibration sources. Expected accuracy of a tracking measurement using signal from multiple calibration sources should be similar to the accuracy expected with a single calibration source within the beam, if the total combined signal from the individual weaker sources is similar to the desired single source. An important point that is worth noting here is that if we want to take advantage of utilizing the same beam interferometry for accurate spacecraft tracking most of the times, then the diameter of the antennas of the proposed array-based deep space network (DSN Array) should be limited to as small a value as practical to give a large field of view. This would enable having suitable calibration source(s) within the primary beam of the antennas. Cons- idering practical aspects it appears that the diameter for the proposed DSN array antenna should be limited to a maximum of about 12 m. [C658]

"Simulation Study of Fractional Frequency Reuse for Mobile WiMAX"

As a primary technology for broadband wireless access (BWA), mobile WiMAX, recently has gained tremendous momentum in the industrial and academic sectors. However, due to significant loss of signal strength along the propagation path especially at higher frequency, the transmit power constraint of mobile terminals, and the interference from neighboring cells, the sustainable coverage area for a specific high data rate is often of limited geographical size. FFR (Fractional Frequency Reuse) can be used to improve the coverage and capacity in order to deliver cost-effective wireless services. This paper is the first time to provide a quantitative discussion on the system level simulation performance for the WiMAX FFR. [C659]

"Analysis of a MUD-based Situation Awareness Messaging System without a Feedback Channel"

This paper is concerned with enhancing situation awareness messaging using multi-user detection (MUD) techniques. Situation awareness messaging involves sending short packets of situation update data. Low latency is an important requirement. This paper focuses on using satellite communications which have a substantial propagation delay. Random access systems without channel feedback information are particularly preferable for such situations. However, the main draw back of these systems is their low channel utilisation. In this paper, the capacity of a MUD-based random access system without a feedback channel is analysed. The results obtained showed substantial improvements when the system is employed with multi-user detectors. A large spread of received packet powers is typically expected in wide area mobile applications. In many implementations, a spread of powers inhibits receiver performance however when MUD is employed it becomes an enhancing factor. [C660]

"IKNOW Mission: Payload Design for In Orbit Test of W Band Technology"

This paper presents the payload design for an in orbit test of W band technology called IKNOW mission (In orbit Key-test and validatioN Of W band). The increasing demand for frequency bands with large bandwidth availability to satisfy satellite communications applications requirements renders mandatory the need to explore higher and higher frequency ranges. W band (75-110 GHz) could represent the answer to these needs due to the large bandwidth availability, allowing to propose many innovative services that need high-volume transfers. Therefore, the exploitation of W band is foreseen in order to meet the high-quality data transmission for a large number of end users and data-oriented services. The IKNOW mission is a demonstrative experiment foreseen within the phase A2 of the WAVE (W band analysis and verification) project, a study funded by the Italian Space Agency (ASI), which aims at designing and developing W band payloads for telecommunication applications. This paper will be focused on the characterization of the IKNOW mission within the WAVE project devoted to carry out a preliminary channel propagation assessment. Specifically, special attention will be paid to the payload design, particularly critical from the technological point of view at these high frequencies. The basic idea is to develop the receiving/transmitting chain using MMIC devices, in order to fit cost, power and weight constraints, typically limited for a spacecraft. Technological critical items will be highlighted, focusing on the present state of the art and presenting some architectural choices. Moreover, some simulations based on ADS software will be reported in order to simulate the performance of the identified payload configuration. [C661]

"Wideband Equalization Using Multiple Antennas"

We explore the concept of combining multiple antenna signals with complex weights so as to realize an overall

transfer function that is as flat as possible over a given bandwidth. This differs from conventional equalization in that no time delay taps are used in the process, and has the advantage of diversity-like noise immunity to deep fades. A frequency- selective fading model is postulated for the propagation paths and the equalization performance is calculated using the optimal complex weights. It is shown that the bandwidth over which a given deviation from flatness can be achieved is proportional to the number of antennas, provided that they are spaced far enough apart so that the fading is independent. Performance of a conventional beamformer is also assessed, but is found to be far less effective than optimal weighting. Applications are envisaged as an alternative to orthogonal frequency-division multiplexing (OFDM) for wideband communication over channels with large delay spread, as well as channel shortening in OFDM, and other possible applications such as ultra wideband (UWB) communication. [C662]

"Proposal for Radio Resource Allocation Using Dummy Burst Definition in IEEE 802.16 Uplinks"

In IEEE 802.16 uplinks, the permutation of data on a frequency domain is performed when logical subchannels are transformed to physical subchannels to scatter deterioration of the radio propagation environment via inter-cell interference. However, it is ideal from the viewpoint of evading interference to completely divide the radio resource between the interfering cells, when there is comparatively low traffic among the cells. In this paper, the authors propose a novel concept for the definition of bursts in the uplinks. It is that a BS defines UL bursts for an imaginary user. Based on this idea, the BS can assign subchannels to users while generating blank logical subchannels between used logical subchannels in uplinks, which could not be realized in conventional ideas. Furthermore, the authors propose a radio resource allocation scheme to successfully avoid inter-cell interference based on this concept. Numerical analysis showed that the proposed method suppresses the interference between adjacent cells and that throughput performance can improve. [C663]

"A Proposal of a Wide Band for Air Traffic Control Communications"

In this paper, a new and wide frequency band was proposed for air traffic control communication (ATC), C band, which could be a supplement to its conventional VHF band. The radio propagation characteristics at this band under ATC conditions were studied through several experiments and theoretical analysis. For this communication channel, Nakagami-Rice distribution was used to extract Rice factor. This study also shows received power level of radio signal for the conical area above the ground antenna system was very weak and was not good enough for a reliable communication. A new antenna model was proposed to increase signal power in this area by reflecting the side lobe of antenna beam pattern at the ground system. This paper concluded the feasibility of utilizing a wideband communication for the next generation of ATC communication. [C664]

"Empirical capacity and the fading characteristics of ultra-wideband indoor propagation channels"

This paper presents an investigation on the fading characteristics occurring in ultra-wideband (UWB) transmission in a typical indoor propagation channel. The quantities of interest are the total received power and the channel capacity, which are calculated on the basis of ray-optical propagation simulations. From the obtained results it will turn out, that the channel capacity of ultra-wideband transmission is solely dependent on the distance between transmitter and receiver and does not suffer from any influence due to multi-path propagation. Furthermore, the path loss exponent is quantified and connections to the capacity are analyzed. [C665]

"Localization in harsh propagation environments"

This paper presents an investigation into the reliability of localization in wireless networks that operate in harsh radio propagation conditions. Received signal strength (RSS) localization techniques are examined due to their ability to reduce implementation costs. The localization systems studied in environments subject to both Rayleigh fading and log-normal shadowing. The maximum likelihood estimator for a Suzuki distribution has been derived for use in a localization algorithm. The accuracy of RSS techniques is then investigated in two-dimensional deployment scenarios and the effects of a variety of propagation environments on localization accuracy are quantified. In response, system deployment techniques to compensate for harsh propagation environments are examined. It is shown that hexagonal reference node arrangements provide location estimation accuracy improvements over square configurations. Results also demonstrate that the harshest propagation environments as far as localization is concerned are those with small path loss exponent and high shadowing standard deviation. [C666]

"Modeling wireless propagation in a rectangular tunnel with the Compact-FDTD method"

The Compact-FDTD method is optimized for modeling electrically large waveguiding structures by analyzing its dispersion relation and predicting dispersion-optimized model parameters. The resulting algorithm is used to

efficiently model an electrically large earth tunnel. Using the dominant mode's quality factor as a benchmark which is a measure of the power leakage through the tunnel walls, it is demonstrated that errors of the order of 1% could be achieved using a very coarse mesh totaling just 200 FDTD cells. This successful numerical experiment paves the way towards modeling more general and realistic tunnels with minimal computing resources. [C667]

"NLOS path loss evaluation for street-cell environment"

Non line of sight (NLOS) path loss has been investigated by using the Shooting and Bouncing Rays (SBR) method. Two building layouts; continuously connected and non-connected building layouts, are used to check the street propagation characteristics and leakage effect due to the building gaps. Based on the statistical data numerically generated buildings are placed along the streets and path loss are evaluated along them. It is found that the predictions by ITU-R model give us somewhat less path loss for our street- cell models. [C668]

"System-Level Modeling and Simulation of Uplink WCDMA"

Universal Mobile Telecommunication System (UMTS) is based on WCDMA technology. The capacity of this system is difficult to manually compute because of at least two reasons. Firstly, this system is designed to support many types of services, and hence capacity calculation using classic Erlang's capacity is not sufficient. Secondly, the capacity of such system depends on interference which is a time-varying factor, so that it is necessary to precisely model the interference; otherwise the result may be inaccurate. This paper aims to provide complete details of uplink WCDMA modeling and simulation. This proposed simulation is a dynamic system-level simulation in which important parameters such as radio propagation effects, user movement, power control and interference modeling are included. The principles of WCDMA modeling and simulation which are presented in this paper are essential tools for study and research in optimising UMTS system. [C669]

"Enhanced outdoor-to-indoor coverage estimation in microcells"

Outdoor-to-Indoor propagation loss has been measured in four buildings in urban microcells. The results of the performed experiment as well as those of several other authors, are compared with COST231 model prediction and postulates are presented for improved coverage estimation in buildings with LOS illumination-an empirical equation for loss in the externally illuminated wall at perpendicular penetration is presented, heterogeneous building surface is fictitiously divided into multiple segments, and paths through NLOS surfaces are also considered for reception points located deep inside the building. It is shown that the proposed enhancements improve the COST231 model estimation error by approximately 3 dB. [C670]

"Multi-location wideband through-the-wall beamforming"

Significant multipath propagation and heavy clutter in indoor environments renders through-the-wall radar imaging a difficult and complex proposition. It is highly desirable to properly interpret the radar images and determine the contents of the indoor scene with a high level of confidence. Data collected from multiple positions around a structure can be used to improve imaging visibility into the indoor scene, thereby enhancing indoor target detection and localization. In this paper, we consider multi-location radar imaging. Image fusion techniques for combining radar images acquired from multiple locations along two sides of an enclosed structure are presented. Supporting results, based on real-data, are also provided. [C671]

"Characterization of RF Propagation in Helical and Toroidal Metal Pipes for Passive RFID Systems"

In this paper we extend the theory of radio frequency (RF) propagation within helical and toroidal metal pipes. This work is motivated by the need to understand the operation of UHF radio frequency identification (RFID) systems when the tags are placed within toroidal metal pipes. The field components inside a helical metal pipe are derived to obtain the propagation and attenuation constants and the different transverse electric and transverse magnetic modes. The cutoff frequencies, attenuation and angle of deployment are used within the theory to identify operating limitations of passive RFID systems in hollow helical metal pipes. The helical model is then simplified to describe the case of a toroidal metal pipe. This theory extends existing theories of propagation within cylindrical metal pipes to form a comprehensive general theory. Analytical evaluations are used to visualize the tags within the metal pipes and to validate the theory presented in this paper. This evaluation presents the propagation of RF waves within toroidal, bent and cylindrical metal pipes. The general theory is shown to predict, and simulations are revealed to confirm that UHF RFID tags can be read under certain conditions within narrow pipes whose cutoff is below UHF frequencies. [C672]

"Wireless networks: What next for radiowave propagation research"

This paper chronicles the progress in wireless information transmission and reception, and discusses future trends in radiowave propagation research. Since the conception of wireless transmission, a number of pioneers have successfully understood and characterised the behaviour of narrowband, wideband and ultra-wideband signal transmission in a variety of environments and spectral regions. The physics of signal propagation mechanisms is now well understood and represented by deterministic and stochastic models. Frequency, spatial and polarisation properties of signal propagation have also been exploited. So are there any fundamental research problems left? The aim of this paper is to provoke discussion and debate so that the state-of-the-art of radiowave propagation is understood and further challenges are amassed. [C673]

"Wide-band indoor localization effectiveness in presence of moving people"

Recently, new standards have emerged in the telecommunication industry. These standards provide an open global specification that enables mobile devices to access and interact with information and services instantly. Paving the way to the emergence of new added-values services, these devices require more and more a localization agent. When deployed, these wireless resources have to operate in non-stationary propagation conditions and from outdoors to indoors. This paper concentrates on the evaluation of UWB radio signals used for localization, in presence of moving people modifying the indoor propagation channel. Different frequencies, bandwidths and densities of moving people are considered. Impacts of these parameters are evaluated on two different ranging methods: time of arrival (TOA) based and received signal strength (RSS) based. [C674]

"2008 Loughborough antennas & propagation conference"

The following topics were dealt with: antennas and propagation for body-centric wireless communications; medical and healthcare applications of RF & microwave; radar measurements and metamaterials theory, modelling and applications; mobile antennas from an industry perspective. [C675]

"Progress in radiowave propagation studies of on-body communications channels"

On-body communication channels are used in an increasing number of applications, including headsets and wristwatch controllers for mobile phones, and systems for emergency personnel and for personal medical support. In channels for such systems, at ISM band frequencies, the movement of the body causes significant fading, in addition to that caused by scattering from the local environment. Statistical modelling is important and difficult because of the non-stationary nature of body movement. Results for the belt to head and belt to wrist channels, for a walking body, are presented. Diversity is being considered to reduce fading, and results presented show that useful gain can be obtained using practical small antenna pairs with small spacing. Finally, angle of arrival data may help in the design of such antennas and some results are also given. [C676]

"Optimal data fusion for pedestrian navigation based on UWB and MEMS"

Indoor pedestrian navigation is probably a very challenging research area. In this context, an optimal data fusion filter that hybridises a large set of observations: angles of arrival (AOA), time differences of arrival (TDOA), accelerations, angular velocities and magnetic field measurements is presented. The coupling of UWB and MEMS data relies on an extended Kalman filter complemented with specific procedures. Geometry based algorithms and a RANSAC paradigm that mitigates the non line of sight (NLOS) UWB propagation are detailed. The benefit of the solution is evaluated and compared with the pure inertial positioning system. [C677]

"Statistical characterisation of the indoor sseudorange error using low cost receivers"

The Global Positioning System (GPS) has made outdoor localization broadly available and is commonly employed for automotive navigation by a very large number of users. Low cost devices available on the mass market are currently able to track satellite signals down to a signal power of -159 dBm. With these high sensitivity devices, receiving (i.e. acquiring) GNSS signals indoor becomes possible. However, the building material used and the kind of construction greatly influence the signal propagation. For instance, European houses are more affected by attenuation as they are now mostly built of concrete compared to many American houses that are often built of wood and brick work. Typical wave propagation mechanism into most European buildings is through windows as ordinary glass attenuates electromagnetic waves less compared to thick concrete walls. Bearing this in mind, diffraction at window frames, as well as outdoor and indoor reflections play an important role in indoor GNSS positioning through the effects on the propagation channel. In the paper we report on both the temporal and spatial correlations of the errors. Since a room and its major fixtures such as furniture and windows, as well as the surrounding building(s), are largely static, the temporal correlation of pseudorange errors measured at a fixed point introduced by the propagation channel is high and slowly decreasing with time (note that the satellites motion is too slow to cause sudden channel changes due to changes in the incoming wave angles). A certain spatial correlation is present but less distinct and fast

decreasing with distance. For the case of a moving object, such as a pedestrian, both temporal and spatial correlations will play a role for optimal model estimators. [C678]

"Impacts of RF radiation on the human body in a passive wireless healthcare environment"

In this paper, we identify the most significant problems involving the impacts of radio frequency (RF) radiation on the human body. The coming pervasive healthcare environment will rely heavily upon wirelessly communicating devices to provide the information visibility and communication capabilities required to achieve these ambitious systems. The impact of significant and continuous RF radiation exposure must be understood to ensure that we first do no harm with our new environments. The specific absorption rates (SAR) is a dosimetric measure that has been widely adopted as a method for quantifying radiation absorbed by the human body. This tool is both simple and useful. We investigate the factors that affect RF absorption in human tissues to identify the physical and biological factors that impact RF absorption. Similarly, we investigate the factors that influence biological responses to the effects of absorbed and incident RF radiation. We focus specifically on low power and passive communicating systems that will form the vast majority of the wireless devices in a pervasive healthcare environment. [C679]

"Dynamic estimation of optimum path loss model in a RSS positioning system"

The development of location techniques in urban and indoor environments by using measurements of received signal strength (RSS) has as a main drawback the fact that in such environments the value of RSS depends on many unpredictable and changeable factors, not only on the actual distance between mobile station (MS) and the different base stations (BSs). With the aim of solving these limitations of RSS-based location systems, in this paper we present a novel technique to find out which model best describes the different propagations of signals traveling between the MS and the different BSs. This method estimates accurately and dynamically, all the path loss exponents that model the signal attenuation in propagation paths to each BS, only by using the received signal strength measurements that are obtained in each moment. Therefore, our method does not need any previous knowledge about user position or kind of propagation environment. From the estimation of the different path loss exponents, we obtain much more accurate distance estimations than those obtained by using a generic and unique propagation model previously fixed. We present the results obtained by using the methods described in this paper, from real measurements taken in a GSM network as well as from computer simulations. By using the techniques presented in this paper we can see the great improvement in the precision on estimating distances from the MS and the different BSs. The results obtained from the real measurements support the simulations results and show how that improvement in the distance estimation makes the location much more accurate. [C680]

"Urban network effects simulation"

The role of robust communications plays an ever pervasive and critical role in today's network-oriented asymmetric warfare. This is especially true in urban environments, where insurgencies tend to be most active and detrimental to the civilian population. Urban-level communications needs to be addressed through a new generation of modeling and simulation tools that not only model the physical layers of radio communications, but that also account for reactive network behaviors that drive higher-level force actions (e.g., the interplay of ground troops, ground vehicles, airborne UAVs, manned aircraft, etc.) Such tools should become essential to communications mission planning, while advancing the deployment of optimally designed communications systems for use in highly complex RF environments. To this end, we describe the Scalable Urban Network Simulation (SUNS), which coordinates physical layer EM propagation modeling with network-level and higher "forces level" modeling to achieve a highly interactive, "full communications stack" approach to network simulation. [C681]

"Path loss estimation in 3D environments using a modified 2D Finite-Difference Time-Domain technique"

Interest has been growing regarding the use of Wireless Sensor Networks (WSNs) for monitoring and assessing the conditions of infrastructure such as tunnels, bridges and water supply systems. Therefore it is vitally important for us to understand the radio propagation characteristics, especially the Path Loss of these specific environments prior to the deployment of a WSN. The Finite-Difference Time-Domain (FDTD) technique using the Yee algorithm [1] is well-known for its ability to produce accurate predictions of received signal levels. However, when facing the challenges of large-scale systems e.g., nodes located in fire hydrants, tunnels, etc, the computational requirements of this technique become overwhelming, particularly for 3D simulations. In this paper, based on comparisons between conventional 2D FDTD simulations and existing analytical models of Free Space Path Loss and Plane Earth Path Loss, we propose a Modified 2D FDTD method. A unique path loss correction

factor is determined. It converts a 3D signal source into an equivalent 2D source and provides path loss results which are identical to those of a full 3D model in both free space and plane earth scenarios. [C682]

"On the Indoor Propagation of UWB Signals"

The large bandwidth of Ultra Wideband systems allows an achievement of extremely high data rates, and moreover utilization of high spectral capacity. The paper introduces the specific features of UWB signal propagation. Based on simulations and measurements the differences to classical narrowband systems are analyzed. Analyses are focused mainly on two-path propagation aspects, taking into account overlapping of a direct and a reflected UWB pulse. Based on such approach more complicated models and analyses of UWB system deployment in indoor environment can be accomplished. [C683]

"Application of raytracing technique for predicting average power distribution in indoor environment"

In order to estimate the signal parameters for mobile systems, it is necessary to estimate a systempsilas propagation characteristics through a medium. Propagation analysis provides a good initial estimate of the signal characteristics. The ability to accurately predict radio-propagation behavior for wireless personal communication systems, such as cellular mobile radio, is becoming crucial to system design. Since site measurements are costly, propagation models have been developed as suitable, low-cost, and convenient alternative. The empirical and statistical techniques offer computational simplicity but low accuracy, while the deterministic techniques based on the numerical calculation of electromagnetic field (such as finite difference method, moment method, finite element method, etc.) provide high accuracy but very high computational intensity. The ray-tracing technique, which speeds up the computation while maintaining the reasonable accuracy, is an appropriate selection. In this paper, we develop a software program for predicting distribution of average power in indoor wireless communications based on ray-tracing technique. The efficiency of the proposed software program is shown in numerical results and is verified by measurement results. [C684]

"Mathematical modeling of disprersive distortions of the wideband chirp signal during its propogation in the ionospheric radiochannel"

Theoretical description of the chirp ionosonde operation has been made. Ionosonde registers spectrum sequence of window received-signal sampling. Mathematical modeling of dispersive distortions of spectra registered has been carried out. [C685]

"A new space-time-doppler code for time-selective fading channels"

Relying on a layered algebraic design, we derive a new space-time-doppler (STD) code for multiple input multiple output (MIMO) time-selective fading channels. The proposed STD code achieves rate Ntand enables full-diversity NtNrNb(Q +1), i.e., the product of the number of transmit antennas Nt, receive antennas Nr, coding blocks Nband channel complex exponential bases (Q +1). Simulation results show that the proposed STD codes achieve higher diversity gain in time-selective channels than some existing STD codes. [C686]

"EMO: A statistical encounter-based mobility model for simulating delay tolerant networks"

We propose EMO, a model to evaluate delay tolerant networks (DTN) and opportunistic systems, which focuses on simulating encounter events between mobile radios, rather than node locations as done in existing models and simulators. Our approach introduces a more accurate simulation of DTNs on the main system timescale (the encounter timescale), while trading off some accuracy at the bit-level, through an abstraction of radio propagation simulation. To design EMO, we extract and characterize the necessary parameters from experimental data and propose a method to generate synthetic node encounter traces based on this characterization. The output of the model is validated using hold-out cross-validation method. Our validation results indicate that EMO is able to maintain the statistical properties of experimental data over a wide range of time (simulation duration) and space (number of nodes) scales, with mean square errors of less than 3% for the main system parameters. [C687]

"Evolution of radiopulses radiated by Hertz's dipole in vacuum"

Properties of the fields and power descriptions are considered. It is shown that the form of radiopulses in a distant area is determined by a derivative from the form of impulse of current, given on Hertzpsilas dipole. Power descriptions of the electromagnetic field are proportional to the square of derivative from the form of impulse of current, given on Hertzpsilas dipole. [C688]

"Estimation of canopy attenuation for active/passive microwave soil moisture retrieval algorithms"

This paper discusses the importance of the proper characterization of scattering and attenuation in trees needed for accurate retrieval of soil moisture in the presence of trees. Emphasis is placed on determining an accurate estimation of the propagation properties of a vegetation canopy using the complex frequency correlation function (FCF). A new technique for determining the canopy attenuation that uses the measured stepped frequency radar backscatter response is proposed. It makes use of the details found in a transient solution where the canopy (volume scattering) and the tree-ground (double interaction) effects appear at different times. The proposed technique is based on separating the backscattering sources within a forest canopy in the time response. The technique has been used with L band data collected over deciduous trees to verify that the algorithm results match the simulated data. [C689]

"A theoretical analysis on the sensitivity of microwave emission to snow parameters"

Snow cover represents the major part of the cryosphere and is an important component of the hydrological cycle. Moreover, it is a key indicator of global warming. In the last decades, microwave radiometry has proved to be very powerful for monitoring the snow cover parameters (e.g. the extent area and the water equivalent). By using electromagnetic models, which simulate emission and scattering from natural surfaces it is possible to interpret the electromagnetic measurements and to perform the retrieval of the parameters that characterize the soil and its covers. This work aims at investigating the sensitivity of microwave emission to snow parameters by means of an advanced model called IRIDE (Ifac RadiatIve Dry snow Emission model). The model is obtained by properly coupling the advanced integral equation method and the dense media radiative transfer theory under the quasi-crystalline approximation. The simulations performed by means of IRIDE allowed us to determine the sensitivity of the brightness temperature to the most interesting snow parameters (thickness, water equivalent and wetness of snow) as a function of different observation configurations (frequency, polarization and incidence angle). [C690]

"A novel microwave radiometer for assessment of atmospheric propagation conditions for 10 and 90 GHz frequency bands"

In order to quantify atmospheric perturbations on satellite signals a new ground based ultra stable microwave radiometer is developed. In addition to several K- and V-band channels two further Ku- and W-band channels are implemented. This frequency combination provides sensitivity towards atmospheric water vapour and oxygen, as well as to rain and cloud droplets. To perform high stable measurements, the radiometer is equipped by a continuous calibration method using a Dicke switch and a noise diode. This yields to radiometer stability for integration times up to 2000 seconds. [C691]

"NLOS Mobile Terminal position and speed estimation"

Non-Line-of-Sight (NLOS) and multipath propagation conditions pose significant problems for most Mobile Terminal (MT) positioning approaches. This is because only path parameters of LOS paths are considered. When in fact all paths are considered, much more information for positioning becomes available, though proper consideration of the NLOS character of NLOS paths is required. On the other hand, channel parameters that have been used so far for positioning purposes concern a static channel snapshot. In the case of mobility, the path Doppler shifts provide information on the mobile terminal speed. In this paper we combine this information with traditional positioning information to jointly estimate the terminal's speed and position. [C692]

"A method to obtain maximum coupling fundamental Gaussian beam of corrugated feed horn based on fast inverse diffraction algorithm"

A method to obtain the maximum coupling fundamental Gaussian beam mode of corrugated feed horn based on fast inverse diffraction algorithm is proposed. The inverse diffraction (O.K. Ersoy, 2007) was employed for field reconstruction by calculating the backward propagation of a given diffraction field. Both the fast-Fourier-transform diffraction integration (FFT-DI) (F. Shen and A. Wang, 2006) and diffracted Gaussian beam analysis (DGBA) (C. Ricckmann et al., 2000) are employed for fast inverse diffraction calculation. An outline of the signal processing about the experimental measured data is presented, along with the comparison of the designed maximum coupling fundamental Gaussian beam mode and the calculated maximum coupling fundamental Gaussian beam mode coupling to the measured data separately, which shows that the later is the optimum choice. [C693]

"A novel approach for radio propagation in indoor environment"

In this paper, we will propose a novel approach to the radio propagation channels in complex indoor environments. This technique is called the deterministic splitting method of ray tubes. The prediction of field strength has been done with this method in indoor environments. A good agreement is achieved between the

simulated results and the published results. [C694]

"Channel Prediction Assisted By Radio Propagation Environments Information"

To solve the problem of channel prediction capability which is limited by channel coherent time, this paper investigates the relationship between the radio propagation environment and the channel state information (CSI). A new parametric predictor assisted by the knowledge of radio propagation environment information is introduced. If the parameters of propagation environment have been known in advance, the variation of CSI can be predicted for a much longer time. Using outdoor measurement data, the performance of the new paramedic predictor is compared with that of the Auto Regression (AR) predictor. The results indicate that the prediction range of the new method is better than that of the AR method. [C695]

"A clustering method of arrival waves suitable for analyzing propagation characteristics"

In analyzing propagation data, It is called "clustering" to classify arrival rays into groups (clusters) according to ToA (time of arrival) and AoA (angle of arrival). Extracting the parameters of each cluster is useful to understand the propagation characteristics in detail, and also to design the wireless system properly. This paper discusses a new clustering method which solves the problem the conventional clustering methods have. [C696]

"Development of Whole-Body Shell and Solid Phantoms and for SAR and Radio Propagation Measurement"

Whole-body phantoms are required to optimize the design and performance of hand-held, body-mounted, wearable, or portable wireless telecommunication equipment. Where the assessment of electromagnetic exposure is required, the phantom is a hollow shell filled with tissue equivalent material; solid tissue-equivalent material can be used in all other cases. [C697]

"Study on Capacity of BLAST System with Error Propagation"

The capacity of the BLAST system is larger than that of a single antenna system, but error propagation affects the BLAST architecture capacity. The ergodic capacity is analyzed of BLAST architecture with error propagation (EP-BLAST). We find that in EP-BLAST system, the diversity orders of all symbols transmitted by different antenna are same, which are equal to the smallest diversity order of the symbol in error-free BLAST (EF-BLAST). Since it is difficult to obtain a closed-form solution of the ergodic capacity of EP-BLAST, the upper-bound of the capacity is achieved in this paper. [C698]

"Propagation channel and MIMO capacity in arched tunnels"

Preliminary experimental results have shown that MIMO techniques can also be applied in tunnels environment, despite the small angular spread of the direction of arrival/departure of the rays. However the gain in capacity compared to a SISO transmission is strongly dependent on the tunnel size and on the communication range. The interpretation of this result, based on a modal approach of the propagation in a rectangular tunnel, is given. Considerations on wave polarization are also introduced, polarization diversity being a solution for reducing the size of the mobile array. [C699]

"Understanding Radio Irregularity in Wireless Networks"

In an effort to better understand connectivity and capacity in wireless networks, the log-normal shadowing radio propagation model is used to capture radio irregularities and obstacles in the transmission path. Existing results indicate that log-normal shadowing results in higher connectivity and interference levels as shadowing (i.e., the radio irregularity) increases. In this paper we demonstrate that such a behavior is mainly caused by an unnatural bias of the log-normal shadowing radio propagation model that results in a larger transmission range as shadowing increases. To avoid this effect, we analyze connectivity and interference under log-normal shadowing using a normalization that compensates for the enlarged radio transmission range. Our analysis shows that log-normal shadowing still improves the connectivity of a wireless network and even reduces interference. We explain this behavior by studying in detail what network parameters are affected by shadowing. Our results indicate that, when it comes to connectivity and interference, an analysis based on a circular transmission range leads to worst case results. [C700]

"Cooperative network coding in selective decode-and-forward networks with multiple source-destination pairs"

In this paper, a cooperative network coding scheme is proposed for a two-stage selective decode-and-forward

relaying network with multiple source-destination pairs. In particular, based on employing Best-Select cooperation to perform relay selection, the selected best relay performs network coding on the correctly decoded information from all the sources, by transmitting a random linear combination of the columns in an underlying full-rate full-diversity perfect STBC matrix. A decentralized implementation with minimal overhead is presented. Under realistic propagation conditions, including the effects of path-loss and flat Rayleigh fading, the performance in term of the single-pair outage probability is evaluated. Simulation results show that, when compared with non-cooperative direct transmission, the proposed cooperative network coding scheme can achieve much better performance while also achieving full-rate re-transmission for each single source-destination pair. [C701]

"Detection of White Spaces in a Cognitive Radio Architecture"

In this paper we consider the use of UHF spectrum that is not allocated to digital TV transmission for unlicensed wireless devices. We model the propagation conditions and calculate the threshold necessary for detection that results in a small probability of creating interference to TV receivers. The threshold depends on the number of wireless devices. We calculated the reduction in threshold possible when multiple devices cooperate to detect the presence of a TV signal. [C702]

"Performance analysis of ultra wide band indoor channel"

Research on wireless communication system has been pursued for many years, but there is a renewed interest in ultra-wideband (UWB) technology for communication within short range, because of its huge bandwidth and low radiated power level. This emerging technology provides extremely high data rate in short ranges but in more secured approach. In order to build systems that realize all the potential of UWB, it is first required to understand UWB propagation and the channel properties arise from the propagation. In this research, the properties of UWB channel for indoor industrial environment was evaluated. A few indoor channel models have been studied so far for different environments but not for indoor industrial environment and various data rates are obtained according to wireless channel environments. Therefore, an accurate channel model is required to determine the maximum achievable data rate. In this thesis, we have proposed a channel model for indoor industrial environment considering the scattering coefficient along with the other multipath gain coefficient. This thesis addresses scattering effect while modeling UWB channel. Here, the performance of UWB channel model is analyzed following the parameters, such as power delay profile and the temporal dispersion properties which are also investigated in this paper. [C703]

"Object localization using round trip propagation time measurements"

The object localization belongs to the basic tasks solved within wireless sensor networks (WSN). It can be shown, that for WSN based on UWB radar systems, localization methods using round trip propagation times can be used with advantages [1]. In this paper we introduce three localization methods of that kind, i.e., a direct calculation, a conventional and weighted least-squares methods and a Taylor series method. It is expected, that these methods can be applied especially for UWB WSN. The properties of the proposed methods will be illustrated by using computer simulations. It will be shown, that Taylor series method can provide the best estimate of object location. [C704]

"Interference avoidance in rapidly deployed wireless ad hoc incident area networks"

In [1], we investigated the use of multi-hop relays (a.k.a. breadcrumbs) to extend the range of public safety communications in indoor environments where the radio propagation conditions are harsh or wireless communications are limited by distance. In this work, we consider the impact of interference on the reliability of the breadcrumb system. We develop a simulation model for the system that considers the incident area floor plan, the characteristics of radio propagation within the incident area, emergency responders' mobility, and the distributed functionalities of the breadcrumb system. We then evaluate the performance of the breadcrumb system in the presence of interference showing that it is diminished. Consequently, we consider the use of the cognitive radio technology to enable breadcrumbs to detect interference, to identify vacant channels, and to dynamically and autonomously adapt their channel selection to enhance the system performance. We develop the functionalities of cognitive radio in our simulation, re-evaluate the system performance in the presence of interference, and show that employing cognitive radios alleviates the impact of interference. We also highlight the overhead that the cognitive radio functionalities may have under favorable network conditions. [C705]

"Statistical analysis of ultra wideband indoor channel"

A few indoor channel models have been studied so far for different environments and the propagation mechanism for indoor industrial environment is evaluated. The channel properties arising from this propagation

mechanism are quite important to build systems that realize all the potentials of UWB. In this paper, we propose a statistical channel model based on S-V model for industrial environment. The profusion of scatters due to presence of industrial metallic equipments creates dense multipath scattering and the effect of it is considered along with other multipath gain coefficient in this model. The power delay profile and the temporal dispersion properties are also investigated to characterize UWB channel. [C706]

"Propagation Path Loss Modeling in Container Terminal Environment"

This paper describes novel method of path loss modeling for radio communication channels in area of container port. Multi-variate empirical model is presented, based on multidimensional regression analysis of real path loss measurements from container terminal environment. The measure instruments used in propagation studies in port area are also described. [C707]

"The Time-Domain Scattering Characteristics Analysis of the Typical Satellites in Different Space Attitudes"

A method to study the time-domain/wide-band scattering characteristics variety with satellite attitude change is proposed in this paper, and the time-domain and wide-band electromagnetic scattering characteristics of typical spin-stabilized and triaxis-stabilized satellites in different space attitude conditions (rolling, pitch and yaw) are investigated by using the proposed methods and the parallel finite-difference time-domain (FDTD) code. The results show the change of rolling attitude more easily arouses the variety of scattering characteristic of satellite target than pitch attitude change does. The calculation results may be helpful to the wide band radar for detecting, identifying and tracking of the satellite targets. [C708]

"The Re-Radiation Characteristics Of Nonlinear Target in Harmonic Radar Detection"

The formula of nonlinear junction's re-radiation is expressed by a Taylor series, and the nonlinear network model of the metallic junction is further studied. A relationship between the power, the voltage of the 3rd harmonic wave and the incident frequencies is calculated, and the function curves are obtained after the simulation of MATLAB. [C709]

"Combined Effects of Humidity and Frequency on the Dielectric Strength of Air for VLF Applications"

The paper reports the results to date from a study to investigate the effect of humidity and frequency on the breakdown of air. Experiments were conducted on Rogowski-profile uniform field gaps and non-uniform rod-plane gaps ranging from 4 to 52 mm. Results show that uniform field VLF (Very Low Frequency Radio; 10-30 kHz) breakdown voltages decrease with humidity, opposite to that observed at 60 Hz. Non-uniform field breakdown voltages at VLF are lower than those observed at 60 Hz, but have similar trends with humidity. Uniform and non-uniform field breakdown experiments have been completed at 60 Hz for validation. [C710]

"A New Model for Predicting the Characteristic of RF Propagation in Rectangular Tunnel"

This paper presents a new model based on the geometrical-optical theory and the uniform theory of diffraction (GO-UTD) for predicting the characteristic of RF propagation in rectangular tunnel. It transforms three-dimensional (3D) propagation model of radio signal in tunnel to two-dimensional (2D) propagation model, which could be easily tackled. Simulation results compared with another prediction model (wireless insite) show that this model can accurately predict the narrow band propagation characteristic of radio signal in rectangular tunnel. Moreover, it reduces the computational complexity greatly and improves the efficiency of prediction. [C711]

"Influence of Propagation Modeling on VoIP Quality Performance in Wireless Mesh Network Simulation"

In this paper we evaluate the influence of radio propagation modeling on VoIP quality in wireless network simulations. How propagation modeling can influence classification of strategies concerned in improving VoIP quality? We analyze reactive AODV and proactive OLSR approaches in a simulated 802.11 mesh backbone and calculate the VoIP quality by means of a reviewed version of ITU-TE-Model. Results showed that: a) irrespective of routing strategy, different propagation model configurations can influence speech quality in such a way that it switches from "acceptable" to "unacceptable", b) the classification of such strategies can be highly influenced by propagation models as well as its configurations. [C712]

"Analysis of Effect of Sunrise on Shortwave Communication Using HF-Doppler Detection"

The propagation of the radio wave is seriously affected by the change of the ionosphere in the night. On the basis of the HF-Doppler detection of the ionosphere the basic characteristics of the Doppler frequency shift at sunrise and its effect on the shortwave communication were discussed. [C713]

"Fading Characteristics of Radio Propagation in One-Way Semicircular Subway Tunnel at 38GHz"

Path-loss characteristic at 38 GHz in a one-way semicircular subway tunnel is attained by means of experiment. Based on the result, simulation parameters, such as roughness, permittivity and conductivity, are attuned exactly. Detailed researches for small-scale fading characteristic at 38 GHz in this subway tunnel are performed using simulation tool based on ray tracing theory. Some significant conclusions are resulted from experiments and simulations. [C714]

"Median path loss, fading and coverage comparison at 3.5GHz and 700MHz for mobile WiMax"

This paper describes a microcellular type propagation environment model that is typical in the Defence Housing Authority in Pakistan. Broadband Access systems are being deployed in this environment. Propagation characteristics in this environment have been investigated in this paper for the typically deployed frequency of 3.5 GHZ. Median path loss, fading and coverage is being reported for propagation at 3.5 GHz band and has been compared with a new band that is being opened up for Broadband wireless access across the globe in the 700 MHz band. The simulation method is based on the quite commonly used ray tracing technique. [C715]

"Forward Propagation over Thick Oil Spills on Sea Surfaces for a Coastal Coherent Radar"

The Ament model is a practical and fast means to evaluate the forward radar propagation over the sea surface in coastal environment. Based on the Rayleigh roughness parameter, it calculates the total coherent power received by an on-board antenna. Here, by extending the Rayleigh roughness parameter to the case of a rough layer, the Ament model extended to the case of rough layers (in which the two rough surfaces are uncorrelated) is presented. This new model is applied to the case of thick oil spills on the sea surface, for which numerical simulations are presented in order to study the possibility of detecting this pollution. [C716]

"The High Resolution Radar Image Simulation of Target on Rough Surface"

The high frequency method can deal with the metal material structure and get a good result. The other method should be used to describe the process of the shadow in the radar image. These shadows are important feature in the radar image. The stability of the shadow contour makes it helpful for the recognition process of the target body. Deterministic and statistical methods play different parts in the radar image simulation. The ray tracing techniques is constructed to describe whole simulation process. Corresponding to the MSTAR image, X band image is simulated under the same imaging condition. Comparing with the same attitude's images, the shadow contour looks similar; and the target part is well coincident too. [C717]

"Compact Polarimetry Mode for a Low Frequency SAR in Space"

In spaceborne SAR, a single-polarisation on transmit has, over full polarisation, the vast advantage of a double swath due to SAR system design issues. Without getting into the technical details deserving by themselves a full paper, we can just mention the swath characteristics of ALOS PALSAR, reducing from 70km for dual-pol mode to 30 km for full-polarisation mode. The options chosen up to now for dual-pol system designs (or single-polarisation on transmit) rely on a linear polarisation on transmit, with two orthogonal polarisations on receive. In an earlier paper, we proposed a more pertinent alternative for the selection of the transmit polarisation leading to a better characterisation of the scattering mechanisms [1,2]. This mode is called the iquest/2 CP mode, in reference to the transmit polarisation being circular. At low frequency, where the ionosphere has a significant effect, the circular transmit polarisation is the only sensible option as it provides an effective constant polarisation as seen by the scattering surface. This is an essential condition for a meaningful multi-temporal analysis In this paper, the analysis is pursued in more depth by including the effect of the ionosphere on the wave propagation, exploring both the POLSAR and PolInSAR applications and investigating procedure to estimate the Faraday rotation from the CP data. [C718]

"Integral Representation of the Electromagnetic Field for the Description of the Main Mechanisms Appearing in Forested Area for Monostatic Radar Configurations"

In this paper, an electromagnetic scattering model based on the electric field integral representation is used to separate the scattering mechanisms involved in the interaction of an electromagnetic field with forested areas. This model is used to examine the different coupling effects between the main scatterers (trunks and branches) and those between the scatterers and the ground. [C719]

"Discovery of Anoumoulous Stripes Over the Amazon by the PALSAR onboard ALOS satellite"

We discovered anomalous stripes over the large area of Amazon when the region was scanned by the radar (PALSAR) onboard ALOS satellite. The stripes appeared on the local midnight along the geomagnetic field line with a typical characteristic width of 600 m. [C720]

"Brightness temperature retrieval with scale-model antenna patterns of the aquarius l-band radiometer"

The Aquarius is a L-band passive/active instrument onboard a spacecraft due for launch in 2010, targeting sea surface salinity retrieval with an accuracy better than 0.2 psu. Measurement and retrieval of salinity by the Aquarius radiometer are simulated using a radiative transfer model. The cross-polarization coupling in the antenna pattern complicates the correction of the Faraday rotation effect in the ionosphere, causing errors in brightness temperature up to several Kelvin. The second-order correction for the Faraday effect is developed and reduces the retrieval error better than the required accuracy (~less 0.1 K). [C721]

"Coherent Decomposition of Fully Polarimetric Radar Data"

This paper presents a coherent decomposition scheme for a few scattering matrix data. A simple model-fitting decomposition method is applied to retrieve scattering mechanism or identify scatterers based on the coherency matrix. The decomposition results are compared with some experimental data obtained by fully polarimetric FM-CW radar. It is shown the scattering mechanisms are well recovered and the orientation angles of wire scatterer are precisely measured. [C722]

"Adaptive In-building Propagation Simulator using ray tracing in WCDMA networks"

In this paper, we describe an Adaptive In-building Propagation Simulator (AIPS) to predict wireless service coverage within buildings for WCDMA networks. The adaptive propagation model was proposed and applied on AIPS. The model provides analysis of the visualized coverage and the received signal strength of the MS (Mobile Station) inside the building by designing the specific location of the transmitter, material of the wall and antenna etc as a construction within building. The performance of this AIPS is investigated by comparing the simulation results with the actual measurements on a location-by-location basis in a building which WCDMA repeaters are operating commercially in KTF, the number 1 WCDMA service provider in Korea. The result shows that the AIPS predicts service coverage on the real access network with a standard deviation of about 5dB over 53 locations in several buildings. The AIPS with the proposed propagation model is widely using to plan the service coverage within a building in KTF WCDMA networks. [C723]

"A comparison of near earth propagation over layered media"

Todaypsilas military works in a complex electromagnetic arena. IED jammers and UGS systems are examples where propagation is very near to the ground, and the interaction of signals with the earth can unintentionally alter propagation. In these scenarios the direct and reflected waves tend to cancel one another, causing the surface wave component to be the dominant mode of propagation. This surface wave must be taken into account in order to correctly model propagation of radio waves in these cases. Many methods of studying propagation do not incorporate the effects of subterranean layers of different materials. This paper demonstrates that subterranean layers can greatly impact near earth propagation. Radio propagation predictions made by Norton, XFdtdreg, and the moving window finite difference time domain (MWFDTDreg) methods are used to analyze propagation for near-ground antennas over various types of layered media. [C724]

"A technique for determining radio-signal propagation in an emulated wireless environment"

The Mobile Ad hoc Network Emulator (MANE) test bed relies on accurate determination of radio signal propagation to emulate realistic mobile ad hoc network (MANET) connectivity. The determination of radio wave propagation is a very complex process that depends on numerous factors such as the transmitting medium (e.g., vacuum, air, or water), antenna properties of transmitters and receivers, and the geometrical environment (i.e. terrain). The Terrain-Integrated Rough-Earth Model (TIREM) software is an Army standard for computing the path loss of radio wave propagation, but it cannot currently be used directly by the MANE system software to determine network connectivity. This paper describes the implementation of an efficient preprocessing technique for using and integrating TIREM into the MANE software system to improve the precision of the calculated radio propagation path loss. The implemented technique has expedited the determination of connectivity and the decision to forward network packets in the MANE test bed. [C725]

"Fidelity at high speed: Wireless InSite® Real Time Module™"

For predictions of vehicle to vehicle communications, convoy communications, and Improvised Electronic Device (IED) detection/defense operations, Remcompsilas Wireless InSite Real Time (RT) module provides a very rapid propagation prediction capability in urban environments. Previous models are either empirical and inaccurate but fast, or deterministic and high-fidelity but slow. The RT Module takes the best of both; it is deterministic and provides higher-fidelity results than empirical models and is much faster than full physics-based models, returning a point-to-point result in milliseconds. It is free of the spatial limits of empirical models. This paper will show how the Wireless InSite Real Time Module can be used to provide accurate communication and jamming predictions for mission planning tools in near real time. The RT module allows user-defined mobile objects to be placed into the urban scene and rapidly repositioned without expensive reloading of geometry. The C++ API permits developers to quickly integrate the RT capability into their Tactical Decision Aids (TDApsilas) and other graphical visualization tools. [C726]

"Physical simulation of long distance and directional wireless channels"

In order to accurately test directional or multiplexed systems in a lab environment, a testbed should simulate both directional wireless channels and propagation delay. Using one or more RF lenses, one can test a radio system that uses switched or adaptively steerable antennas: one side is switched by an ldquoenvironmentrdquo controller, the other by the the discovery and tracking loop of the radio system. True path delay testing can be done by using analog RF-to-optical converters and miles of low-cost, low-loss fiber optics. Apart from verifying latency, this test can also determine if there are issues with ACK or other timeouts: information unavailable by simply attenuating a link to simulate distance. [C727]

"A routing approach for inter-ship communications in wireless multi-hop networks"

Existing communications from ships via satellites are expensive. We are motivated to extend the cheaper terrestrial communication coverage to sea via multi-hop networking. Maritime environment presents new challenges because sea surface moves randomly resulting in wave occlusion that breaks communication links. This paper models the maritime communication link after considering the wave occlusion and propagation impairments. Based on characteristics of the link, this paper proposes an aggregated-path routing approach that forms a route connecting virtual nodes, where each virtual node is a collection of nodes that are within the radio range of all nodes in its previous virtual node. Simulation and analytical results confirm that aggregated-path routing is significantly better than traditional single-path routing in terms of efficiency. [C728]

"Preliminary Design of a Propagation Experiment for a Radio Link Analysis at W Band"

Nowadays W band (75-110 GHz) is an experimental frontier since no satellite telecommunication mission has been developed and the technology at these frequencies is still poor and relatively not ready. In this framework, a preliminary useful step toward the W band exploitation in satellite telecommunications is represented by the analysis and the validation of a terrestrial link operating at these frequencies with the capability to carry out transmission/reception experiments. Such experiment could give important feedback from the technology point of view and also for the channel characterization. In this frame, the University of Rome Tor Vergata in collaboration with the company Rheinmetall Italy is carrying out an experiment to investigate a W band terrestrial point-to-point link over a distance of around 15 km. Many technological issues must be faced. In this paper, we present an overview of preliminary design of an experimental W band terrestrial air link identifying main critical elements. [C729]

"Influence of antenna parameters on the radiation of a rectangular microstrip patch antenna"

This paper present a rigorous analysis of rectangular microstrip patch over ground planes with substrates isotropic is presented. The dyadic Greenpsilas functions of the problem are efficiently determined in the vector Fourier transform domain. The integral equation for the unknown patch current and field are solved numerically by applying the Galerkin method of moments. The TM set of modes issued from the magnetic wall cavity model are used to expand the unknown current on the patch. Also, the same basics functions are used for approximating the field in accordance with the concept of complementary electromagnetic structures. The validity of the solution is tested by comparison of the computed results with experimental data. [C730]

"Time-of-arrival characteristics of an indoor radio channel at 2.4 GHz"

The measurement study of three different radio propagation aspects at 2.4 GHz is reported in this paper. The first propagation scenario included three different environments, the second involved two different transmitter antenna types and the third, two parallel propagation planes at different heights. Some observations, based on

the measurement results, were carried out along with the comparisons with the other references. [C731]

"Real time location estimation using active RFID system"

The accuracy issues in the location prediction system using active RFID tags is addressed in this paper. First we present the location prediction accuracy in different environmental conditions. Later on, we propose a new technique to improve the prediction accuracy. The proposed technique is validated with measured data obtained under different propagation environments. [C732]

"Soft-computing in antennas & propagation"

In recent years, electromagnetic simulation has seen many changes with adaptation of tools from other fields like DSP, Artificial Neural Networks, Genetic Algorithm etc. This presentation aims at informing the audience of the applications of Soft-Computing techniques for CAD in the area of Antennas and Propagation. It starts with the application of Artificial Neural Networks in design and analysis of Microstrip Antennas. An example of application of Real Coded Genetic Algorithm for designing a pre-fractal antenna follows it. Finally, a propagation model for outdoor loss estimation using Knowledge Guided Neural Network is explained. [C733]

"Characterization of fixed wireless channels between 200 MHz and 2 GHz for intelligent grid applications in suburban macrocell environments"

Growing interest in the wireless-enabled intelligent grid has prompted spectrum regulators to re-allocate various bands between 200 MHz and 2 GHz to fixed wireless applications. Although it is well-known that fixed wireless channels are subject to fading due to the motion of scatterers in the environment, most past efforts to characterize such fading on non-line-of-sight links in suburban macrocell environments have focused on frequency bands at 2 GHz and above. Based upon received signal strength data that we collected simultaneously in the 220, 850 and 1900 MHz bands at ranges between 1 and 4 km from a set of transmitting antennas located at 80 m above ground level, we have investigated the manner in which path loss and signal fading vary with distance at lower frequencies in such environments. Our results show that the severity of fading increases rapidly as both the carrier frequency and path loss increase. [C734]

"Accurate tracking using TOA in sensor networks"

Localisation and tracking of nodes in wireless sensor networks is valuable in many applications, and is the primary purpose of the network in applications such as for monitoring emergency service personnel and athletes for performance monitoring. Performing high accuracy tracking using low-cost hardware in difficult radio propagation environments is extremely challenging, and the CSIRSO WASP system was designed to meet this challenge. In this paper results are presented of trials of the WASP system for monitoring cyclists that were conducted with the Australian Institute of Sport. The results show that the system has an absolute and relative error less than 0.33 m for 95% of the measurements. [C735]

"Statistical modelling of a wideband propagation channel in the factory environment"

This paper presents statistical modelling of impulse response of the radio propagation channel in a factory environment. Proposed channel model was based on the results of the wideband measurements. Amplitudes and delays of particular multipath components have been described by means of statistical distributions in order to model the spatial variation of the channel. Certain simplification of the model, consisting in utilising single distribution to describe amplitudes of all multipath components except the first one, was also proposed. [C736]

"Restoration of the RET Phase Function Using Deconvolution"

The influence of vegetation has become an important aspect of the design of wireless communication links. In recent years theory of Radiative Energy Transfer (RET) has been adapted as a reliable tool to predict the radiowave propagation through and near vegetation. The developed RET prediction model requires 4 input independent parameters, which so far had to be established from one measurement only, thus limiting their accuracy. An independent measurement which is termed the phase function can readily yield 2 of the 4 input parameters independently, which significantly increases the accuracy of these parameters. However one major factor influencing the phase function measurement is the radiation pattern of the receiving antenna. The measured curve will be the result of the convolution of the antenna radiation pattern and the phase function of the vegetation medium. The measurement curve therefore needs to undergo a deconvolution process before any RET input parameters can be derived from it. This paper presents the deconvolution method developed using optimal compensation deconvolution methods. Deconvolution is demonstrated using both simulation signal shapes and those measured in vegetation set up in the anechoic chamber. This paper discusses different cases

of optimal compensation filtering with the relative curves shown. [C737]

"Research on Polarization Parameter Extraction in Radar Reconnaissance"

The basic theory of polarization application in radar reconnaissance is studied. Under circle polarization-base, the description form of average and instantaneous polarization parameter of radar signals based on Stokes vector estimate is deduced. The models of polarization analysis and average polarization parameter extraction are set up. A local statistical analyzing method of the polarization parameters is put forward for in-pulse polarization agility radar signal and in-pulse polarization coded radar signal. Theory and simulation prove that pulse polarization information can participate the selection and identification of radar signal to raise the ability of radar signal reconnaissance in complicated electromagnetic environment. [C738]

"Calculation of constants of model ITU IEEE 812.16 under condition of equality of path loss to real attenuation"

Constants of Stanford University Interim (SUI) model at which real attenuation of a signal in the environment is equal to calculated losses of radio waves distribution (RWD) are designed. [C739]

"Improving the acceleration of ray tracing estimation in an urban environment"

In this paper, we present the advanced ray path search method. The proposed method can be applied to complex urban environments with arbitrary building layouts and heights. [C740]

"Localization of transmitter in forest environments using inverse diffraction parabolic equation"

Localization has been extensively researched and applied; in this paper, localization of transmitter in forest environments using inverse diffraction parabolic equation is presented and a good localization estimate is shown. [C741]

"Algorithms of signals processing in radio acoustic systems"

The algorithms of radio acoustic systems' signals processing, constructed with allowance for a radio wave transformation in the channel and making it possible to perform qualitative measurements of atmosphere parameters not only with the fulfilled Bragg condition but with q Г‚Вї 0 (q is a parameter of the Bragg condition disruption) and complex sonic pulses radiation, are synthesised in this work. With this aim in view the mathematical model of the received signal is created, and the synthesis of the optimum mathematical operator of the measuring system is carried out with the use of the optimum estimation theory. [C742]

"Prediction of received signal power and propagation path loss in open/rural environments using modified Free-Space loss and Hata models"

This paper describes a modification of the Free-Space and Hata formulae for the prediction of received signal power, PRand propagation path loss, LP, in two cellular mobile radio systems (CMRS), in the Northern Nigeria. Measurements of PRs were taken with a Cellular Mobile Radio test Receiver (Sagem OT 160), in some selected open/rural environments, when the receiver was being moved away from the base stations along the propagation paths. LPs were then obtained from values of measured PRs using an appropriate expression. A close comparison of measurement values and computed values from the free-space and Hata formulae revealed that direct application of these formulae is inappropriate for the prediction of these parameters in the region of investigation, as computed values fell short significantly from the corresponding measured values. Consequently, some correction factors have been introduced to both models and these have produced results which closely matched the measured values. [C743]

"Link availability improvement using site diversity for high altitude platform station in Malaysia"

Link degradation due to rain fade is one of the obstacles in establishing the HAPS Communication services, mainly in the frequency above 10 GHz. As tropical rain is more localize in nature rather than wide spread. The site diversity is one of the effective solutions to limit the effect of rain fade in HAPS-Earth links to improve the systems availability. This paper examines the site diversity performance under the rainy condition by considering the three earth stations having different rain rates at different locations within a specific rain cell. The study is based on ITU-R model to provide a method for predicting the rain attenuation statistics for HAPS linked to an Earth station. Carrier to Noise density ratio (C/N0) is computed to analyze the impact of site diversity fade mitigation technique and it is specified that the link availability is improved from 97% to 99.9% using site diversity. [C744]

"A new double-counting cancellation technique for ray tracing using separation angle distribution"

This paper presents a new efficient and accurate method to overcome the double-counting problem of ray tracing in indoor environments. The conventional method of modeling the transmitter using an icosahedron inscribed in the unit sphere is used. The separation angle distribution of the source rays over the faces of the icosahedron is calculated prior to the start of the tracing procedure. These angles are used to cancel the double-counting problem in the post processing stage. To validate our proposed method, an electromagnetic problem that has analytical solution is presented and the ray tracing results are compared to this solution. The simulation results agree with analytical solution only when double-counting cancellation is applied. [C745]

"Propagation environments of radiowave information systems"

Radio systems are in contact with the channels of information transmission in high-tech information times tightly more and more. The channel becomes an important part of radio systems, which is known as the radiowave propagation environment. Digital grid data can not only reflect the continuous visibilities of different part of the radiowave environmental parameters, but can achieve the propagation forecasts and generate the necessary visual maps for any regions. Based on the radiowave space grid environmental information data from advanced remote sensing instruments and radiowave environment station networks, as well as the management and application of space-time information which is expressed by radiowave environment grid data, the radiowave environment observation and security system is realized with comprehensive observation system, abundant data acquisition methods, integrated earth space, and real-time information capacity that can be used in radar, communication, monitoring and control, navigation and other electronic information systems, and integrated security systems, etc. [C746]

"A bistatic HF radar for current mapping and robust ship tracking"

A bistatic HF radar has been developed for application to ocean current mapping and ship vector tracking. The radar can operate in a multi-frequency mode, so that it can map ocean current vertical shear and can provide more robust ship tracks than single frequency HF radars. This tracking robustness is achieved by avoiding target fading due to echo nulls from frequency and azimuthal variations in ship radar cross section that occur using a single radar frequency. The radar is fully digital in frequency generation and reception, and has no RF receiver components because the received antenna signals are digitized at the HF frequency directly. We use A/D conversion rates sufficiently high to maintain the 2 to 1 frequency ratio required for the highest radar frequency of interest to avoid frequency aliasing. The newly developed radar acquisition code provides real-time range compression, so that data files that are stored are in-phase and quadrature (I/Q) samples, at a much less dense rate than the original digitized signal time series. The bistatic capability is based on accurate system timing and radar frequency. These are provided at each of two or more radar sites by rubidium clocks and GPS timing, accurate for the first pulse to 50-ns to initiate data acquisition in the bistatic mode. Once acquisition is initiated, the rubidium clocks at each site maintain much more accurate frequency and time stability to allow Doppler velocity measurements accurate to 2 millihertz at 25 MHz operating frequency. The primary site requires an 8- or 16-element receive array, and both primary and satellite bistatic-illuminator sites have a modest 2 or 4-element monopole transmit antenna pair. This bistatic approach reduces the coastal space requirements because of the need for just one receive-antenna array per radar system. These systems can be operated with a pair of bistatic transmitters, either side of the receive site, to expand the spatial coverage. Using such an approach, these- units could be staggered to create a system of radars, providing continuous coverage along a coastline, alternating transmit and receive sites. This type of arrangement could be used to provide robust ship tracking along a country's coastline, and a modest estimate of type and tonnage of all vessel traffic based on target echo strength. Due to its digital approach, the cost of these radars is substantially less than that of existing coastal HF radars, none of which have a multi-frequency capability. [C747]

"On the inclusion of Stokes and Ekman surface currents into hydrodynamic models"

Recently published results (Mao and Heron, J. Phys. Oceanog., 2008) comparing sea surface currents, measured by a 30 MHz ocean radar with wind speed and direction under a range of conditions in Bass Strait, Victoria, Australia indicate that the coupling between wind and surface currents depends on the maturity of the sea wave spectrum. For a mature sea the main contribution to surface current is usually Stokes drift, while in developing sea conditions the Stokes drift is reduced and Ekman-type stress is the main contributor to surface currents. At short fetches where stress driven currents dominate the net surface current has the Ekman angular offset of up to 45 degrees. At long fetches this angle falls to a value around 10-15 degrees and depends on wind speed. The inclusion of these parameters into hydrodynamic models requires knowledge of the age of the wave spectrum and wind speed and direction at any given site. The Stokes component of the surface current is in the direction of the dominant waves, and the Ekman component of the surface current veers in a direction consistent

with the Coriolis parameter. [C748]

"High frequency (HF) radar cross sections of the ocean surface incorporating a continuous wave frequency modulated source"

Frequency modulated continuous wave (FMCW) is often employed in practical HF radar ocean surface remote sensing systems. The first- and second-order monostatic cross sections of the ocean surface in the context of high frequency ground wave radar operation are derived for a dipole source with an FMCW waveform. The Fourier coefficients of the rough ocean surface are described as zero-mean Gaussian random variables. The electric field equations for the reception of vertically polarized radiation scattered from ocean surfaces are obtained. Illustrative comparisons of the cross sections between the pulsed and FMCW waveforms are presented and their properties are addressed. [C749]

"Some aspects of the calculating schemes correctness in users positioning in radionavigating systems"

We consider a problem of a radio wave propagation from space apparatus to user's equipment, from the point of view of navigating tasks. In our investigation of correctness of the calculating schemes, methods of equivalent in extended meaning transformations were used. Main variable characteristics were determined by geometrical factor of the system ldquospace apparatus almanac-users equipmentrdquo. [C750]

"Simulation of structures situated in a layered medium at low frequencies"

Numerical analysis of structures situated in a layered medium at low frequencies is presented in this paper. The matrix-friendly formulation of layered medium Green's function is implemented for its elegant form, and frequency scaling property of the matrix element with this kernel is analyzed before frequency normalization. Good convergence can be achieved with the help of the connection matrix. [C751]

"An efficient method of time-domain ray tracing based on the deterministic splitting method of ray tubes"

In this paper, we will propose a novel approach to the radio propagation channels in complex indoor environments firstly. This technique is called the deterministic splitting method of ray tubes(DSMRT). The DSMRT is optimized for predicting indoor radio channel which can overcome the drawback of the ADRTT. At the same time, the DSMRT has the merits of less CPU time and higher computing efficiency, compared with two known methods of ray tubes on the condition of same prediction precision in.Meanwhile ,the prediction of received power in frequency-domain has been done with this method in indoor environment. Secondly, we will apply DSMRT to time-domain prediction of radio propagation characteristics. It is well known that a time-domain multipath channel model is developed based on TD-UTD technique. We choose the same typical office environments as to model. A good agreement is achieved between the simulated results and the published results. [C752]

"Non-line-of-sight propagation measurements at 60GHz for millimeter-waves WPAN"

Propagation measurement campaign at 60 GHz band has been conducted in the laboratory environment for both LOS and NLOS situations. Path loss and delay spread were described as basic propagation characteristics. The parameter of path loss model with shadowing effect was also extracted. The result showed a large delay spread in the specific condition. [C753]

"Positioning and tracking algorithm using node selection method in wireless sensor networks"

For various kinds of applications in sensor network, the position information of each sensor tag is essential. Some conventional linear search algorithms used for time-of-arrival (TOA), however, are easily degraded due to serious multipath fading and non-line-of-sight (NLOS) propagation especially in indoor or urban environments. In this paper, we describe some novel algorithms for accurate indoor positioning of a sensor tag in a network of fixed base station. The proposed technique uses node selection method. The proposed algorithm has two position-fix processes. Firstly, the combination of base station in line-of-sight (LOS) environment is selected by locating the base station from the target sensor tag. Then, positioning result is obtained with only combination of base station in LOS environment. Results using simulated data show usefulness of the proposed algorithm which can achieve more robust and precise estimation compared with conventional methods. [C754]

"Electromagnetic propagation in structures and buildings-research at the University of Auckland"

An outline of research into the electromagnetic characterisation of propagation in building structures being undertaken at the University of Auckland is presented. Improved system performance is the key driver, and quantifying this requires a good understanding of radiowave propagation-in particular co-channel interference. Results from various techniques (including the Green's function/Method of Moments and FDTD) are presented and are shown to be capable of isolating the key propagation mechanisms responsible for interference. This knowledge is being used to formulate simple yet accurate propagation models for use in system design. The use of frequency selective surfaces to control interference is also described and shown to be a feasible approach. [C755]

"Wireless networks in vehicles"

Wireless networks in vehicles have the possibility to reduce wiring costs and weight, and allow for more flexible installation of electronic systems. However the radio propagation environment inside vehicles such as aircraft presents unique challenges to the operation of wireless networks. An airframe or other vehicle body can be considered a set of coupled cavities. The cavities present a potentially high-Q reverberant behaviour which results in large delay spreads which can cause poor performance in digital radio systems. The presences of multiple, coupled cavities exacerbate the problem. Coupling between cavities is not controlled in vehicle designs and must be considered if radio connectivity is to be ensured. This paper will describe research being earned out at the Universities of York and Nottingham in measuring and modelling the performance of wireless networks in reverberant environments using the Zigbee system as an example. [C756]

"Radio wave propagation in smart buildings at long wavelengths"

A collection of slides from the author's seminar presentation is given. The paper is about propagation through air aperture in a PEC plane can be modelled by ray-tracing or PO method. A hybrid model combining ray-tracing and CST can model propagation through FSS and is more efficient. The proposed hybrid model can be used to predict radio wave propagation in large scenarios as an efficient tool and examine the impact of the FSS on 'smart' buildings. [C757]

"Indoor radiowave propagation for UWB wireless communication systems"

Radiowave propagation characteristics inside a modern office electromagnetic environments (EME) were experimentally investigated. To this end, reflection and transmission parameters across a 2.5 GHz bandwidth (including both GSM and ISM bands) were measured across a scanned volume between a fixed transmitting antenna and a mobile receiver. [C758]

"Interferometric Radiometers: Fringe Washing Function Estimation"

This paper summarizes the procedure to estimate the Fringe Washing Function shape. Several tests were conducted at the Maxwell anechoic chamber at ESA-ESTEC facilities on spring 2007. A wrap-up of theoretical and experimental results after data analysis is presented. [C759]

"Radar Volume Backscatter from Spatially Extended Geophysical Targets in "Slice" Approach"

Assessment of the radar backscatter from spatially extended geophysical target (SEGT) is under consideration. The SEGT is any geophysical object which is, at least, semi transparent for radar illumination (cloud, rain, snowfall of the atmosphere, thick snow cover of a terrain). It consists of a multitude of point Rayleigh scatterers. The "slice" approach is applied, it means that particles located close to the wave front of the radar illumination produce the backscatter mainly coherently. This approach allows describing the contribution of the microphysical parameters of the scattering media to volume component of the radar cross section (RCS) more comprehensively then the incoherent approach. Known result of the incoherent approach based on summation of RCS from each scatterer takes place in particular case when the fluctuation of particle number within slices is pertaining to the Poisson law. [C760]

"Simulation study for effects of attenuation and interference in cellular mobile systems with application to UAE"

This paper presents a performance study for the effects of attenuation and interference on cellular mobile systems. UAE terrain examples are chosen to perform the numerical analysis and simulation which is based on Okumura-Hata and ITU-1546 propagation models. Simulation results presented demonstrate the effect of different terrain on the field strength, as well as the effect of co-channel and adjacent channel interference. Results of this paper are helpful in the successful design of cellular mobile systems. [C761]

"Electro conductive concrete"

The author presents a collection of slides which cover the topic of: shielding by concrete and its effect on mobile radio communications. Measurement methods are also considered. [C762]

"The Role of Propagation Effects in Airborne RF Communication Systems Design"

Recent years have seen the emergence of Unmanned Aerial Systems performing roles that use various Radio Frequency (RF) systems. Thus, there is a need to use accurate and broadly capable signal propagation models to capture multi-path effects as well as atmospheric effects in system requirements analysis. One such model, the Variable Terrain Electromagnetic Parabolic Equation (VTRPE) model, enables the required analysis for a wide range of applications. The work presented in this paper uses VTRPE to analyze signal propagation in multi-path environments and places the results in a system design context drawing conclusions to aid in airborne RF systems design. [C763]

"A new generic model for signal propagation in Wi-Fi and WiMAX environments"

The ability to accurately predict radio propagation behavior for wireless communication systems, such as cellular mobile radio, is becoming crucial to system design. Since site measurements are costly, propagation models have been developed as suitable, low-cost, and convenient alternative. In this paper, we will propose a new generic signal propagation model for Wi-Fi and WiMAX environments. To develop this model we used existing models which are classified as: Free space models and land propagation models. This includes different types of loss: path loss, slow fading (shadowing) and fast fading. Our aim is to have a flexible model to be applicable in indoor and outdoor environments. Experiments carried out for indoor Wi-Fi and outdoor WiMAX cases have shown excellent results for the proposed model. [C764]

"A greedy approach to beacon placement for localization"

The need for location aware applications is increasing with the popularity of ubiquitous computing. Localization which is the process of estimating the location of a node is an important building block in these location aware applications. In a typical localization technique, beacons whose locations are known a priori, acts as reference in estimating the location of user nodes. It has been observed that the placement and density of these beacons have strong impact on the accuracy of localization. The intuitive approaches-uniform and dense beacon placement will not suffice in practical situations due to the presence of nonuniform obstructions and self interference of beacons which results in non-uniform signal propagation error. The effect of beacon density on localization error is characterized as decrease in error with increase in beacon density up to a point termed as threshold density and there after the effect is minimal. The number of beacons that will be in range at this threshold density is threshold degree muthresh. To address the problems of uniform and dense placement, we will present a novel beacon placement algorithm in this paper which uses greedy approach, to achieve threshold degree condition at all points and observed an improvement in accuracy over uniform placement. [C765]

"Use of reverberation chamber to simulate the power delay profile of a wireless environment"

Multipath propagation environment effects, such as frequency-selective fading, have a strong impact on the quality of a wireless channel. For example, multipath can impact bit error rate (BER) differently from Gaussian noise. For testing wireless devices/systems in these multipath environments it is imperative to have a reliable, controllable, and statistically repeatable measurement facility. The purpose of this paper is to illustrate how the reverberation chamber can be used to simulate different multipath propagation environments. Channel characteristics such as power-delay profile, RMS-delay spread, and the Rician K-factor are examined. Results for different chamber configurations (e.g., loading of the chamber, antenna positions, etc.) are compared and their effects discussed. Results achieved inside a chamber are compared with those obtained in an actual industrial environment. [C766]

"Gaussian Random Fields as a Model for Spatially Correlated Log-Normal Fading"

Slow fading or shadowing on a wireless channel is commonly modeled by stochastically independent, log-normally distributed random variables. However, as slow fading is caused by buildings and large size obstacles, spatial correlations occur. In this paper, Gaussian random fields are used as a model for correlated slow fading in urban environments. An exponential correlation function is employed. The according parameters are estimated from path gain predictions by an accurate ray-optical propagation algorithm, named CORLA. Furthermore, a multidimensional model is suggested to describe correlated shadowing of the path gains from different base stations to a single receiver. [C767]

"Indoor Propagation Measurements for Performance Evaluation of IEEE 802.11g"

Using indoor propagation measurements, the throughput performance of an IEEE 802.11g wireless local area network (WLAN) under different received signal strength (RSS) values is investigated. By using a pair of wireless laptops and an access point (AP) we conducted several experiments involving IEEE 802.11g computer links, which were carried out in an obstructed office block at the AUT University within the School of Computing and Mathematical Sciences office building. Results obtained show that the link throughput of an IEEE 802.11g is not always increasing with RSS in an obstructed office building. [C768]

"The application of OFDM in digital multimedia broadcasting"

The paper considers the application of orthogonal frequency division multiplexing (OFDM) techniques in the physical layer of a satellite system devoted to the provision of digital multimedia broadcasting (DMB) services, which are presently the focus of extensive research and development endeavours. In particular, the paper demonstrates that the inherently high spectrum efficiency of OFDM can be retained even in unfavourable propagation channels affected by heavy non-linear and linear distortion, respectively introduced by the on-board high power amplifier and by multi-path propagation. This encouraging performance is achieved through the proper design and application of coding and predistortion techniques, as described in the paper. [C769]

"Some preliminary short-range transmission loss measurements for wireless sensors deployed on indoor walls"

Antenna characteristics and propagation are of fundamental importance to the coverage, capacity and service quality of all wireless communication systems. This paper presents short-range narrowband propagation measurements at 2.445 GHz for sensor network applications in an indoor environment. The effect of sensor node location on a wall has been determined for a pair of linearly polarised rectaxial antennas and a pair of ceramic patch antennas. Propagation loss has been measured as a function of (i) node separation (i.e. link length), (ii) node drop (i.e. vertical displacement of nodes below the ceiling) and (iii) node height (i.e. the perpendicular displacement of the nodes from the wall surface). It is observed that there is no significant effect of wall offset. In addition, the path loss exponent n generally increases with decreasing node drop. [C770]

"A New Model for Predicting the Characteristic of RF Propagation in Rectangular Tunnel"

This paper presents a new model based on the geometrical-optical theory and the uniform theory of diffraction (GO-UTD) for predicting the characteristic of RF propagation in rectangular tunnel. It transforms three-dimensional (3D) propagation model of radio signal in tunnel to two-dimensional (2D) propagation model, which could be easily tackled. Simulation results compared with another prediction model (Wireless Insite) show that this model can accurately predict the narrow band propagation characteristic of radio signal in rectangular tunnel. Moreover, it reduces the computational complexity greatly and improves the efficiency of prediction. [C771]

"Combined Linear Regression and Simplex Method for Signal Strength Based Indoor Position"

This paper focuses on the location of the signal strength, and introduces the simple signal propagation model and an empirical model based on linear regression which is suitable for non-visible environments. Based on the two models, the object position is solved by simplex method. The simulation results demonstrate the proposed indoor positioning method using linear regression method and simplex method has good positioning performance. [C772]

"A mitigation of line-of-sight by TDOA error modeling in wireless communication system."

In this paper, TDOA (time difference of arrival) measurements from pilot signals of a wireless communication network is proposed to solve the navigation problem in the case that under the environments that each BS(base station) have NLOS(non-line-of-sight) error. TDOA measurements are known to have poor accuracy due to technical limitations of a communication system and propagation environments. The major error source of TDOA is the NLOS. NLOS propagation error occurs when a direct LOS(line-of-sight) path between an MS(mobile station) and a BS(base station) is blocked by some obstacles. To mitigate the NLOS error in a cellular network, TDOA error modeling is used for each BS channel. And then, remove NLOS error from each measurement. Some simulations and real tests are conducted to evaluate the performance of the proposed methods. Real experiments are conducted at the city center of Seoul. A commercial GPS cellular phone and a QXDM program are used. And then, TDOA measurements are measured. Test results show that the proposed methods continuously provide subscribers a reasonably accurate location under the NLOS environments. [C773]

"Multi-dispersive channel characterization for radio localization-based rescue search"

This paper describes the results achieved by various experimental campaigns aimed at characterizing the directional propagation channel in DCS/UMTS band (1.9 GHz) in indoor and forest areas for similar antenna heights at both ends. These experimental results are useful in the context of pedestrian radio-localization systems relying on cell phone signals. Wideband data, are used to model the channel through various parameters: pathloss, shadowing, fading statistics, delay and azimuth-spreads. For indoor scenarios, path-loss exponents range from 1.4 to 2.2, while the shadowing, temporal K-factor, delay- and azimuth-spreads are found to be lognormally distributed. The RMS delay-spread ranges from 9 ns to 95 ns, whereas the azimuth-spread ranges from 20 to 140 degrees. In forests, the delay-spread, ranging from 60 to 120 ns, is strongly anti-correlated with the temporal coherence, and increases with transmit-to-receive distance. The azimuth-spread remains limited, with average values around 15 degrees. [C774]

"Algorithms of signals processing in radio acoustic systems"

The algorithms of radio acoustic system signal processing constructed with allowance for a radiowave transformation in the channel and making it possible to perform qualitative measurements of atmosphere parameters not only with the fulfilled Bragg condition but with q ne 0 (q is a parameter of the Bragg condition disruption) and complex sonic pulsed radiation, are synthesised in this work. [C775]

"Diagnostics of the troposphere refraction by the signals of TV centers and satellite radiation"

Comparison of signals from TV centers on over the horizon route in a penumbra region and radiation from satellites of a global navigation system is carried out. Classification signatures are proposed which allow forecasting troposphere refraction state on propagation route at a signal change receiving from TV center or a satellite. [C776]

"Enhanced Signal-Strength-Difference Position Method Based on an Inversion Propagation Model in Cellular Network"

This paper develops a simple and efficient position method based on relative signal-strength prediction, which can be got from an inversion propagation model in cellular networks. The inversion propagation model can predict the propagation loss between any two points along the virtual propagation path from the base-station to mobile-station, which precision has been presented in. So the user's location can be predicted by matching the average signal-strength-difference of the neighboring list in the mobile phone to the coverage prediction differences from multiple base-stations in the appointed area. The effectiveness of the proposed method has been demonstrated by using experiments under various radio environments in Guang Dong, China. It was shown that the enhanced signal-strength-difference position method can locate the user with about the accuracy of 150 m in 67 percentage and 300 m in 92 percentage respectively. Despite the result not meeting Federal Communications Commission (FCC) requirements, this method proved to be sufficiently simple and efficient in terms of the computation at burden and network signaling load. [C777]

"A Proposed Propagation-Based Methodology with Which to Address the Hidden Node Problem and Security/Reliability Issues in Cognitive Radio"

A highly accurate, fast and robust integral equation-based propagation method is presented here. It is explained how this method, in conjunction with a radio environment mapping server can be used to address the dasiahidden node problempsila and salient security/reliability issues in cognitive radio (CR) by accurately quantifying the effects or CR transmissions in realtime thus allaying the legitimate concerns of primary users regarding the deployment of CR technology. A roadmap for the development of the propagation method is given such that sufficient accuracy and execution times can be achieved. [C778]

"Performance of a Turbo-Coded CDMA-Based Modulation for Mobile Satellite Systems"

The performance of a satellite systems depend on the propagation mode of the radio waves. The nature of satellite channel is one of the biggest obstacle facing the design of communications systems. This characterised satellite channels by fading and interference. Moreover, satellite communication systems are limited by available transmitting power and bandwidth. Signal power could be reduced while maintaining the same quality of service (QoS). This can be achieved by channel encoder techniques using forward error correction (FEC). Turbo codes is one of the efficient error control codes currently available. The combination of turbo codes and code division multiple access (CDMA) could improve the system performance especially in a multiuser environment. This paper presents the simulation results of turbo codes and CDMA performance on mobile satellite communication channels. [C779]

"Pulse design for maximizing SIR in partially equalized OFDM/BFDM systems"

Mobile wave propagation undergoes severe distortions caused by inter symbol interference (ISI) and inter carrier interference (ICI), which are due to multipath and high mobility. OFDM/BFDM techniques have a good ability to overcome ISI limiting quality effects whereas ICI can be increased for severe Doppler spreading. In this paper, we study the use of well localized time-frequency pulse shaping to reduce the effect of these interferences. The linear combination of several of the first most localized Hermite waveforms enables the design of an optimal transmit/receive pulse. By subtracting the interferences coming from some neighborhood symbols that will be treated by a partial equalization scheme, considerable gain in the signal to interference ratio (SIR) is achieved. With a reduced complexity OFDM system, partial equalization of the interference coming from 2-frequency neighbor symbols results in a gain of about 20 dB in the SIR, at high spectral efficiency and severe channel spreading. More gain in the desired ratio is achieved by optimizing the time-frequency spacing of the underlying lattice. [C780]

"Propagation characteristic prediction method confirmed by propagation measurement for indoor MIMO cooperative transmission systems"

In this paper, to evaluate the basic performance of MIMO cooperative transmission systems, a simple prediction method which calculation complexity is decreased for evaluating indoor MIMO cooperative transmission is proposed. 5.2 GHz indoor MIMO propagation measurements are carried out in line of sight condition. And the frequency utilization efficiency and eigenvalues are evaluated by measurement data. Simple prediction method of MIMO channel matrix, which takes into account the phase difference of direct waves based on the antenna position, is used to simulate the MIMO channel. The simulation results are then compared to the measurement results. Based on this comparison the proposed prediction method can accurately estimate the characteristics of indoor MIMO cooperative transmission systems. [C781]

"Impact of mobility pattern on epidemic propagation in wireless networks"

The physical topology of a wireless ad hoc network has a great impact on not only the performance of the algorithms developed for such networks, but also on the robustness (i.e., vulnerability to attacks or node failures) of the network. In this work, an empirical study on the impact of mobility on the epidemic (e.g., worm) propagation is provided, where topology-dependent and independent mobility models are compared in terms of infection (compromise) propagation among nodes. Results show that if there is no node recovery (i.e., no patches), for some mobility models whole network can be compromised in a short amount of time with infection rates less than 0.01 for even sparsely-connected ad hoc wireless networks. If there is recovery an epidemic might arise depending on the infective time durations and infection rates. [C782]

"Deficiencies of common MIMO channel models with regard to indoor Line-of-Sight channels"

Different multiple input-multiple output (MIMO) channel models are analyzed with regard to the indoor line-of-sight (LOS) MIMO channel. In the literature this channel is proven to achieve high capacities while being highly correlated. The modeling results from physical as well as analytical models are compared with measured channels, showing that none of the established models is exactly suitable for the considered indoor LOS MIMO channel. However, there is a promising approach that applies an extended Saleh model in conjunction with the physically correct spherical wave propagation. Although in its current state this basic approach cannot be regarded as a complete MIMO channel model, at least it provides an adequate origin for the correct prediction of MIMO capacities in different types of LOS channels. This is due to the fact, that the crucial prerequisites for an appropriate LOS MIMO channel model, which are by name the application of the physically correct spherical wave propagation, the correct modeling of the high correlation in LOS channels and the inclusion of the geometrical antenna setup, are regarded correctly. Contrarily, these prerequisites are included in none of the current models that are widely accepted in MIMO radio communications nowadays. The proof of this statement using measured data is a major objective of this paper. [C783]

"Computing the Receive Spatial Correlation for a Multi-Cluster MIMO Channel Using Different Array Configurations"

Spatial correlation among received signals has a significant impact on the performance of a multiple- input multiple-output (MIMO) system. In prior research, expressions were derived for the spatial correlation between the signals received at a uniform linear array (ULA) by assuming that the propagation environment has a single cluster, low angular spread or that the received rays arrive only along the broadside of the array. In this paper, analytical expressions are derived for the spatial correlation between the received signals of a ULA and uniform circular array without making any of the above mentioned assumptions. The derivation can be extended to suit

most planar antenna array configurations. This makes the derived expressions valid for most practical propagation channels. Finally, we show using simulations that the derived expression evaluates spatial correlation more accurately than the existing models. [C784]

"Multipath DOA and fading coefficients estimation using fourth-order cumulants"

In this paper, a novel method based on fourth-order cumulants (FOC) is proposed to estimate the direction of arrival (DOA) and fading coefficients in multipath propagation. Firstly, we exploit the FOC to estimate the generalized steering vectors, and then the DOA of signals in each coherent group can be estimated separately. Afterwards, we can calculate the fading coefficients directly with the generalized steering vectors and DOAs. Furthermore, the estimated DOAs and fading coefficients can be utilized to further improve their estimations. The maximum number of resolved signals by our method can largely exceed the number of array elements with good performance. Simulation results validate the effectiveness and efficiency of our method. [C785]

"Modelling the Relative MIMO Gain"

The relative MIMO gain (RMG) is introduced as the ratio of the multiple input/multiple output capacity of a radio channel over its single input/single output one. In this paper, a statistical model is developed to approximate the distribution of the RMG, so that it can easily be incorporated into system-level simulators. A set of scenarios has been defined with different antenna configurations, for distances between 10 and 2400 m. The different antenna configurations range between 2 and 16 transmit and/or receive elements. The distribution of the RMG, presented here, is extracted from simulation results. The distribution of the RMG is modelled by an inverse Sigmoid function, which is determined by its mean value and standard deviation. The obtained model is assessed by simulation results, which shows a good fit for most of the cases. The model has a relative mean error of less than 6%, and a relative mean square error of less than 7.5%, for all antenna configurations and distances, compared to the simulation results. [C786]

"Doppler Spread and Coherence Time of Rural and Highway Vehicle-to-Vehicle Channels at 5.9 GHz"

An experimental study of the Doppler coherence time properties of Vehicle-to-Vehicle (V2V) wireless channels at 5.9 GHz in both rural and highway environments is presented. Simultaneous RF and mobility measurements were conducted in environments near Pittsburgh, Pennsylvania. The average Doppler spread was observed to depend linearly on effective speed, defined as the square root of the sum of the squares of the ground speeds of the two vehicles. Sample spectrum is analyzed and comparisons with the double-ring models are presented. The coherence time was observed to vary inversely with effective speed, as expected. In addition, the coherence time was observed to decrease with vehicle separation out to about 100 m, followed by a relative peak at about 200 m. A possible interpretation of this peak in terms of a two-ray propagation model is presented. The observed Doppler spread should not be a problem for proposed V2V OFDM signal transmission formats, but the channel coherence time is much shorter than a typical packet suggesting that present equalization schemes may not be adequate. [C787]

"A Linear Least Square Method of Propagation Model Tuning for 3G Radio Network Planning"

Propagation model is the basic of radio network planning in mobile communication system. It is related with the rationality of network planning directly whether the propagation model is exact or not. In order to obtain the radio propagation model reflecting propagation characteristic in Chinese city environment, and then direct radio network planning of the third generation (3G) communication system rather better, a simple linear-iterative tuning method based on linear least square theory is proposed in this paper. This method depends on existed tuning methods and radio propagation testing data of a certain city. Furthermore, using this method can obtain exact outdoor propagation model fitting for 3G system. Results of experiment show that the calculating complexity is reduced obviously. When it is used to model tuning in small and medium-sized city, the average error of forecasting data calculated by tuned model reduces by 14 dB. The veracity of propagation model is advanced greatly. [C788]

"Scalable and Efficient Graph Colouring in 3 Dimensions Using Emergence Engineering Principles"

This paper describes ways in which emergence engineering principles can be applied to the development of distributed applications. A distributed solution to the graph-coloring problem is used as a vehicle to illustrate some novel techniques. Each node acts autonomously to color itself based only on its local view of its neighborhood, and following a simple set of carefully tuned rules. Randomness breaks symmetry and thus enhances stability. The algorithm has been developed to enable self-configuration in wireless sensor networks, and to reflect real-world configurations the algorithm operates with 3 dimensional topologies (reflecting the

propagation of radio waves and the placement of sensors in buildings, bridge structures etc.). The algorithmpsilas performance is evaluated and results presented. It is shown to be simultaneously highly stable and scalable whilst achieving low convergence times. The use of eavesdropping gives rise to low interaction complexity and high efficiency in terms of the communication overheads. [C789]

"Tesla's multi-frequency wireless radio controlled vessel"

A review of the Teslapsilas contribution to dual-band wireless radio controlled vessel is presented. The intention of this paper is to describe multi-frequency remote controlled vessel using two transmitters and which operate a distant receiver which comprises two or more circuits, each of which is tuned to respond exclusively to the signals of one frequency and so arranged that the operation of the receiver is dependent upon their conjoint or resultant action. [C790]

"An evaluation of two swarm intelligence MANET routing algorithms in an urban environment"

We study through simulation the performance of two swarm intelligence MANET routing algorithms in a realistic urban environment. The two algorithms, ANSI and AntHocNet, implement the swarm intelligence paradigm for routing in different ways: while ANSI applies a reactive approach in which ants are only sent out when no route is available between the source and destination of a communication session, AntHocNet integrates reactive and proactive mechanisms whereby the algorithm sends out ants at regular intervals during the entire duration of running sessions in order to continuously adapt and improve existing routes. The two swarm intelligence routing algorithms are compared to AODV, a state-of-the-art reactive algorithm, and OLSR, a state-of-the-art proactive algorithm. Our objective is to investigate the usefulness of the different approaches adopted by the algorithms when confronted with the peculiarities of urban environments and the requirements of real-world applications. At this aim we define a detailed and realistic simulation setup. We model node mobility by limiting node movements to the streets and open spaces of town, use a ray-tracing approach to model the propagation of radio waves, and investigate different kinds of interactive data traffic patterns, ranging from SMS messaging to VoIP communications. [C791]

"Practical Results of Hybrid AOA/TDOA Geo-Location Estimation in CDMA Wireless Networks"

This paper describes a hybrid AOA/TODA mobile station (MS) location estimation method based on the CDMA wireless communications signals. The method utilized estimates the angle of arrival (AOA) and time difference of arrival (TDOA) of downlink pilot channel. In this paper, signal parameter estimations including AOA and TDOA, and position estimation challenges in real wireless communications systems are denoted. For position estimation, the mathematical model and its linearized model for a hybrid TDOA/AOA method based on the Taylor series expansion are derived. The performance analysis of the high-resolution MUSIC angle and double delta delay estimators using field measurements from a typical outdoor IS-95 CDMA radio propagation channel are demonstrated. In this paper, practical considerations on the implementation of a standalone positioning system are described. The performance of TDOA and hybrid AOA/TDOA positioning system when the receiver has access to minimum LOS signals are compared. [C792]

"Performance Evaluation of Cooperative Relaying Networks Using 3D Ray Launching Method for Wireless Propagation Prediction"

Cooperative relaying is a promising technique for multihop wireless networks to exploit spatial diversity. Most of the studies of multihop relaying assumed a simple i.i.d. Rayleigh fading model. In this case, there is no correlation of phase and amplitude among the received signals. However, this assumption is not always fulfilled in practice. For instance, the transmission distance in multihop wireless transmission is supposed to be a close range and the shadowing effect needs to be taken into account. The ray launching method based on geometrical optics is a technique for estimating a deterministic propagation channel. In this paper, 3D ray launching method is used for wireless propagation prediction. By computer simulations, the performance of 2-hop cooperative relaying with two relay stations is investigated. The simulation-based performance analysis confirms that the cooperative relaying scheme has an advantage of diversity gain thus improving the bit error ratio performance. [C793]

"The benefits of directional antennas in heterogeneouswireless ad-hoc networks"

Basic properties of wireless ad-hoc networks, such as connectivity, have traditionally been analyzed and evaluated under the assumption that all nodes have homogeneous communication capabilities. While this assumption usually holds for small networks, it is unlikely to be true in most large scale networks. This paper studies how heterogeneous communication capabilities affect basic properties of ad-hoc networks. More

specifically, we consider one type of heterogeneity in which nodes are equipped with two different types of antenna technologies, omni-directional and directional, and evaluate them against four properties: network connectivity, energy consumption, interference tolerance and resilience to failures. Our main results show that even under a very simple network model that does not assume any global knowledge of the network, an ad-hoc network where only 10% to 20% of the nodes are equipped with directional antennas, can outperform a comparable homogeneous network (where all nodes have only omni-directional antennas) in all four metrics. [C794]

"Decoupling Estimators in Mobile Cooperative Positioning for Heterogeneous Networks"

Positioning in wireless communications represents nowadays an important topic in the research community. The main reason is the increasing number of new location based services available on the market. Since some types of these services require accurate positioning information, research has evolved in the direction of overcoming the adverse propagation effects that commonly degrade accuracy of positioning solutions. One approach to overcome propagation effects is to consider cooperative schemes where close-by users share information regarding their links. However, due to the coexistence of numerous technologies, heterogeneity and interaction between technologies shall be regarded as an additional problem. This paper proposes and analyzes a positioning framework for cooperative schemes, which is specifically beneficial for scenarios with heterogeneous link technologies. [C795]

"Investigation of electromagnetic field structure in the near-field region of antenna"

It was shown that simplified methods of antenna properties analysis usually do not fully describe characteristics of electromagnetic processes especially when considering the near-field region of the antenna. With the help of the generalized induced EMF method the main characteristics of simple wire antennas were calculated and the peculiarities of the structure of electromagnetic field in the near-field region are investigated. The clear visual interpretation of the investigated phenomena taking place when the electromagnetic waves are radiated is proposed. [C796]

"Studying of possibility of determination of parameters of hydrometeors using radiosignals of geostationary satellites"

Possibility of using of radiosignals of geostationary satellites for the determination of parameters of hydrometeors has been studied. The method and results of experimental investigations have been presented. Conclusions about the ecological safety and possibility of wide use of the method have been made. [C797]

"Impact of the ionospheric and atmospheric irregularities on the navigational satellites signals propagation"

The model of small scale fluctuations of the troposphere and lower stratosphere, incorporating previously published observational data, is proposed. Numerical simulations of the signal propagation of the global navigational satellite system (GPS) through the fluctuations of lower atmosphere are performed. Corresponding errors in the refractivity height profile, reconstructed by the radio occultation technique, are estimated. Oblique reflections of the waves from the ionospheric sporadic layers are simulated. Impact of the small scale fluctuations of the ionospheric plasma is discussed. [C798]

"Troposphere diagnostics on satellite radiosetting"

Work contains the analysis of possibilities of determination of troposphere refraction index gradient on the height and distant attenuation factor gradients of UHF radio signal in shadow or half-shadow area of the radio-occultation satellite path. The simplified relations are used for calculation. It is determined, that diagnostics on the height attenuation factor gradient is more effective. [C799]

"Results of comparing between experimental observations of Schumann resonance and the OTD-model of world thunderstorms"

The experimental results on Schumann resonance monitoring are compared with OTD-model of global thunderstorm activity. [C800]

"Some notes on transmission line representations of Tesla's transmitters"

In this paper, we present a transmission line representation of various Teslapsilas oscillating transmitters and of propagation based on ldquotrue conductionrdquo, a Teslapsilas concept of non-Hertzian wireless transmission.

We follow bits of Teslapsilas papers, mainly ldquoThe True Wirelessrdquo, from which is obvious that his theory is in essence compatible to the transmission line theory, and compare results obtained by the model and those given by Tesla, as well as predict some theoretical characteristics of his resonating coils. Although his conception of a more efficient radio transmission by ldquonon-Hertzian wavesrdquo has never been recognized exactly what he claimed it to be, his concept of radio apparatus prevailed as they were the first patented true radio systems. [C801]

"Modification of pole model for wideband responses of distributed structures"

For more effective approximation of wideband responses of the distributed structures the necessity of a modification of pole model is shown. Refinement of the model for the account of beam propagation in an open distributed structure and for the account of frequency dependence of the model parameters is suggested. Efficiency of the considered approach is demonstrated on the numerical example. [C802]

"Experimental research of field structure in microstrip line using the method of magnetic probe on the basis of ferromagnetic resonance"

The method of magnetic probe on the basis of ferromagnetic resonance for electromagnetic field structure investigation in microstrip line is presented. Magnetic components of electromagnetic field with circular polarization of left-hand and right-hand rotation above and inside the dielectric were measured. Using the known algorithm, magnetic field components were determined. [C803]

"Short-term forecasting of the likelihood of interference to groundwave users in the lowest part of the HF spectrum"

In the design and performance evaluation of practical HF communication systems, it is essential to use procedures that assess the detrimental effect of interference from other users in a near real time mode. These procedures can extend system capability to estimate interference background, in the context of real time channel evaluation (RTCE) in order to advise operators on typical interference occupancy levels and to improve the quality and reliability of radio communication services through adaptation of communication parameters. In this study a Neural Network approach is proposed for the short-term forecasting of the likelihood of interference experienced by HF groundwave communication systems. In particular this paper describes the development of neural network models to indicate the degree of spectral congestion in frequency allocations in the lowest part of the HF spectrum (1.6 to 4 MHz) 1 hour in advance, as a function of the present congestion level, time of day, season, and field strength threshold. The modeled parameter, congestion, is defined as the relative number of narrow frequency channels (1 kHz wide) within a frequency allocation that have signals above a given threshold. [C804]

"Modelling the radio wave propagation in the troposphere with Discrete Mixed Fourier method"

Application of the discrete mixed Fourier transform method to solve the narrow angle parabolic equation with impedance boundary condition is presented, and this method is used to investigate the properties of radio propagation in atmospheric duct. In the process of discretization of auxiliary function, traditional central difference formula is replaced by backward difference formula, this make the numerical results more stable. The research lays the theoretical foundation for studying the radar detection performance, radar detection shadow zone and forecast of atmospheric duct. [C805]

"Study on scintillation of radio wave propagation through the ionospheric irregularities"

The parabolic equation which the radio wave propagation through the ionospheric irregularities was established in this paper. The Rytov and Markov approximation method was used to solve it. Derived the scintillation index of radio wave through the ionosphere. And the results was analyzed by used the power-law spectrum. The result shows that the high or low of the radio frequency, the thickness of the electron density irregularity, the inner and the outer scale, the spectral index and the variance of the fluctuation of the electron density are all have a effect on the scintillation index of radio wave final, the theoretical results of the scintillation index were compared with the experimental one. [C806]

"MUF variability at Haikou, China"

By using the ionosonde data at Haikou, China over the time period of 1996-2006, this paper analyses the diurnal and seasonal behaviour of the ionospheric MUF variability at low latitude. Data used in this study are the critical frequency foF2 and the propagation factor M(3000)F2 with hourly interval resolution. Four parameters including upper quartile(Qup), lower quartile(Qlo), monthly inter-quartile(DeltaMUF) and their percentage

ratio(DeltaMUF(%)) to the monthly medians are used as quantitative measurement of the MUF variability in diurnal and seasonal study, where in the latter the seasonal averages of these quantities are calculated for winter, equinox and summer, separately. Our study shows: (1)MUF values and their variability are greatly affected by foF2 values and their variability. (2)Instead of falling off after sunset, in high solar active years MUF values remain large until the next early morning. (3)Both MUF Qup and Qlo have the similar trends as those of their corresponding monthly medians. However, the departure of Qup and Qlo from the monthly medians is not symmetric. (4)For the DeltaMUF(%) parameter, the variability is much lower during daytime than nighttime, and the maximum variability appear in the pre-sunrise generally. (5)The seasonal averages of DeltaMUF(%) from 1996 to 2006 are of difference in magnitude in different season. The variation range fluctuates from 18.1% to 49.0% in winter, from 18.4% to 46.2% in equinox and from 17.6% to 39.7% in summer respectively. It is also shown that the seasonal averages of the DeltaMUF(%) is usually smaller in equinox than in winter and summer, except that in pre-sunrise time when they are larger in summer. [C807]

"A low profile dual-band inverted L antenna with slotted electromagnetic band-gap (EBG) structures"

The reflection phase feature of an EBG structure which has two different in-phase reflection phase features is studied in this paper. This EBG structure is applied as high impedance ground plane (HIP) to a low profile inverted L antenna. The simulation results show that due to the EBG structure, the inverted L antenna can operate at dual-frequency bands and have the characteristic of low profile. [C808]

"Multiple scattering of HF skywave radar signals: Physics, interpretation and exploitation"

HF radar signals rely on the ionosphere to achieve over-the-horizon surveillance, but this is obtained at the expense of subjecting the signals to a diverse range of scattering and modulation phenomena. Many of these effects are associated with multiple scattering, both in the ionosphere and near the earthpsilas surface. This paper reviews a variety of multiple scattering phenomena and shows how an understanding of the physics enables the radar echoes to be interpreted so as to extract information about targets and the environment. Particular attention is focussed on (i) scattering from small scale plasma irregularities, which can be used to classify propagation modes and thus improve target tracking, and (ii) scattering from the sea surface, which can be exploited for optimising radar ship detection performance as well as a range of remote sensing applications. [C809]

"Modeling surface layer turbulence effects at microwave frequencies"

The paper describes two approaches to model surface layer turbulence effects in a marine environment on microwave frequencies. One of the techniques is implemented within a hybrid ray optics parabolic equation model called the advanced propagation model (APM) and is based on a Monte Carlo approach. The second method is a direct computation of the log-amplitude variance of the signal. Predictions from the APM are compared against radio data taken during the rough evaporation duct (RED) field campaign, where radio data was collected at 3 GHz, 10 GHz, and 17 GHz. Turbulence effects were observed at the highest frequency of 17 GHz. [C810]

"Indoor Access Points Location Optimization Using Differential Evolution"

Wireless indoor positioning systems have become very popular and attractive in recent years. These systems have been successfully used in many fields such as asset tracking and inventory management, and location fingerprinting schemes are the most promising technique because of technical restrictions. However, how to optimize the location of access points to improve the positioning accuracy is still a challenging and difficult problem because of the complexity of indoor radio propagation environments. In this paper, we firstly discussed the indoor radio propagation model and proposed a novel optimization model for access points location optimization in which the Euclidean distance of received signal strength array among all the sampling points should be maximize in order to increase the differentia and diversity of the signal strength array, and thus improve the positioning accuracy of location fingerprinting schemes. Then we presented the Differential Evolution algorithm which was used to optimize the proposed problem, and the experimental testbed, experimental results and analysis were discussed. Experimental results show that the proposed model for access points location optimization can improve the positioning accuracy remarkably. Finally, we summarized the paper and gave possible future directions for research on access points location optimization for indoor environments. [C811]

"Earth equivalent conductivity inversion based on immune clonal computation"

At present, earth conductivity is a key factor which influences the calculation accuracy of the correction value of low-frequency ground-wave propagation time delay. Based on the practically metrical data and academic

estimate method of time delay of low-frequency ground-wave propagation, this paper adopt the immune clonal computation method to inverse the earth equivalent conductivity of the propagation path. Contrast immune monoclonal selection algorithm (IMCSA) and immune polyclonal selection algorithm (IPCSA) with genetic algorithms (GA), the simulation results show that the IPCSA has better stability and higher precision. [C812]

"The effect of electromagnetic environment of high-voltage transmission line and ubstations on electronic equipment test"

The electromagnetic environment of high voltage transmission lines and substations as well as its influence on electronic equipment test are researched. And the electromagnetic scatter caused by high voltage power lines and substations is mostly analyzed. The radiowave propagation affected by substations is tested, which is shown that the effect of vertical polarization caused by substations is much more serious than single transmission lines. [C813]

"Spatial stability in indoor radio propagation channels"

Indoor radio channel responses are composed of multipath components with short spatial areas of stability. Measured channel responses are analyzed to extract a representation of the channel that is based on multipath components with a finite extent in space, i.e. over receiver locations. This representation of the channel is compared with a classical representation based on multipath components that are apparent in receiver locations along a one-meter rail. We show that the former representation is superior. [C814]

"Measurement and Modeling of RFID Propagation Channel with in an Indoor Environment"

The radio frequency identification (RFID) technology was automatic identify becomes was essential in the service an indoor environment such as contactless smart card and libraries at high frequency in free space transfer function in wireless communication usually consider used Friss's formula for analysis. This paper the RFID propagation channel at 2.45 GHz with indoor environment. The measurement result are evaluation by using Friis's transmission formula to find the magnitude and phase channel transfer function, path loss, and power delay profile. This technique is very useful for analyzed the signal strength and radio propagation loss of RFID transmission signal. [C815]

"Electromagnetic field of a vertical dipole on a non-perfect conductor coated with a negative-index medium"

The explicit formulas of the electromagnetic field produced by a vertical electric dipole in a negative-index medium coating a non-perfect conductor slab is derived. The contribution of three kinds of wave number to the total field is discussed and investigated. The wave-number of the surface wave is between the wave-number in the air and that in the negative-index media. Because the contribution of each types of wave varies with the medium parameters, the amplitude of total field as function of distance is complicated. [C816]

"Estimation of group path in oblique ionospheric propagation"

The ionospheric group path and other parameters are discussed in this paper. Relation between the group path and the receiver location has been illustrated. For oblique propagation, neglecting the geomagnetic field and electron collisions, the estimation model of the virtual height and the initial elevation angle are presented. The virtual height and the initial elevation angle are estimated from the group path. The group path estimated using the analytic model is in agreement with the measured results. It is observed that the ionospheric channel has equity to the transmitter and the receiver from the experiment results. The phenomenon is maybe significant for the HF communications. [C817]

"The microwave interferometer on J-TEXT tokamak"

A 2 mm microwave interferometer is developed to measure plasma electron density for the J-TEXT tokamak. The interferometer views the plasma vertically through a set of large diagnostic ports and the system is configured as a frequency-modulated interferometer. The interferometer routinely provides real-time feedback control for the gas injection system. [C818]

"Research progress on seismic radio sounding technology"

Electromagnetic monitoring methods are in good graces of the experts on short-term and immediate earthquake prediction. Radio sounding technology is one of the methods which has been studied for more than 10 years in Russia and Japan. The research has showed the functions in revealing the seism-ionospheric coupling

mechanism and earthquake prediction. Various ways of radio sounding technology to monitor the seism-ionospheric perturbations at home and abroad are summarized in the paper. The typical experiments methods in radio sounding technology are summarized in this paper. The research progress on mechanism of seism-ionospheric disturbances is concluded. The analysis methods of earthquake precursor information and the results in the study at two different frequencies are introduced contrastively. According to the deficiency of the research on radio sounding technology in China, the suggestions on future development are given. [C819]

"Rainfall Rate and Rain Attenuation Model in Bangkok Thailand"

This paper describes the measurement of rainfall rate at King Mongkut's Institute of Technology Ladkrabang (KMITL), Bangkok, Thailand, by using satellite signal from Thaicom5. Three years measurement of rainfall rate are presented. The experimental results indicate that the measured rainfall rate are 90mm/hr in 2005, 94 mm/hr in 2006 and 102 mm/hr in 2007. Moreover, we have developed new modify prediction model of rain attenuation by ITU-R rain attenuation model. The model provides for prediction of annual and for expected year to year variations. This model applied to collecte data compared with ITU-R model. From the results of prediction model at KMITL, we found that the highest rainfall rate 102 mm/hr in 2007 cause to signal attenuate 14.34 dB. [C820]

"Polarization characteristics of multiple-input multiple-output channels"

In this paper, we investigate the polarization characteristics of the multiple-input multiple-output (MIMO) channels. The cross polarization discrimination (XPD) is found to change over time, while its variation in frequency domain is relatively small. The probability density function (PDF) of the XPD follows a Gaussian distribution. Analysis and measurement results show that the polarization preserves better in the line of sight (LOS) scenario. In the case of non line of sight (NLOS) scenario, the polarization of the signals is destroyed due to multiple reflections, diffractions or scattering. The difference between the XPDs of the vertically polarized and horizontally transmission highly depends on the specific propagation environment between the transmitter and the receiver. Comparison of the capacity in different scenarios further shows that the polarization diversity gain is less in NLOS scenarios compared with that in LOS scenarios. [C821]

"Path Loss Model and Measurements of 5.8 GHz Wireless Network in Durian Garden"

This paper presents the path loss model and measurement of wireless network in durian garden at 5.8 GHz. This study is important in wireless communication system for predication and design the communication system of durian garden such as communication range, power transfer, position of transmitting and receiving antenna. From the results, it is obvious that the path loss at the distance of 128 m from the transmitter is less than -50 dB. [C822]

"Applied the artificial neural network for reduce the position error on GPS receiver due to ionospheric irregularities"

When the GPS signal pass through the ionosphere irregularities effect to rapid fluctuation of signal or scintillation occurred. This effect to the GPS receiver position error. This paper presents the error reduction of GPS receiver due to ionosphere irregularities by artificial neural network. The GPS position error depends on the strength of scintillation which measured in scintillation index or S4index which due to total electron content (TEC) in the ionosphere. We used the measurement data which include the S4index to analyze and correct the position error by artificial neural network. The result of this research we found the position error can reduce to less than 1 meter. The positions average close to correct position. [C823]

"Characterization of the wideband wireless channel in the context of DVB systems"

Recent radio systems (3G, DVB-T/H) present a wideband bandwidth possibly enlarging the capacity of the networks. The systems are interference-limited and thus an accurate radio network planning requires a refined characterization of the interference levels. A French research project called Semafor has been set up to investigate this characterization by means of two tools. First a hardware equipment is able to detect low interference levels by making use of antenna arrays and powerful algorithms. Second a coverage simulation tool is used. It is based on a propagation model able to estimate accurately large range echoes. System parameters like the interference level and SINR for DVB are simulated and validated by extensive measurement campaigns realized in the project with sophisticated testbeds. [C824]

"Essential factors influencing building penetration loss"

This paper investigates radio wave propagation into buildings illuminated from an outdoor base station with an antenna above the rooftop. Field strength measurements are taken in four buildings in urban microcells. Results

of the performed experiment as well as those of several other authors are analysed and the most important factors influencing building penetration loss have been discussed namely angle of incidence, external wall configuration, receiver height and significance of non-line-of-sight surface of the building. [C825]

"Hough transform based automatic pipe detection for array GPR: Algorithm development and on-site tests"

GPR is one of the most reliable instrument to obtain information on underground assets. Since its diffusion, many efforts have been made in order to overcome one the main limitations of this technology: the ldquohuman factorrdquo in data interpretation. Actually, operators have to look and interpret a huge number of radargrams. This requires an enormous effort, about 2 days are usually needed for analyzing radar data gathered from a 3000 m2wide site Some useful tools like tomography has been developed, but their quality and reliability is related to the migration algorithm which is heavily depending on knowledge of the propagation velocity of EM wave in the soil. Hyperbolas automatic detection algorithm reduces human factor in radar data interpretation and aims to strongly lower the amount of time needed for data analysis. The algorithm works on each radargram, recognizes the presence of target by looking for the hyperbolic patterns and marks them. Then the operator can correlate those results from different radar maps and extract the position of the underground assets. The algorithm also gives an accurate evaluation of the propagation velocity of EM waves in the soil, so this estimate can be used by migration algorithm in order to obtain an improved tomography. Using both Hyperbolas Automatic Detection and tomography, time needed to analyze a 3000 m2wide area can be reduced up to less than 4 hours. [C826]

"Using UWB Radios as Sensors for Disaster Recovery"

This paper considers the sub-problem of estimating the interior structure of a collapsed building by using embedded UWB radios as sensors. We created an extensive database of UWB propagation data through various building materials. Then, using this data and a novel algorithm, we demonstrate that we can indeed determine material type, thickness and cavity dimensions using UWB radios. This paper presents the algorithm and the evaluation results. As we show, for most common building materials such as concrete and reinforced concrete, the presented algorithm has a very small estimation error. [C827]

"Unfair Access Problem in Wi-Fi Hot Spots"

Internet access via Wi-Fi hot spots representing infrastructure Wireless Local Area Networks (WLANs) controlled by the IEEE 802.11 protocol [1] is very popular over the world. In the paper, we develop an analytical model to estimate Wi-Fi hot spot throughput, focussing on the problem of unfair access. The problem is caused by the signal capture and propagation loss phenomena, owing to which mobile terminals located near the Access Point (AP) can succeed in transmitting their packets in spite of possible collisions with terminals near hot spot borders. Consequently, the further a terminal is from the AP, the less portion of the network throughput it can use. The method developed in our paper allows finding optimal values of the protocol parameters to provide equal access opportunities for all terminals of the hot spot. [C828]

"On the Effect of Mutual Interaction between the Walls for Modelling Radio Propagation in Indoor Environment"

Study of radio-wave propagation into and through buildings has become important with the increase in the broadband mobile services. Currently ray tracing and ray launching techniques are used for modeling radio transmission but due to unavailability of detailed building databases, it is not possible to take into account all the edges and discontinuities in the buildings. To overcome this limitation a semi-deterministic technique is proposed in which walls and windows/doors in the buildings arc modeled as strips and slits respectively and their distribution is treated statistically. The model so developed takes into account all the edges and discontinuities in the buildings and doesn't rely heavily on the vector database. Simulations for field strength prediction in the vicinity of a room were carried out using the proposed model. The results show that to accurately model the scattering from buildings multiple interactions between the walls (strips) must be taken into account. [C829]

"Antennae Polarization for Effective Transmission of UWB Signal around Human Body"

Ultra wideband (UWB) is an emerging technology with promising applications in wireless body area networks (WBANs). Detailed understanding of the propagation mechanism of UWB signal around human body is essential for the development of wearable sensors. However there are currently limited studies describing UWB signal propagation around human body. In this paper, the favorable antennae polarization for effective transmission of signal to receiver is investigated through numerical simulations. The results showed that antennae oriented in

perpendicular polarization with respect to body surface provide a lower path loss as compared to horizontal polarization. [C830]

"Methodology of Path Loss Calculation using Measurement Results"

This paper deals with path loss calculation by using measurement results. This paper offers methodology for processing path loss measurement results. First part of the paper gives short introduction. Second part of the paper describes measurement results collection process. Third part of the paper offers methodology for processing measurement results. By using this methodology we can found real propagation model which caused path loss. Finally, paper gives example of calculation by using real measurement results on WiMAX system in town Cakovec on 3.5 GHz frequency band. [C831]

"Comparison between radiative transfer and ray tracing for indoor propagation"

In this paper the authors report how -under specific and limited condition-radiative transfer proved to be an useful tool for power fluctuation predictions experienced by an indoor wireless propagation channel. The analysis is carried out by comparing the radiative transfer results with the second order statistics of the ray tracing computed signal in a two-dimensional geometry comprising randomly placed scatterers. [C832]

"Improving MANET Simulation Results-Deploying Realistic Mobility and Radio Wave Propagation Models"

Recent research has shown the poor accuracy of widely used simulators in the area of wireless networks. Beside many other parameters two are of particular interest: (i) the mobility model, and (ii) the radio wave propagation model. The first is responsible for the network topology and the latter for the perception of transmitted data. Both have strong impact on the performance of mobile ad-hoc networks, e.g. the performance of routing protocols changes with these models. We developed a framework combining a realistic mobility model and radio wave propagation model. To generate mobility multiple well understood random mobility models are combined in a scenario graph. The graph also includes obstacles which restrict the movement and the radio wave propagation. The radio wave propagation is calculated using a ray-tracing approach. We present an extensive simulation study on the effect of the mobility and radio wave propagation on simulation results. [C833]

"Comparing UWB Freespace Propagation and Indoor Propagation Including Non-ideal Antennas"

Electromagnetic wave propagation of UWB signals can be interpreted as a superposition of narrowband electromagnetic wave propagation for a large set of frequencies. Since channel and antenna radiation patterns depend on frequency, describing and modeling the system transfer function of a UWB system including channel and antennas is more challenging compared to a narrowband system. This paper compares mathematical modeling of UWB freespace propagation to the more realistic case of UWB multipath propagation in indoor scenarios. Simulation results based on 3D Ray Tracing visualize the effect of both indoor channel and antennas on the UWB transmit signal in an indoor scenario, and finally, it is demonstrated, how signal distortions can be compensated by inverse filtering using an estimated system transfer function. [C834]

"Event Based Mobility Model for Subway Scenarios"

High cost and complexity of mobile ad hoc networks (MANETs) testbeds let simulation as the best solution to experiment MANETs protocols and applications. Thus improving current simulation tools become crucial to provide valuable results. Mobility and propagation models are key element to realistically simulate user's behaviour and wave propagations and therefore assure the validity of the simulations results. Unfortunately, accurate mobility models are complex and consider a wide range of parameters. Indeed to reflect reality every detail which may modify the mobility of users has to be included in the models. Consequently most of the realistic simulations models are not scalable and involve excessive computation time. Furthermore, these models are very generic and fail to capture the impact of event in real environments. In this paper we present an accurate subway mobility model which requires only few parameters. Moreover the simulated environment represents an application prolific context which can easily be set up. Finally we provide average simulation execution time for large networks and a comparison with the random waypoint model. [C835]

"Cooperative Synchronization Techniques for UWB Wireless Networks"

This paper proposes a novel cooperation technique to achieve symbol synchronization, in the context of UWB-IR (ultra-wideband impulse radio) wireless networks. Basically, a set of nodes in the network characterized by reciprocal line-of-sight (LOS) transmission links may join efforts during the symbol acquisition phase in order to improve performance, either in terms of average acquisition time or robustness vs. false alarms. In this paper,

the proposed methods are tested under realistic channel model propagation, including multipath and in presence of multi-access interference (MAI). [C836]

"Prediction of Line-of-Sight Propagation Loss in Inter-Vehicle Communication Environments"

This paper presents a prediction formula of propagation loss for low antenna height scenarios on a line-of-sight (LOS) straight-line road having an intersection, for modeling the propagation loss characteristic in inter-vehicle communications (IVCs). The regression analysis is applied to the propagation loss data generated by computer simulation based on the geometrical optics theory, and the regression formula is established as a dual-slope model having variables of propagation distance, frequency, road width, and antenna height. In this analysis, the position of breakpoint is determined so that the RMS error of the regression becomes the smallest on both slope regions because its position is an important factor for good prediction accuracy. Furthermore, the comparison between predicted and measured propagation losses is performed in 2 GHz and 5 GHz bands, and the effectiveness of the prediction formula is confirmed by evaluating the prediction errors. [C837]

"Performance Enhancement of Multiuser Time Reversal UWB Communication System"

UWB communication is a recent research area for indoor propagation channels. Time reversal (TR) communication in UWB has shown promising results for improving the system performance. In multiuser environment, the system performance is significantly degraded due to the interference among different users. TR reduces the interference caused by multiusers due to its spatial focusing property. The performance of a multiuser TR communication system is further improved if the TR filter is modified. In this paper, multiuser TR in UWB communication is investigated using simple TR filter and a modified TR filter with circular shift operation. The concept of circular shift in TR is analytically studied. Thereafter, the channel impulse responses (CIR) of a typical indoor laboratory environment are measured. The measured CIRs are used to analyze the received signal peak power and signal to interference ratio (SIR) with and without performing the circular shift operation in a multiuser environment. [C838]

"IEEE 2007 International Symposium on Microwave, Antenna, Propagation and EMC Technologies for Wireless Communications"

The following topics were covered: systems and services; microwave electronics; antennas; propagation; electromagnetics; signal processing; signal coding, waveforms; EMC; micro-electronic devices; micro-electronic circuits; micro-electronic systems; wireless applications; and remote sensing. [C839]

"Effect of 8.43 Hz Frequency Magnetic Field on the Single Neuron"

Electromagnetic field (EMF) of the GSM cellular telephones affect on the living tissues thermally. In this communication system radiofrequency EMF is modulated by extremely low frequencies (ELF) -8,43 and 217 HZ. On the other hand bulk of investigations proves existence of non thermal effects of the ELF EMF on the biological systems. The current controversy lies on the possibility that the ELF-EMF could produce biological non-thermal effects. We present in vitro experimental data which show that neurons from the brain ganglia of the mollusk HelixPomatia are sensitive to ELF magnetic field of 8.34 Hz in the ranges of 0.2-10 mT. [C840]

"Estimation of Exclusion Zones for Base Station Antennas in Wireless Communications Systems"

A model for the estimation of exclusion zones around base station antennas in wireless communication systems, taking the actual surrounding environment into account, is presented. Numerical methods are applied to a GSM900 antenna installed in five common scenarios. Results show that the exclusion zone calculated in free space conditions must be redefined, due to the presence of surrounding objects, as its extension might need to be doubled when considering the installation scenario. In the case of metallic corner configurations at the back of the antenna, the exclusion zone may increase by a factor of 5. The main conclusions are valid for other wireless technologies. [C841]

"Modeling in-Vehicle Wideband Wireless Channels Using Reverberation Chamber Theory"

In this paper, the wideband channel is studied inside a vehicle. Propagation inside a recent car (model bought in 2006) is investigated and the power delay profile is measured for three different scenarios. Two kinds of transmission bandwidths are studied, 200 MHz around 5 Ghz and an ultra-wideband bandwidth of 3 Ghz around 4.5 GHz. The ultra-wideband measurements allow to clearly identify the propagation mechanism in this kind of environment. For each scenario, an exponential model for the power delay profile is shown to be in good agreement. A theoretical model based on reverberation chamber theory is proposed. It allows to predict the rms delay spread inside the car. A comparison with measurements inside a reverberation chamber is presented.

[C842]

"Fast Edge-Diffraction-Based Radio Wave Propagation Model for Graphics Hardware"

Fast radio wave propagation predictions are of tremendous interest, e.g., for planning and optimisation of cellular radio networks. We propose the use of ordinary graphics cards and specialized algorithms to achieve extremely fast predictions. We present a ray-optical approach for wave diffraction at building edges into street canyons, exploiting the programming model of graphics cards. More than twenty predictions per second are achieved in a 7 km2urban area with a mean squared error of less than 7 dB when compared with measurements. [C843]

"Performance Evaluation of MIMO-STBC for Inter-Vehicle Communications in a Shadowing Environment Generated by a Large Vehicle"

The present study investigates an inter-vehicle communication (IVC) scheme for safety driving support systems, such as collision avoidance warning systems at intersections. In order to realize high communication reliability, we apply a multiple-input multiple-output (MIMO) with space-time block coding (STBC) method in the IVC system. We investigate the transmission quality of the method in collisions when making a right turn, as an example of a dangerous situation. A key transmission feature of the MIMO system is determined by radio wave propagation. Therefore, the radio wave propagation at an intersection in this dangerous situation is analyzed by computer simulation using the ray-tracing method and by radio wave measurements in a field experiment. In addition, we propose propagation channel models in a shadowing environment generated by a large vehicle. Finally, we clarify the effectiveness of the proposed MIMO-STBC scheme by computer simulations. [C844]

"Propagation Characteristics of Polarized Radio Waves in Cellular Communications"

Narrowband and wideband measurements of the radio channel using different combinations of transmit and receive polarization have been performed. The measurements cover a range of scenarios including urban, suburban and open terrain, as well as both outdoor and indoor terminals. The vertical-to-vertical (V-V) and horizontal-to-horizontal (H-H) polarization combinations are found to provide equal received power on average, while the cross-polarized combinations (V-H) and (H-V) typically provide 5-15 dB weaker received power due to the limited amount of cross-polarization scattering in the radio channel. Fast fading variations are further found to be uncorrelated between different combinations of transmit and receive polarization. [C845]

"A Dynamic Propagation Prediction Platform Over Irregular Terrain and Buildings for Wireless Communications"

The paper introduces an algorithm that converts dynamically GIS terrain and clutter information into the flat terrain input parameterization needed for COST 231 Walflsch-Ikegami model. Under this algorithm, a new method for average building height calculation is presented, using Epstein-Peterson's multiple knife-edge diffraction method. Additionally, it is introduced a new realistic approach for line-of-sight stochastic modeling. The mobile station (MS) paths are generated using a new mobility model previously validated for the city of Lisbon, Portugal. [C846]

"Robust Indoor Positioning Based on Received Signal Strength"

A positioning algorithm based on the relative order of the received signal strengths is discussed. This algorithm in conjunction with the ray-tracing propagation model can have promising performance for indoor environments without any needs for extensive set of a priori training. Enhancements to the positioning algorithm will be proposed and investigated. Two sets of experimental results with 802.11-based infrastructure and MICA2 motes are presented to demonstrate the system capability and performance in practice. [C847]

"The Diagrams of Hertz's Radiator Direction in Uniaxil Crystall"

Radiation and EM waves propagation in uniaxial crystal have been researched. Using generalized function method exact analytical decisions for Maxwell equations in infinite uniaxial crystal have been received in vector form. Directional diagram for electric dipole are presented. [C848]

"The Noise Level and Standard Frequencies in the LF-Band"

We researched the electro-magnetic environment at standard frequencies in Japan. With the APD (Amplitude Probability Distribution) approach, if standard frequencies are received, the probability is constant for 60-70% in spite of increase of electric field intensity. Pulse duration measurements of time signals show another important element. The ratio of duration which coincides with time signals' is very low, but summing up neighboring

durations comes up to the ideal ratio. However, such ratios depend on the slice level selected for calculating the duration time. The best place for slice levels is in a pocket of the distribution of the electric field intensity, which is the probability constant area of APDs. This pocket fluctuates up and down daily, and the best time for measuring time signals is midnight. [C849]

"RF Emission Measurement of 433 MHZ RFID Tags for EMI Evaluation to Onboard Instruments of Aircrafts"

This paper describes the probability of the electromagnetic interference (EMI) to aircraft electronic systems by 433 MHz active radio frequency identification (RFID) tags on board aircraft. We mentioned the behaviors of two types of the tags. One of them has a simple function broadcasting their own identification code like a beacon. Another tag has many functions or modes. We also evaluated the RF emission from these tags in comparison with the emission limit written in the document named as "environmental conditions and test procedures for airborne equipment" (DO-160E) published by the radio technical commission for aeronautics (RTCA) [1]. Emission from both tags has been higher than the limit of DO-160E at the operation frequency and the harmonics. We also show that the emission level depends greatly on the location and material on which a tag is placed. [C850]

"Chipless Radio Frequency Identification (RFID) Device"

A novel technique for radio frequency identification devices (RFID) based on remote measurement of complex impedance at microwave frequencies is presented. The low cost read-only tags do not need semiconductor elements and can be implemented by printing a conducting pattern on a low cost dielectric substrate. Multiple tags are simultaneously illuminated by a chirped microwave signal with a bandwidth of few hundred MHz to few GHz. The composite backscatter from all tags is mixed with the transmitted chirp signal and filtered to generate an intermediate frequency (IF). The IF is further processed with a narrow detection bandwidth to select a particular tag. Next, the phase-frequency profile of the reflection coefficient (complex impedance) of the selected tag is recovered with the help of a reference channel. Phase-frequency signatures of individual tags determine the tag identity. The technique allows operation with low transmit power, provides range information and mitigates against multi-path propagation and interference. [C851]

"Visually Improved Understanding of Three-Dimensionally Propagating Electromagnetic Fields in Wireless Networks"

Visualizations are highly valuable in improving the understanding, as well as the analysis of a variety of physical phenomena. Two such applications can be as a pedagogical tool for enhanced perception of complex topics, or as an everyday aid that helps engineers interpret the outcome of simulations. In this paper we try to meet both these objectives and propose a novel approach to three- dimensionally visualize time-varying electromagnetic fields and show how this can be applied to improve the understanding of propagating radio waves used in wireless communication networks. To obtain this, we use a numerical version of Maxwell's equations to create snapshots of a propagating electromagnetic field. In this manner we are able to not only, intuitively get a better general understanding of radio waves, but also disclose important phenomena such as diffraction, reflection, attenuation and multipath behavior. [C852]

"Scattering Cross-Section of Sea Targets in Nonhomogeneous Incident Field"

An approach to calculation and measurement tasks for scattering cross-section of sea targets observed at grazing angles to the sea surface is suggested. The method is based on a multibeam model of radiowave propagation and scattering at sea targets. An analytical expression has been obtained for propagation factor in the line-of-sight range. Diagrams are presented illustrating the dependence of propagation factor as a function of sea roughness, observation angle and range. Effects of increased backscattering from targets and ships are discussed. [C853]

"Building penetration measurements for indoor coverage prediction of DVB-H systems"

The digital broadcasting standards DVB-H (Digital Video Broadcasting-Handheld) enables a high data rate broadcast access for hand-held terminals (e.g., portable, pocket-size battery-operated phones). For actual DVB-H reception, indoor coverage is required because users are likely to be inside a building. Therefore, one needs building-penetration models, accounting for an additional propagation loss, due to the building where the user is present. This paper presents the penetration loss measurements performed at 600 MHz (ultra high frequency or UHF, band V) in an office building in a suburban environment. At this frequency the propagation characteristics remain acceptable to offer coverage in a large area and the size of the receiving antenna is suitable for

integration in a handheld. [C854]

"Investigation of ray tracing and the effect of simulation parameters for an L shaped hallway"

This paper will discuss the effect(s) of altering a few parameters in ray tracing simulations: ray spacing, maximum number of bounces, and diffraction. The same geometry is simulated via FDTD for reference. [C855]

"Unusual features of the pseudo non-diffracting microwave vortex"

A recently formulated, planar, circular-aperture field-distribution has been found to generate a radiation pattern exhibiting fundamentally-unusual features [1]. The aperture electric-field Eoarr, and magnetic field Hoarr were defined as linear-combinations of the W. W. Hansen's Moarr, and Moarr and Noarr basis vector-fields, and exactly satisfy therefore the Vector- Helmholtz equations for homogeneous, isotropic free-space [2]. Further, both the Eoarr and Hoarr fields generated by that aperture field-distribution include, in cylindrical coordinates, the axial Ezand Hzcomponents, besides the Er, Ephi, Hr, and Hphitangential components. Also, most remarkably, the radial component Sr*of the complex Poynting Vector is identically-zero, everywhere on and above the aperture-plane, at all radial distances from the broadside-axis, and at all axial-distances from the aperture- * plane, while the broadside-directed axial component Sz*includes a very sharp center- lobe, with a maximum radius, on the aperture-plane, in the order of a half free-space wavelength. That center-lobe also contains most of the total power radiated from the whole aperture. The actual diffraction-pattern of that center-lobe, that actually is the main-beam of the generated radiation-pattern, is being determined using the ";Direct Electromagnetic Field Integration"; method, reported by Walter Franz in 1948 [3], and reviewed by Chen-To Tai in 2000 [4]. The planar, circular aperture is truncated, in that diffraction analysis, at an arbitrary maximum radius, by applying various edge-tapers of different shapes, with free-space all around the aperture-edge and behind the aperture- plane. The main beam of the generated radiation-pattern appears to have a wave-front in the form of a 3D helicoid-surface, becoming thus the microwave equivalent of an "optical vortex". The main beam is therefore-expected to propagate through free-space almost as a guided circular-waveguide mode would. [C856]

"Finite difference frequency domain (FDFD) modeling of trans-ionospheric propagation of VLF signals over long sub-ionospheric paths"

In this paper, we apply a recently developed Segmented-Long-Path (SLP) Finite Difference Frequency Domain (FDFD) model of VLF propagation over long (tens to hundreds of wavelengths) paths to determine the coupling of wave energy through the collisional (i.e., lossy) ionospheric D-region up to altitudes where collisions (and thus losses) are not significant, i.e., ~120 km or higher. In this context, the primary loss process is collisions of electrons with neutral molecules, and with the neutral density falling off with altitude with a scale height of ~6 km, most of the attenuation occurs in a narrow altitude range of ~80-100 km. However, in this same region, the electron density and thus the wave refractive index exhibit rapid variations over height ranges comparable to or smaller than the VLF wavelength, so that accurate modeling of the reflection from this stratified region and the absorption losses therein generally requires 'full-wave' modeling. [C857]

"Estimation of the diversity performance of several two-antenna systems in different propagation environments"

In this paper, we propose the computation of the envelope correlation (rhoe), the diversity system gain (DSG) and the mean effective gain (MEG) of two-antenna systems (with and without the neutralization technique) in indoor and outdoor environments from the simulated radiation patterns. The analysis of the results demonstrates the overall improvement brought back by the neutralization technique. [C858]

"Simulation method of wireless LAN indoor propagation using FDTD technique and MATLAB/simulink"

The use of wireless LAN system is widely spread because the handling of cables is not needed and the high-speed communication is possible anywhere. However, high-speed wireless applications require precise evaluation and estimation of indoor propagation since the influence of physical propagation environment cannot be ignored. In this paper, we suggest an efficient computer simulation method of indoor propagation. It employs the FDTD technique for electromagnetic field analysis in the passband and MATLAB/Simulink for baseband signal generation, reception and processing in wireless LAN equipments. First the proposed method is explained in detail. Next, we carry out a computer simulation about radio wave propagation of IEEE 802.11b wireless LAN in the free space and show the effectiveness of the proposed method. In the method, baseband signals are simulated by MATLAB/Simulink on a personal computer. On the other hand, a high-end computer system is used for the electromagnetic field analysis by the FDTD method. [C859]

"Radio-wave transparent surface containing lines loaded with impedance at regular intervals"

The vector effective length of a half wavelength-dipole becomes almost zero when a reactance of about 500 ohm is loaded to its center. Since the current integral is almost zero when the vector effective length is zero, the electric influence on other antennas and to the radiation field is smaller than an open-circuited dipole. On the other hand, although other antennas affect the amplitude of the current distribution, the shape of the distribution does not change. Therefore, the vector effective length should be kept to zero. Accordingly, not only the influence on other antennas but also the influence by other antennas can be neglected. Dipoles are, therefore, thought to be almost electrically invisible. Lines composed with electrically invisible dipoles joined in series with a connector of open stubs are also thought to be electrically invisible. A surface containing such lines arranged in parallel is thought to be electrically transparent for radio waves at the same frequency at which the dipoles become electrically invisible. In this paper, we examine analytically the transparency of such surfaces. [C860]

"A Kirchhoff Integral approach to radio wave propagation in fire"

Experiments have shown that fire can significantly attenuate radio signals and that the effect can vary appreciably with frequency. The current paper has used a modified Kirchhoff integral approach to simulate the effects of fire upon radio waves. [C861]

"Wind and rain influences on forested radiowave propagation"

The objective of this paper is to provide preliminary results and analyses based on measurements conducted at 240MHz, 360MHz, and 700MHz in a forest area. Special attention is given to the temporal and spatial foliage attenuation fluctuation due to wind and rain influences. It is found that the temporal variation closely follows the Rician function and is easily influenced by wind and rain. The spatial fluctuation is obvious due to the rich scattering environment. [C862]

"Improvement of channel capacity on MIMO antenna systems with antenna pattern selection"

Although MIMO (multi-input multi-output) has attracted attention as an efficient communication technology for high frequency use, the channel capacity of MIMO systems depends primarily on radio propagation. Therefore, development of a MIMO antenna system that can obtain high channel capacity in a variety of propagation environments is important. This paper focuses on antenna pattern selection (APS system) by providing multiple directional patterns that can be switched to each antenna element of the receiver according to the propagation environment. [C863]

"A real-time location system using near-field electromagnetic ranging"

Near-field electromagnetic ranging (NFER) technology is emerging as a preferred real-time locating system (RTLS) solution for operation in complicated indoor propagation environments [H. Schantz and R. DePierre, 2005]. Operating at low frequencies, typically within the AM broadcast band (530-1710kHz), NFER systems exploit the near-field behavior of radio signals within about one-third of a wavelength. This paper explores the performance of NFER systems and the propagation of NFER signals. [C864]

"Employing realistic propagation models in wireless system simulations"

This paper presents a new method of incorporating propagation models into wireless systems simulations. The multipath data for each transmitter-receiver pair in a realistic environment is calculated using the site-specific propagation modeling software developed at the University of Hawaii. Instead of fitting the multipath data into a statistical model, we directly use the data for the calculation of discrete channel impulse responses for each transmitter-receiver pair. The Doppler effects and the effects of pulse shaping filters on the calculation of discrete channel impulse responses are investigated. Finally, these channel impulse responses are employed in a CDMA system simulator to evaluate the output signal-to-noise ratio (SNR) and the corresponding bit error rate (BER). [C865]

"Accurate ray-launching analysis for indoor propagation through a high lossy wall"

In this paper, we propose a simple accuracy improvement of the ray- launching analysis. This paper starts from deriving the analytical reference solution of the transmitted wave in the appropriate Green's function problem. From the derived analytical solution, it is found out that the attenuation effect inside the wall in the ray-launching solution is estimated to be much smaller than that in the analytical solution, and it tends to be greater with increase of incident angle. So, taking into account this fact, we apply an accuracy improvement to the ray-launching solution by making the path length inside the wall slightly longer. By this simple improvement, one can

easily compensate for the shortage of the internal attenuation in the ray-launching approximation. The validity of the improvement is finally confirmed by some numerical experiments. Here time harmonic factor e-iwtis assumed and suppressed throughout the context. [C866]

"Measurement of propagation effects for high-speed, digital UHF channels"

The work described here relates to an effort to assess the reliability and robustness of datacasting for use in the mobile environment. Datacasting employs the excess bandwidth from digital television signals for use in one-way data transmission and it is being used successfully for high-speed downloads at fixed receiver locations. It is being considered as a means for providing data-rich information to police and emergency personnel in the field, and the work reported here is part of the evaluation process. Datacasting operates in the UHF television band and employs 8-level vestigial sideband (8-VSB) modulation to provide data rates in excess of 2.5 Mb/sec. Datacast reception is known to be very vulnerable to multipath interference, particularly time-varying multi- path interference. Because of this, an estimation of coverage area based upon signal strength alone does not accurately predict where the signal will be available. While propagation models are available that can predict both signal strength and multipath, they cannot provide the type of statistical information about signal availability and reliability that is sought in this study. In order to get the desired information, datacasting receivers and data logging equipment were installed in police vehicles to measure the channel over a wide range of operating conditions. This paper reports on some of the key findings from that study. [C867]

"The Need for Cooperation and Relaying in Short-Range High Path Loss Sensor Networks"

This paper focuses on the energy efficiency of communication in small-scale sensor networks experiencing high path loss. In particular, a sensor network on the human body or BASN is considered. The energy consumption or network lifetime of a single-hop network and a multi-hop network are compared. We derive a propagation model and a radio model for communication along the human body. Using these models, energy efficiency was studied analytically for a line and a tree topology. Calculations show that single-hop communication is inefficient, especially for nodes far away from the sink. There however, multi-hop proves to be more efficient but closer to the sink hotspots arise. Based on these findings, we propose to exploit the performance difference by either introducing extra nodes in the network, i.e. dedicated relay devices, or by using a cooperative approach or by a combination of both. We show that these solutions increase the network lifetime significantly. [C868]

"Channel reciprocity and time-reversed propagation for ultra-wideband communications"

This paper is the first paper of an new effort to understand UWB communications and sensor networking in RF harsh environments. Channel reciprocity and time reversed propagation are studied, using an intra-vehicle environment. Communications using time reversal is also investigated. [C869]

"Time domain measurements for UWB on-body radio propagation"

Wireless body area network (BAN) has being a subject of growing interest in recent years. It allows the monitoring of health information with the help of sensors utilizing low power technology such as ultra-wideband (UWB) systems. Scanning the existing literature reveals that most experimental studies on BAN channel have been conducted with human object in a standing position. Alomainy et al. have performed a measurement campaign to investigate UWB on-body radio channels with some sitting body scenarios. Nevertheless, very few antenna positions have been considered for each sitting scenario. In this work, we demonstrate experimental investigations of UWB on-body propagation when the human object is in the sitting position, as the sitting posture may be the most common behavior for people living a sedentary lifestyle. A large number of data points are collected to facilitate a comprehensive characterization of the BAN channel. Vector network analyzer has been typically used in the previous measurements to obtain the S21 parameter for analysis. In the current work, time domain apparatus are employed. An UWB pulse generator is used to send an extremely short pulse around the body and the signal is picked up by a time-domain digital communications analyzer (sampling oscilloscope). From the received data, simple signal processing algorithms are used to extract the relevant channel parameters including the path loss and the signal power variation. Such information could provide useful insight into designing efficient body-centric radio systems. [C870]

"Mobile Localization for NLOS Propagation"

Non-line-of-sight and multipath propagation conditions pose significant problems for most mobile terminal positioning approaches. In contrast, power delay profile fingerprinting (PDP-F) thrives on multipath propagation. This multipath extension of T(D)oA is based on matching an estimated power delay profile from one or several base stations (BSs) (or other transmitters (broadcast, ...)) with a memorized power delay profile map for a given cell. It is obvious that the overall location accuracy depends strongly of the quality of the PDP estimation. We

propose exploiting the prior knowledge on the received signal structure to enhance the PDP estimation and increase the localization accuracy. Depending on the propagation environment, we propose a deterministic and Bayesian framework for PDP estimation. And, we investigate the application to fingerprinting based mobile localization. [C871]

"Deterministic Simulation of Flat-Fading MIMO Wireless Channels Under Non-Isotropic Scattering Conditions"

This paper describes a simple methodology for the simulation of flat-fading multiple-input multiple-output (MIMO) wireless propagation channels under non-isotropic scattering conditions. The proposed channel simulator is based on the sum- of-sinusoids (SOS) principle and has been developed under the framework of the geometrical one-ring scattering model. All the simulation parameters are computed in a purely deterministic manner, which results in an ergodic channel simulator. By considering that the angle of arrival (AOA) of the received signal follows the von Mises distribution, we will show that the proposed simulator satisfactorily approximates the channel's time and spatial correlation functions. [C872]

"Incorporating the Fresnel Zone Theory in Ray Tracing for Propagation Modelling of Fixed Wireless Access Channels"

A propagation model which combines the Fresnel zone theory and the ray tracing techniques is presented in this paper. The aim of this novel approach is a more accurate representation of the fixed wireless access channel. Deterministic models do not consider power loss when the radio waves propagate close to roof tops. However, according to the theory of the Fresnel zones, even when there is line-of-sight (LOS), the loss can be as much as 6 dB due to a single obstacle just below the LOS. In the model presented here, the path of each ray is found by a three-dimensional (3D) ray tracing algorithm and the electromagnetic field of each ray is calculated according to geometric optics (GO) and the uniform theory of diffraction (UTD). The first Fresnel zone of each ray is also found and examined and the losses due to its partial blockage are taken into account. Simulation results show significant differences in the power predictions when the blockage of the Fresnel zones is considered. [C873]

"Measurements and Analysis of the Propagation Channel for Various Indoor Environments"

The paper presents measurements results of the propagation channel for three types of indoor environments. Basing on these results statistical analysis and comparison of obtained data are presented. Short review of channel profile measurement techniques are also presented. The paper includes discussion of indoor channel propagation type influence on positioning systems accuracy. Measurements were part of EU VI FP RESOLUTION project, in which WUT was responsible for propagation and antennas work package. [C874]

"UWB system coverage using transmission line matrix power flow"

The quality of the result will depend on the presence of obstacles in the propagation path. The final results will have some degree wavelength independent, if the number of obstacles is not large compared to the size of the free-space area and the spacing between them are large enough. This is possible due to the nature of TLM power flow computations. [C875]

"A free access mat by tightly coupled patch array for short range wireless access"

We proposed a free access mat consisting of tightly coupled patch resonator array for an easy and low loss access for short range communications. By numerical simulation we obtained lower loss propagation than the free space transmission for one and two dimensional array models. By measurement we confirmed that this mat has lower loss propagation in the mat than through the free space even when the antenna coupling to the mat is considered. The gain was more than 10 dB which is large enough to say that the free access mat is available to provide an easy and small loss access for short range wireless access. [C876]

"A MIMO propagation channel model in a random medium"

This paper presents an analytical expression of MIMO propagation matrix in a random medium. We first extend the SVD (singular value decomposition) to include the propagation channels in the random medium in terms of the stochastic Green's functions. The eigenvalues and eigenfunctions are obtained from the transfer matrix langTrang = langH'Hrang. The elements of langTrang can be expressed analytically using the coherent Green's function and the mutual coherence function. Examples are shown for the propagation channel consisting of a random distribution of scatterers. Included in this analysis are the effects of number density, scatterer sizes, scattering pattern, and scatterer locations. [C877]

"Measurements and simulations of scattering for propagation modeling at THz frequencies"

In Piesiewicz et al., (2005), we proposed an efficient method to model reflective properties of smooth building materials at THz frequencies. It is based on Fresnel equations, which are applied to measured material parameters to account for frequency dependence. However, this technique is adequate for smooth materials only as it neglects scattering losses.The method can be extended to rough materials with Kirchoff theory of scattering from rough surfaces. In order to account for scattering losses in the specular direction, the reflection coefficient, derived from Fresnel equations can be multiplied with a Rayleigh roughness factor. This factor can be obtained from measured surface roughness data of the investigated material. Here, we show the model and direct reflection measurements for a set of angles of incidence for two common rough building materials: ingrain wallpaper and concrete plaster. [C878]

"Near-field scattering methods applied to radio-propagation modeling in urban outdoor environments"

In this paper a time-efficient method for the calculation of the scattered field from rectangular plates (walls) in the near and Fresnel zone is presented. The method, which we call 'Near to Far Field Transformation Method', is based on the analytical method of Physical Optics (PO) and uses the technique of segmentation of the scattering surface into an appropriate number of small rectangles (cells). By such a division of the large scatterer, an observation point which is originally located in the near or Fresnel zone of the scatterer, is now transferred/relocated to the far zone of the smaller cells. As a result, the PO far-field approximations, which use the easy-to-compute sine (sin(x)/x) function, can be invoked in order to calculate the electromagnetic field at the receiver due to the induced PO currents at each cell. The total scattered field at the receiver's position is calculated by complex vector addition of all signal components received. [C879]

"Spherical resonators acting as rf replicas of plasmonic nanospheres"

The experimental investigation of recently proposed nanophotonic devices and metamaterials based on the plasmonic nanospheres is rather difficult and expensive using the present technology of nano-fabrication. Here, we propose the idea of scaled experiments in the RF regime, based on the spherical resonators that behave similarly to the plasmonic nanospheres. Two different designs, based on well-known Best's four-arm spherical resonator and on Stuart's spherical resonator were tested experimentally in 500 MHz and 1 GHz bands. It was found possible to construct the linear chains of the resonators and to demonstrate both the backward-wave propagation and the forward-wave propagation, which is consistent with already published theoretical predictions. [C880]

"Modal Transmission-Line Modeling for Electromagnetic Wave through Building Structures"

The modal transmission-line (MTL) method is applied to analyze the transmission and reflection effectiveness of building structures. The paper improves a previous study of MTL method and extends the method to transverse magnetic (TM) polarized mode of obliquely incident plane radio wave based on a more general building structure model in 2-D settings. Simulation results are compared, and the enhanced MTL method is proven effective. [C881]

"Theoretical Discussion of Doppler Frequency Shift Generated by Solar Zenith Angle"

In this paper we presented theoretically the dependence relationship between the solar zenith angle and the height of some layer with some fixed electron concentration in the ionosphere and provided the equations used to calculate the Doppler frequency shift. On the base of the materials obtained through the up-to-date experiments we discussed the influence of the variation of the solar zenith angle to the Doppler frequency shift. The observed quantities well coincided with the theoretical values.These instructions give you basic guidelines for preparing papers for conference proceedings. [C882]

"Fast Extraction of Hyperbolic Signatures in GPR"

The hyperbola exhibited from the local target in B-scan of GPR can contribute to estimate the propagation velocity and locate target. In this paper, a new method of fast extracting hyperbolas and apex is presented. The method is based on peak tracing and the symmetry of hyperbolas. The method was tested on experiments, and the results indicate that it can be achieved in near real-time. [C883]

"MIMO Wireless Channel for Video Communications using Distributed Video Coding"

The research on distributed video coding (DVC) has been increasingly popular in recent times due to its promising features. DVC primarily has a modified complexity balance between the encoder and decoder, in contrast to conventional video codecs. In video communications over wireless channels, the noise and multipath fading effects have a significant effect on the perceptual video quality experienced at the decoder. However, it is noted that in all the research literature on DVC, an error-free ideal communication channel is assumed between the encoder and decoder. In this paper, we take into account the effects of noise and fading in a wireless channel on the performance of a DVC codec with necessary modifications to the decoding algorithm while proposing a higher order (4x4) MIMO based diversity scheme to take advantage of the multipath propagation effects to improve the performance. Simulation results show that the proposed DVC system outperform the state of the art H.264 video codec at low SNR levels. [C884]

"Analysis of Doppler Frequency Shift Using Actually Measured Frequency-Height Diagram"

The equations for calculating the phase path and the Doppler frequency shift (DFS) on the basis of the actually measured frequency-height diagram were theoretically derived. As the example of observation, the DFS of the standard radio wave of BPM 10 MHz from the Dalian-Xi'an channel at sunrise was calculated and analyzed. The theoretical values coincided well with the actually measured values. [C885]

"Beam-wave interaction simulator"

In the part of the helix TWTs' nonlinear beam-wave interaction, we developed a 3D relativistic beam-wave interaction model, which can describe the interaction process between the symmetric TMO1 mode RF electromagnetic fields and the relativistic electron beam. This model can describe the 3D RF electromagnetic fields, the 3D motion of the macro-particles, and the 2D space-charge fields. Applying the Lorentz reciprocity theorem, the excited equation is obtained by the theory of waveguide excited. By Lorentz force equation and the conservation of energy, the 3D momentums and positions are obtained. The axial and radial ac space-charge fields are calculated by the harmonics wave means. [C886]

"Synthetic TEC Mapping with Ordinary and Universal Kriging"

Spatiotemporal variations in the ionosphere affects the HF and satellite communications and navigation systems. Total Electron Content (TEC) is an important parameter since it can be used to analyze the spatial and temporal variability of the ionosphere. In this study, the performance of the two widely used Kriging algorithms, namely Ordinary Kriging (OrK) and Universal Kriging (UnK), is compared over the synthetic data set. In order to represent various ionospheric states, such as quiet and disturbed days, spatially correlated residual synthetic TEC data with different variances is generated and added to trend functions. Synthetic data sampled with various type of sampling patterns and for a wide range of sampling point numbers. It is observed that for small sampling numbers and with higher variability, OrK gives smaller errors. As the sample number increases, UnK errors decrease faster. For smaller variances in the synthetic surfaces, UnK gives better results. For increasing variance and decreasing range values, usually, the errors increase for both OrK and UnK. [C887]

"A Cube Oriented Ray Launching Algorithm for 3D Urban Field Strength Prediction"

Fast radio wave propagation prediction is of tremendous interest for planning and optimization of cellular radio networks. We propose a cube oriented 3D ray launching algorithm for both fast and accurate field strength prediction, particularly suitable for urban scenarios. Our model allows field strength prediction for a 5 km2area with 5 meter resolution in about 8 sec with mean squared error of 7 dB. As urban environments cannot be completely described, we recommend a parameter calibration for different cities using measurement data from test runs. [C888]

"Log-normal shadowing meets SINR: A numerical study of Capacity in Wireless Networks"

The capacity of wireless multi-hop networks has been studied extensively in recent years. Most existing work tackles the problem from an asymptotic perspective and assumes a simplified physical layer model, as e.g., the protocol interference model or the path loss radio propagation. Real life network planning, provisioning and deployment can only be done with more precise statements about capacity in finite networks. With this in mind, we adopt a numerical approach based on Monte-Carlo methods to study capacity under various interference and radio propagation models, including the physical interference model and log-normal shadowing radio propagation. Our results indicate that, depending on the interference model, capacity may experience a three phase transition related to the connectivity of the network. We further show that throughput capacity increases in the presence of randomized radio propagation, even above the critical node density. Our analysis of the numerical data illustrates that log-normal shadowing creates more interference, but decreases the total amount of transmissions to be scheduled. [C889]

"The Influence of Wave Propagation Channel Properties on Error Probability"

The error probability of radio short-range navigation systems (KSNS) in a various propagation environments is considered. Basic and modified structure of the KSNS in various propagation environments is investigated. The modified signal structure for increasing transfer rate of the channel has been developed. [C890]

"Complexity and Error Propagation of Localization Using Interferometric Ranging"

An interferometric ranging technique has been recently proposed as a possible way to localize ad hoc and sensor networks. Compared to the more common techniques such as received signal strength, time of arrival, and angle of arrival ranging, interferometric ranging has the advantage that the measurement could be highly precise. However, localization using interferometric ranging is difficult as it requires a large number of measurement readings. In this paper, we provide a formal proof of this difficulty in terms of algorithmic complexity. Furthermore, we propose an iterative algorithm that calculates node locations from a set of seeding anchors, gradually building a more global localization solution. Compared to previous localization algorithms, which treat localization as a global optimization problem, the iterative algorithm is a distributed algorithm that is simple to implement in larger networks. More importantly, the iterative algorithm allows us to study the error propagation behavior of localization using interferometric ranging. Using simulations, we validate the performance of the iterative algorithm in terms of localization error and coverage. [C891]

"Eigen-Analysis of UWB Channel on the Basis of Information Theoretic Criteria"

Underground mine galleries can be considered as complex transmission lines where multipath, attenuation, reflection, diffraction and scattering effects are dominants. However, some companies have started to deploy modern wireless system networks in mine galleries with the objective of increasing safety and productivity. In the last decade, ultra-wideband (UWB) technology has gained much interest for its application to wireless communications. This paper reports on experimental results of UWB channel propagation in an underground mine. Eigen-decomposition and subspace-based statistical signal processing on the autocorrelation matrix of the channel impulse response are used. We apply information theoretic criteria to estimate the number of significant eigenvalues. This result is then used to calculate the RMS delay spread of the channel. [C892]

"A Connectivity Model for the Analysis of a Wireless Ad Hoc Network in a Circular Area"

This paper proposes a connectivity model for nodes which are spatially distributed according to a Poisson Point Process in a bounded (circular) area. The propagation environment is characterized by distance-dependent loss and log-normal shadowing. We consider nodes that communicate with a terminal located in the center of the circular area and derive an expression for the distribution of the power received by this terminal. We also obtain an expression for the moments of the co-channel interference received by the terminal located in the center of the area. [C893]

"Mobile Path Loss Prediction with Image Segmentation and Classification"

This paper presents an intelligent radio wave propagation prediction model by using the 2-dimension aerial image which is taken from the actual area. An suburban area is used as examples. The prediction procedure is done in three steps. First, the image segmentation is employed to divide the area image into subgroups by using Maximum Likelihood algorithm. The second step uses the subgroup images from step 1 to determine the parameters for the fuzzy model that we use to classify the propagation areas. The final step is to plot the path loss contour on the image so the cellular cell site can be chosen. The research results show that the proposed segmentation provides an accuracy of 80-90% compared with the actual area. Therefore, cell site selection can be designed on the 2-dimension aerial map with the error less than 8 dB. [C894]

"General Packet Radio Service Performance Evaluation Based on CIR Calculation, Considering Different Radio Propagation Models"

General Packet Radio service (GPRS) is a step on the evolution path towards 3rdGeneration (3G) mobile radio networks. This paper investigates the effect of using varied Coding Scheme (CS) based on Carrier to Interference Ratio (CIR), that is computed using different radio propagation models. A comparison between these models and a fixed CS is evaluated. A simulator model was developed to study the behavior of data transmission between a GPRS server and data terminals via air interface. Simulation results show the convergence between different radio propagation models, and the capability of using a less protective CS. [C895]

"A Robust Integrated Propagation and Site Specific Land Clutter Model"

This paper reveals a robust land clutter model that is based upon site-specific radar reflectivity and topography. The model includes the effects of transhorizon propagation caused by atmospheric boundary layer induced radar ducting. The model accounts for three dimensional effects due to inhomogeneity of radar reflectivity and propagation within the confines of the radar resolution cell, without the complexity of a true three dimensional propagation model. [C896]

"Impact of Propagation Delay on Characteristic of IEEE 802.11 DCF"

This paper presents analytical study impact of propagation delay on characteristic of the IEEE 802.11 distributed coordination function assuming ideal channel conditions. Study is performed for two types of packets small and relative large and different set of channel speeds. For analytical study.was used two-dimensional Markov chain model for saturated traffic conditionals. [C897]

"Comparison of Pulse and Continuous Wave Propagation Through the Wall"

Knowledge of UWB pulse propagation in and through walls is needed for precise structure analysis and radar sensing. In this paper some experimental results (insertion loss, delay) of pulse propagation through the wall are shown. The methodology of time domain measurement is presented as well. Attenuation of the same wall was measured also in frequency domain. Comparison of spectral components wall attenuation measured using time domain techniques and continuous wave measurements is also done. Dependency of signal delay and attenuation on wall-antennas distance is investigated. [C898]

"Measurements on DRM Receiver"

This paper deals with a measurement on the receiver of the digital radio broadcasting system in bands below 30 MHz. Described measurements could be used for a testing of functionality of DRM receiver, especially for a comparison in the set of receivers. Minimal input level and minimal carrier-to-noise ratio are measured in the case of single-path and multi-path propagation. Minimal echo attenuation and maximal echo delay are measured in the case of multi-path propagation additionally. [C899]

"Decision Tree Approach to Estimate User Location in WLAN Based on Location Fingerprinting"

The estimation of user location using modern communication technology like WLAN based on radio signal strength, is a recent interesting area. There are many indoor positioning techniques to estimate user location; location fingerprinting, time of arrival (TOA), time difference of arrival (TDOA), angle of arrival (ADA) and others. LocationfFingerprinting technique is more suitable than other techniques, because TOA, TDOA or AOA is suffer from non-line-of sight error and multi path, especially in urban and suburban area. In this paper we study the fingerprinting technique using neural network, nearest neighbor and decision tree to estimate the location. The results of the experiment show that using DT technique is the best to estimate the location of the user. [C900]

"Clustering Analysis of Refractive Index Profiles: Toward a Ducting Climatology"

Historically, radiosonde and other data sources were used to determine average duct heights, average M-deficit and other properties of ducts. Further, various values can be found for certain deciles of each of the computed statistical parameters. However, it is, in general, difficult to reconstruct profiles that are representative of the original refractive profile structure and its distribution. The goal of this research is to develop methods that can be used to determine representative climatological atmospheres for use in high fidelity RF parabolic equation propagation models. This entails determining representative atmospheric profiles worldwide. This research focuses on determining representative refractive profiles at a specified time, date and location. The methods can then be extended to give representative atmospheres for RF links of interest. [C901]

"A Dual Logarithm Model for Estimation of WCDMA Downlink Pole Capacity in Multipath Propagation Channel and Verification with Measurements in Live Node B Sites"

A new and precise dual logarithm model are derived to estimate WCDMA downlink pole capacity in the local multipath propagation channel and verified with measurements from several live Node B sites. Model estimations show excellent consistence with measured data. As well, cell-breathing phenomenon has been detected. In estimating the Downlink pole capacity of WCDMA radio network, we propose a new algorithm to calculate orthogonality factor for different spreading codes and derive a dual logarithm equation for the orthogonality factor with respect to the data bit rate. With that equation, an exact solution of the downlink pole capacity for an isolated cell or a cluster of cells can be estimated when loading distribution for all services are assigned and the

downlink interference ratio is calculated as well. [C902]

"The effect of shifting on wires and split ring resonators"

Based on finite integration technique, the effect of shifting introduced in wires and split ring resonators on the pass band and resonant frequency of wires and split ring resonators is investigated. We similar pass bands and resonant frequency for two shifting structures of negative refractive index materials.The results show that there exists a shifting for resonant frequency and a narrowing in pass band deduced by the introduction of shifting wires and SRRs into materials. [C903]

"Using Frequency Hypsography to Deduce Doppler Frequency Shift and Phase Path"

This paper presents a new method- using frequency hypsography to calculate Doppler shift and phase path. Formula deduced from this method can avoid some unbelievable factors that are produced from hypotheses on not only parameter of ionosphere but also model of electronic density distribution. And this formula can also explain "C" trace occurring on HF-Doppler records. [C904]

"Mitigation of Ionospheric Propagation Errors with GPS"

As radio waves propagate through the ionosphere and troposphere, the value of the index of refraction changes. This results in apparent range error, refraction, and, at times, amplitude and phase scintillation. These ionospheric errors can become quite significant, even in the mid-latitudes during large geomagnetic storms. This paper will describe ionospheric effects in general and the major space weather events that exacerbate the ionospheric issues. This paper will also describe different schemes to mitigate the ionospheric errors, using ionospheric models, measurements, or some combination of both. [C905]

"GO Method for Reflection from Convex and Concave Surfaces in an Irregular Terrain Model"

An irregular terrain propagation model based on ray optics is developed. The model consist of modeling the terrain by round earth plateaus, slant flat plateaus, convex and concave plateaus between hills and depression. Multiple hill top diffraction combined with reflections from plateaus are considered. [C906]

"Analysis and Compensation of RF Impairments for Next Generation Multimode GNSS Receivers"

Global navigation satellite system (GNSS) receivers require solutions that are compact, cheap and low-power, in order to enable their widespread proliferation into consumer products. Furthermore, interoperability of GNSS with non-navigation systems, especially communication systems will gain importance in providing the value added services in a variety of sectors, providing seamless quality of service for users. An important step into the market for Galileo is the timely availability of these hybrid multi-mode terminals for consumer applications. However, receiver architectures that are amenable to high-levels of integration will inevitably suffer from RF impairments hindering their easy widespread use in commercial products. This paper studies and presents analytical evaluations of the performance degradation due to the RF impairments and develops algorithms that can compensate for them in the DSP domain at the base band with complexity-reduced hardware overheads, hence, paving the way for low-power, highly integrated multi-mode GNSS receivers [C907]

"Transmission Characteristics of Ultra-Wide Band Impulse Signals"

A simplified analytic solution for UWB impulse signal transmitting through a finitely conducting slab is proposed in this paper. To obtain the impulsive transmitting field, either for vertical or horizontal polarization, approximations to the refraction coefficients and propagation loss are made. Thereby, it permits simplified closed-form expressions in the time domain for both terms. The resulting transient response for the transmitting impulse field is then given by convolution of the time domain refraction coefficients and time domain propagation loss. The simulations of incident monocycle transmitting through slabs of different materials and thickness are presented by applying the simplified time domain analytic solution to illustrate the characteristics of transmission and give some results in simplification of transmission field analysis in indoor channel modeling. [C908]

"A Novel Ray Tracing Acceleration Method for Radio Propagation Modeling Based on Prior Environment Processing"

Ray Tracing has been successfully used in prediction of wave propagation models in recent years. Although this method has its own obvious benefits, it suffers from a big problem: slow performance. In this paper, a novel method is proposed in which the main focus is on reducing the number of ray-facet intersections. It includes a light-weight pre-processing operation on the environment which is completely independent of the locations of

source and target and is performed once for each environment. In this step, measures for the distances between entities in the environment are computed and saved. Later in the main procedure, theses data will come to help reduce the number of ray-facet intersection tests dramatically. [C909]

"The Probe Into Reflection Model of Large-Scale Fading"

Reflection is one of the three basic factors which impact a mobile communication system. Reflection occurs when the electromagnetic wave meets an object that is much larger than the wavelength of electromagnetic wave. Received power (or its reciprocal, path loss) is generally the most important parameter predicted by large-scale propagation models based on the physics of reflection. We in this paper deduce a conclusion which is different from the authority publishings. The trigonometric vectors resultant vector ETOT(d), the received power can be come out. [C910]

"Meteor Time Transfer and Meteor Cryptography"

We show that peculiar properties of meteor wave propagation allow construction of radio channel that may deliver transfer of data with theoretically perfect protection from eavesdropping. Method uses natural stochastic process that is generated only for two communicating participants so that it is not available for possible cryptanalysis. Possible eavesdropper can not reproduce measurements that have been performed by participants at their particular locations, due to mirror-like channel properties and random positions of each meteor trail. The suggested method of data protection can be used, for example, for theoretically absolutely secure way of key exchange. [C911]

"Performance evaluation of wireless networks exploiting multi-beam antennas in multipath environments"

The use of multi-beam antennas has been shown to significantly enhance the network throughput by improving the spatial reuse and coverage. In this paper, we consider both the multi-channel smart antenna (MCSA) and the multiple fixed-beam antennas (MFBA) and evaluate their node throughput performance in a multipath propagation environment based on the signal-to-interference-plus-noise ratio (SINR). Realistic array beams, rather than the idealized sector-based models, are used in the performance evaluation. Simulation results show that, in a multipath propagation environment, MFBA suffers from significant node throughput reduction, whereas MCSA benefits from path combining gain and, as such, has a clear advantage over MFBA. [C912]

"Cross-eye jamming of monopulse radar"

Radar seeking missiles present a serious threat towards ships and aircraft. In cross-eye jamming a missile seeker is deflected by signals from two onboard antennas transmitting out of phase with signals of nearly equal strength. The limits on cross-eye performance imposed by scattering have been studied when scattering takes place far from the propagation path. It will be shown that a digital cross-eye system with several antenna units can be seriously affected by scattering from sea waves and terrain. [C913]

"Analysis of Radiation Characteristics of the Electric Dipole in the Rectangular Tunnel"

The parameter of the rectangular tunnel have greatly influence on the radiation characteristics of a electric dipole. The expression of the electric and magnetic Hertz vectors in vertical direction was deduced by the method of the Fourier Transform. Based on the MATLAB software, the field strength against different environment was studied. The main conclusions are as follows: for the horizontal dipole, with bigger of the dielectric constant, the field strength is increase in low frequency, and is decrease in high frequency, if the frequency or the conductivity is greater, the field strength is rising, for the vertical dipole, if the frequency or the dielectric constant is bigger, the field strength is higher, and the field strength is smaller with higher of the conductivity. The attenuation rate of the field strength with the horizontal dipole is smaller than the vertical dipole. In the rectangular tunnel, the high frequency or the horizontal dipole is beneficial for the radio wave to propagate. [C914]

"Coordinated Observations of High Power Interactions with the High Latitude Ionosphere"

The High Frequency Active Auroral Research Program (HAARP) transmitter in central Alaska changes the properties of the F-region with transmissions of high power radio waves that reflect in the ionosphere. Simultaneous measurements of radar scatter from plasma waves, radar scatter from field aligned irregularities, and radio wave spectra near the HF pump wave frequency provide a clear picture of the radio wave interactions. The HAARP F-region diagnostics are (1) Modular IJHF Ionospheric Radar (MURI), (2) Dual Auroral Radar Network (SuperDARN), and (3) Stimulated Ionospheric 1 {missions Radio Receiving Array (SIKRRA). The MUIR

incoherent scatter plasma line spectra are produced by Langmuir waves driven by the HF pump. The plasma line is initially intense with a decay associated with formation of field aligned irregularities (FAFs) that absorb the electromagnetic HF before reaching the reflection altitude. Consequently the growth of SuperDARN radar backscatter from FAI is coincident with the decay of the HF induced plasma lines, the independent SIERRA diagnostic of stimulated electromagnetic emissions (SHE) measured with ground receivers show a decay of a down-shifted spectral feature associated and a formation of a weak broad continuum. The temporal history of the radar and SEE data are being analyzed to provide a complete understanding of nonlinear interactions of high power EiM wave in the ionospheric over HAARP. [C915]

"Mobile Station Location using Survey Points Based on LS-SVM"

The performance of mobile location systems is often limited by large errors primarily caused by non-line-of-sight (NLOS) propagation conditions. Nonparametric kernel-based estimators for location of mobile terminals using measurements of propagation delays have been proposed to mitigate the NLOS error. This paper proposes a novel estimation algorithm based on non-parametric density approximation of the measurements using a survey of time difference measurements. This method estimates the joint density function based on the Least Square Support Vector Machine (LS-SVM) solving linear operator equations. Utilizing kriging we interpolate the measurements to specific points that we are interested in to get more survey data. Simulation results indicate that the proposed algorithm provides better location accuracy even in severe NLOS conditions. [C916]

"CDMA Relaying in Multiple Frequency Schemes in a Manhattan Environment"

The relaying concept utilises the non-linear character of the radio propagation at the expense of engaging additional resources. This paper investigates the benefits from employing relaying in multiple frequencies, as opposed to a single band. Rearrangement of the communication links among the resources can convey the interference from the user terminals to the base station receiver at the operator's choice. Applying relaying on alternate sites and using concurrent uplink connection throughout the system is shown to perform substantially better than other frequency relay options. [C917]

"Two Variables Feedback Control of Plasma ETCH Processing"

In this study, we have experimentally demonstrated two realtime feedback control systems in a chlorine inductively coupled plasma etcher. One is the closed-loop control of the electron density and the ion energy, the other one is the closed-loop control of the ion energy and the ion flux on the wafer surface. A novel transmission line microwave interferometer was used to measure plasma electron density'. The principle of this technique is the same as the conventional microwave interferometers except that the sensing microwave propagates along a transmission line structure, thus, it avoids the multi-path problem which often reduces the sensor's dynamic range and accuracy. An impedance meter was adopted to measure the rf voltage, current and their relative phase angle. The electrical characterizations on the electrostatic chuck can be obtained by compensating the parasitic effect of the coaxial cable which located between the impedance meter and the electrostatic chuck via transmission line theory. The rf voltage is linearly dependent on the sheath voltage, or the ion energv and the ion flux can be calculated from sheath model method. A back-propagation artificial neural network was adopted to estimate the ion flux at low bias power level. In both of the control systems, the actuators are two 13.56 MHz rf power generator which drive the inductive coil and the electrostatic chuck to adjust the plasma density and ion energy, respectively. The information of the plasma electron density, ion flux and peak voltage step responses are used to set up two first order liner time-invariant systems. The closed-loop proportional-integral controllers are designed to compensate for process drift, process disturbance, and to minimize steady-state error of plasma parameters. The experimental results showed that the closed-loop control had a better repeatability of plasma parameters and a better reproducibility in etch rate compared with open-loop control. [C918]

"CARE: Rocket Experiments for Investigation of the Radar Scatter Proerties of a Dusty Plasma"

Summary form only given. The Charged Aerosol Release Experiment (CARE) will use a rocket payload injection of particulates in the lower ionosphere to determine the mechanisms for enhanced radar scatter from the electrons imbedded in an artificial dusty plasma in space. Natural dusty plasmas in the mesosphere near 85 km altitude have been shown to enhance radar scatter at VHF frequencies by 40 dB or more. The CARE program is designed to study the scatter processes near 200 km altitude in the ionosphere where densities are up to 1000 times larger. Numerical simulations of particulate transport in the upper atmosphere with charging by electron pickup or photodetachment have been used to predict the dusty plasma densities. These charged particle distributions provide initial conditions for particle simulations of plasma turbulence driven by the free-energy of the high-speed charged particle motion. Finally, radar signals scattered from the plasma irregularities are estimated using electromagnetic wave theory. The physical properties of the dusty plasma as will be determined

using the radar echoes as well as in situ probes on the rocket payload and on secondary payloads launched after the dust has settled into the lower atmosphere. In addition, the NASA AIM satellite will measure the dust layer by-scattered sunlight and absorption. [C919]

"Modeling of a Single Element Pulsed Ring-Down Antenna for Implementation in a Phased Array System"

Summary form only given. A pulsed ring-down phased array antenna provides substantial energy deposition in the far field region in addition to a broad range main beam with scanning capabilities. This allows remote neutralization of Improvised explosive devices (IEDs) at far field distances and in virtually any direction. The pulsed ring-down antenna operates by charging the single element antenna with a high potential source and closing a switch to develop transient wave reflections on the antenna which then propagate in air. The performance of a pulsed ring-down phased arrav is highly contingent upon the design and performance of the individual antenna elements within the array. Such factors as operating voltage, antenna capacitance, material losses, antenna geometry and closing switch conductance characteristics must be examined for optimal performance to be achieved. By utilizing the Comsol RF module transient analysis functions, we are able to characterize the various parameters beginning with a monopole and a dipole pulsed ring-down antenna operating in the hundreds of MHz range. We have examined and compared the results achieved from the experimental setup to the simulation model in order to better characterize the individual components of the antenna. We have also examined the discrepancies between an ideal closing switch and the experimental setup closing switch, which dramatically affects the far field range of the antenna. We have examined the material properties of the antenna to improve losses and increase system capacitance allowing an increase in the number of RF cycles per antenna discharge. With the results presented, an accurate model of pulsed ring-down antennas is available and will allow future development of more complex geometries that will improve the operation of pulsed ring- down phased array. [C920]

"Site-Specific Model for UWB Indoor Propagation Channel"

A site-specific model of UWB pulse propagation in the indoor environment is addressed in this paper. The simulation utilizes the principles of geometrical optics (GO) for direct and reflected paths' tracing and time domain technique for describing the transient electromagnetic field reflected from wall, floor, ceiling, and objects. The polarization of received waveform is determined by taking into account the radiation pattern of transmitting and receiving antenna, as well as the polarization changes due to every reflection. The model gives more intrinsically interpretations for UWB pulse propagation in realistic indoor environment. [C921]

"Polarization of Atmospherics Propagating Under Night-Time Ionosphere"

Polarization parameters of ELF-VLF radio waves propagating within the Earth-ionosphere waveguide under night-time conditions have been investigated using experimental records of tweek-atmospherics (tweeks). Tweeks are observed during nighttime and represent a response of the Earth-ionosphere waveguide excited by lightning strokes. Tweeks are formed by series of pulses consecutively reflected from the waveguide boundaries under different incident angles depending on a source-observer distance and effective ionosphere height along a propagation path. Using a source location technique described in our previous works we determined geometrical propagation path parameters such as source range, effective ionosphere height. We used then a time-frequency representation of the analyzed tweek waveforms to infer polarization parameters of the electromagnetic waves propagated under different incident angles as the first waveguide mode. Obtained dependencies show substantially different behavior in depend on a propagation path orientation in refer to the magnetic meridian. [C922]

"A Mobile Positioning Algorithm Based on Environment Estimation"

In this paper, we propose a novel mobile positioning algorithm based on estimation of radio propagation environment in cellular networks. Accurate and effective mobile positioning is imperative for successful location based services (LBS). Since radio propagation characteristics vary in different environments, knowing the environment of the mobile user is essential for accurate location estimation. The key feature of our algorithm is its capability to estimate the environment of the mobile user and utilize this information for enhancing received signal strength (RSS) based distance calculations. The proposed algorithm has been evaluated using field measurements collected from a GSM network in diverse geographic locations. Typical examples and measurements statistics are provided. The proposed algorithm turns out to be significantly successful, achieving high estimation accuracy, and thereby enabling high-performance mobile positioning. [C923]

"Experimental Analysis of the MIMO Channel for In-door NLOS Multi-path Propagation"

Multiple-input and multiple-output (MIMO) channel measurement and analysis are presented based on multiple-input and single-output (MISO) antenna configurations associated with dynamic measurements. The measurement is considered in a time-stationary elliptical scattering in-door propagation scenario, where a special case of the "Kronecker" MIMO channel model is derived and the channel reciprocity for the uplink and downlink is assumed. The cumulative distribution functions (CDF's) of the delay spread and fading envelope, as well as the maximum-to-minimum eigenvalue ratio (MMEVR) are investigated and compared with respect to different antenna spacing and angular spread, respectively. For large angular spread, a wider arrival angle shows that it is not necessary to increase the un-correlated inter-subchannels. These analysis results meet most real MIMO channel statistical property scenarios. [C924]

"Rainfall Statistics Over India"

Rainfall is one of the most important parameters in climatology, agriculture, weather modification and weather monitoring. Moreover, it is of immense interest in communication and link designing as above 10 GHz it attenuates the signal giving rise to interruption in wave propagation. In addition to this rain gives rise to cross polarization effect in communication systems where frequency reuse technique in used in order to increase channel capacity. Hence study of rainfall, the attenuation and cross polarization effect needs careful study. Attenuation prediction methods like ITU-R needs rainfall rates at less integration time. The Meteorological Departments, however, supply rainfall data at hourly interval. Hence a conversion formula from hourly to less integration time, say 1- minute or 15 minutes is needed. In this paper conversion formulae have been derived between hourly and 15 minutes rainfall rate over few stations in India. The rainfall data have been collected from India Meteorological Department, Pune. Regression coefficients have been derived between hourly and 15-minutes rainfall rate data. [C925]

"Mikrowave Propagation Factor at Small Grazing Angle Over Sea"

On the basis of analysis of extensive experimental data of our researches on the centimeter and millimeter radiowave propagation above a sea and land and results was formulated the conception that heights are single meters above a marine surface with agitation for description of the field it is necessary to utillize a diffraction model but not method of tangent plane (MTP). The lower limit bound of strict application of MTP is determined two criteria: 1. by absence of shadings of elements that reflect to a point observation of the field, its roughnesses; 2. by a limit on the minimum value of the glancing angle from the convex element of roughnesses. After such conclusion obtained from test data analysis, we have applied the proposed DCT based filter to processing real life X-band side look aperture radar (SLAR) images. Thus, we demonstrated that the proposed adaptive DCT-based filter is rather efficient for removing non-stationary noise in selected test applications. [C926]

"Diurnal Pattern of ELF Radio Signal Detected at the `Bellinshausen' Antarctic Station"

Diurnal amplitude variations were found in the man-made ELF radio wave recorded at the Antarctic station "Bellinshausen". The propagation path was 16.25 Mm long. Average level of the field corresponds to the literature data. Diurnal amplitude variations in the record arise from the day-night non-uniformity of the waveguide. The ambient day level is by 5-6 dB lower than that at the ambient night conditions in the vertical electric field component, it is by 4-5 dB lower in the horizontal magnetic field. Computational results are presented for the fields in the spherical Earth-ionosphere cavity with the 'whole day' and 'whole night' ionosphere models taken from literature. Model data contradict to observations indicating on inexact literature value of the phase velocity of radio waves. Model data match the experiment after the phase velocity is corrected by 10%. Since the 'whole day' and the 'whole night' ionosphere models do not account for the wave diffraction at the day-night interface, we conclude that more exact modeling is desirable. [C927]

"Attenuation Time Series Synthesis for Land Mobile Satellite Links"

This contribution provides a method to synthesize attenuation time series for land mobile satellite links. The time series generator is based on an attenuation threshold dependent fade duration model of the land mobile satellite channel [1, 7]. The fade duration is modeled with partitioned Fritchman's Markov-chain and parameterized on a land mobile satellite measurement performed on the board of a moving vehicle, thus the fading events can be observed in the measurement data are due the multipath propagation. To achieve attenuation time series from the fade duration process the synthesized time series are generated in two steps. At first a two-state Markov model applied to generate the long term behavior of the channel and it models the fading/non fading states. The second step is to simulate the fine structure of the single fading events for the fading periods calculated previously with the two-state fade/non-fade Markov chain. The attenuation threshold dependent Fritchman's model of the fade duration is applicable for the parameterization of the two-state fade/non-fade model and also

for the generation of single fading events with any desired duration and fade depth. The combination of the long-term and the short-term synthesized events can be applied to generate time series for long term [C928]

"Adaptation of Angle-of-Arrival Estimation in Mobile Communications Using Geometrically Based Channel Models"

Channel modeling is considered a way of simulating and studying RF channels. A channel model can perform the function of producing the channel output parameters, such as multipath delays, and signal direction of arrival. Geometrically based channel models are introduced by defining a propagation environment with a specific geometrical layout. This work focuses on geometrically based single bounce elliptical model, GBSBEM and geometrically based single bounce circular model, GBSBCM because of their ability to produce spatial channel characteristics that are tied to the physical propagation environment. Simulations that represent and implement the geometry of the channel for both models are designed and analyzed using Matlab software. A thorough study of the channel output parameters AOA, TOA, and joint AOA-TOA probability density functions is carried out. The impact of the geometric channel parameters on adaptation of AOA estimation is illustrated.. [C929]

"On the Range-Data Rate Performance of Outdoor UWB Communication"

Major envisioned commercial ultra wideband (UWB) applications are indoor, nonetheless, the suitability of UWB technology for data communication over longer ranges may also have a relevant role in the outdoor wireless communications. In this paper we evaluate and compare the achievable range-data rate performance of a reliable UWB communication link for long ranges, considering an Impulse Radio UWB system and the use of M-ary PAM and M-ary PPM modulations. The free space, lognormal shadowing and two-ray path loss models are considered. We incorporate the UWB frequency dependency of two different ground reflection materials as well as different electric field polarizations in the two-ray path loss model. Tables with the achievable range-data rate performance of the UWB link are provided. Novel results of this research work indicate that, complying with the FCC emission limits, a reliable outdoor UWB link can be established by compromising between range and speed of transmission. [C930]

"Structural Barrier Electromagnetic Effects Modeling and Simulation"

The phenomenological study of magnetic, electric and electromagnetic field interactions with barrier structures and materials is important to understand from the standpoint of designing for the effects of stray magnetic and electric fields on sensitive electronic equipment for evolving aircraft applications to advanced sensors and systems for urban warfare. Northrop Grumman integrated systems eastern region (ISER) has developed a world-class, robust and validated electromagnetic environmental effects (E3) modeling and simulation (M&S) capability and has performed preliminary M&S of various barrier structures to gain an initial understanding of the phenomenology which must be used as a systems design tool, to design realistic and meaningful test/validation experiments, as well as to validate experimental results for a range of parametric barrier structural enclosures and architectures. ISER is using fundamental, first principal electromagnetic modeling tools, as well as unique hybrids of these phenomenological descriptions, to accurately describe E, H, and RF propagation through complex media/barrier structures. These M&S tools, coupled with laboratory validation measurements, are being used to establish key metrics and performance parameters of individual as well as networked configurations. This presentation will review very basic to more complicated electromagnetic wave/barrier interactions. [C931]

"Requirements for Indoor Building Databases to increase the Accuracy of the Propagation Results"

Currently, for the planning of wireless networks (e.g. WLAN) in indoor scenarios either empirical (direct ray), semi-deterministic or ray-optical propagation models are used. In this paper two different model approaches are used to investigate the impact of database inaccuracies to prediction results. Therefore a fast ray tracing model using a preprocessing of building vector data is used, as well as a semi-deterministic dominant path model. This paper focuses on different inaccuracies in indoor building databases: Time variance due to doors or windows which are closed or opened causes slow fading and has thus significant influence to the prediction results. The accuracy of models is also influenced by missing objects in the building database, such as furniture or walls. The impact of adjacent buildings is also investigated. [C932]

"UWB Multipath Simulator based on TEM Horn Antenna"

Most of the existing UWB models are extensions of narrowband models. These models suffer from limitations because UWB multipath propagation is frequency and antenna dependent. In this paper, a directional simulator based on TEM horn antenna is developed. This simulator illustrates the spatial impact on the received multipath profiles. Several deterministic scenarios are simulated to examine the antenna impact on receiver design and positioning accuracy. [C933]

"The Impact of Different Radio Propagation Models for Mobile Ad hoc NETworks (MANET) in Urban Area Environment"

Network simulation tools are frequently used to analyze performance of MANET protocols and applications. They commonly offer only simple radio propagation models that neglect obstacles of a propagation environment. The radio wave propagation model has a strong impact on the results of the simulation run. This work shows different radio propagation models into a simulation tool. The model is based on data of the simulation area in urban area. Consequently, we obtain different performance evaluation results. This paper gives insights on the effect of different propagation models for MANETs in indoor and outdoor environments and presents the parameters and the results of simulating using network simulator. [C934]

"Ray Tracing with Fresnel Zone Theory for Fixed Wireless Access Channel Characterization"

Until now deterministic models only considered the power loss of a ray due to its total path length or its interactions with the environment (i.e. reflections, diffractions). However, in the fixed wireless access scenarios the radio waves propagate close to roof tops and according to the theory of the Fresnel zones, even when for LOS conditions, the loss can be as much as 6 dB due to a single obstacle just below the ray path. The aim of this paper is to investigate how the radio channel characterization is affected by the partial blockage of the Fresnel zones. Simulation results show that the received power is the channel characteristic mostly affected. [C935]

"Vectorial Characterization of DVB-T Propagation Channel Application to Radio-Mobile Communications: The "CAVITE" Project"

In this paper, the whole project CAVITE is described. This project is proposed within the framework of sets of themes around "Sciences and Technologies of Information and Communication" for radio-mobile digital communication in order to increase the data rate or quality of transmission. One of the objectives is the reception of Digital Video Broadcasting on Terrestrial networks (DVB-T) in vehicular condition (car, train ...). [C936]

"Modeling the Time-Variant MIMO Channel"

This paper studies two different modeling strategies for capturing the time-variant behavior of multiple-input multiple-output wireless channels. The first method generates a multi-variate random description of the channel matrix based on the measured space-time covariance. The second method describes the physical variation of the multipath propagation components with time. Information theoretic metrics are used to compare the performance of the models to measured data. [C937]

"Research on Tropospheric Propagation Modeling in Satellite Radio-Links"

The paper is a brief report describing the "story" of the propagation models used for the design and control of satellite systems in the recent years (telecom_munications and broadcasting). The more common models found in the literature are cited, briefly commented, when possible, and referenced. [C938]

"Reflection and Transmission Properties of Building Materials in W-band"

The paper provides details of the measurements of reflection and transmission properties of common building materials in W-band. The measurements are conducted with a vector network analyzer with high gain horn antennas. In particular, bistatic reflection profiles, reflection scattering profiles and transmission scattering profiles are presented. The measurements provide basic information needed for propagation related research in the development of future indoor communication systems in W-band. [C939]

"Modelling Radiowave Propagation through Vegetation media: a comparison between RET and dRET models"

This paper compares the performance of the radiative energy transfer (RET) model and an enhanced discrete version of the RET, the so called dRET, when predicting the scattered signals emanating from inhomogeneous vegetation volumes. The analysis of each model performance was carried out by comparing the model predictions with the actual scattered signal measured in a selected inhomogeneous tree formation at 11.2 and 62.4 GHz. It is shown that both models perform satisfactorily provided that the vegetation surrounding the receiver remains relatively homogenous. Nevertheless, when the vegetation geometry is more irregular, and therefore consists of differing types of vegetation, only the dRET model was observed to provide reasonable

signal level estimates over the entire angular range. [C940]

"Measurements and Simulations for On-Body Antenna Design and Propagation Studies"

This paper overviews a number of research activities aimed at characterising and optimising transmission links on human body. Measurement of the channel path gain with practical antennas and computer simulations of for body movement are presented. Performance of shorted microstrip patches is compared to that of monopole and disc-loaded monopole antennas. Different orientations of the shorted patches are compared. Use of simulations in the analysis of the effect of body dynamics on on-body antenna design and channel characterisation is demonstrated by numerical analysis of an FM wearable dipole antenna and simulations of the path gain variation while the user is standing up. [C941]

"Performance Considerations on MIMO Spatial Multiplexing from the Viewpoint of Antennas and Propagation"

MIMO channel characteristics and spatial multiplexing are investigated from the viewpoint of antennas and propagation in this paper. We conducted 4x4 MIMO channel measurement campaigns in an indoor propagation environment. Using the measured data, we examined the detail of the MIMO channels. The MIMO channels and eigenvalues are largely different for MIMO array orientations in an LOS environment. This is due to the effect of mutual coupling between antenna elements. Then, the bit error rate (BER) of eigenbeam space division multiplexing (E-SDM) in a quasi-static environment is examined using the measured MIMO channel data. It is shown that the BER performance in an LOS environment is affected by the mutual coupling. Furthermore, we obtained time-varying MIMO channel data, and calculated the channel auto-correlation and Doppler spectrum. The BER performance is evaluated for different maximum Doppler frequencies and different (LOS/NLOS) environments. [C942]

"UWB Multipath Response Analysis and Ranging Accuracy Improvement"

In-depth understanding of indoor ultra wideband (UWB) radiowave propagation characteristics is very important for indoor UWB communication system design and optimisation. Using the wave propagation channel information, it is possible to improve the ranging accuracy for positioning applications. In this paper, the UWB propagation characteristics is first analysed using both indoor measurement data and ray tracing simulation results. A multipath scattering series is defined based on the channel impulse response. The cumulative distribution function (CDF), mean value and standard deviation (STD) of each scattering series subset are analysed in detail. Then a novel algorithm for ranging accuracy improvement is proposed to deal with the shadowed non-line-of-sight (NLOS) scenario. Simulation results show that this new algorithm can improve the ranging accuracy significantly. [C943]

"Multiple Antenna Gain in Ultra-Wideband Indoor Propagation"

This paper presents an investigation on the gain that can be achieved by the application of multiple antenna techniques in ultra-wideband indoor channels. Both classic diversity approaches with only one transmitter as well as MIMO configurations with multiple antennas at transmitter and receiver are regarded. The investigations are based on deterministic indoor propagation simulations that have been conducted with a fully three-dimensional ray-optical simulator. The analysed quantity is the probability distribution of the signal to noise ratio at the receiver, which allows for the assessment of the reliability that can be obtained for data transmission. [C944]

"Results from a Very Short Distance Dynamic Diversity Experiment"

The objective of this experiment is to carry out a study of the rapid fading and enhancement (scintillations), simultaneously experienced by two Ka-Band receivers 9 metres apart monitoring a 20.7 GHz satellite beacon at 30 degrees of elevation. The experimental set up [1] permitted to analyse the dynamics of the wave front amplitude fluctuations, aiming to add a new insight into the early observations of microwave scintillations above about 10 degrees of elevation. As regards results, statistical information obtained from the analysis of the single time series is briefly presented and compared with the results of previous experiments. New results of the dual time series analysis (cross-correlation) are then presented along with the main conclusions obtained from the statistical processing and the correlation (and comparison) with ground based meteorological variables. This article introduces the experiment and briefly describes the dual receiver and data acquisition system specifications. The signal processing and the experimental results, including single and dual receiver analyses, are explained and finally the main conclusions reached are summarised. [C945]

"Rain Measurement for Improved Propagation Modelling in Czech Republic"

When planning the microwave links (i.e. reasonable transmitter power, antenna diameters, receiver noise number etc.) it is necessary to take into account the atmospheric attenuation, especially its major component that is caused by rain. According to the international conventions, the considerations are based on the cumulative distribution of the atmospheric attenuation. This contribution shows some examples of rain data analysis aiming at the radiowave propagation assessment and fade mitigation technique. The cumulative rain rate distribution, the distribution of fade and interfade duration is presented. Statistical dynamic properties of rain event are added. A method attempting the estimation of the basic rain type is shown and an equation to predict the type and the decision threshold is described. A simple method to estimate the site diversity gain based on rain rate measurement is also included. [C946]

"A New Satellite Experiment in the Q/V Band for the Verification of Fade Countermeasures based on the Spatial Non-Uniformity of Attenuation"

The paper summarizes the baselines of a new satellite payload for radiowave propagation measurements in the Ka and Q/V bands which is being developed by the European Space Agency for the ESA Alphasat mission with the full support of the Italian Space Agency (ASI). The radiowave propagation experiment will be based on a geostationary satellite and will allow collecting a set of multiple simultaneous attenuation and depolarization measurements during a period of at least 3 years (with a possible extension up to 5 years) in many locations spread across a large area. This experiment represents a natural continuation of the European commitment on the characterisation of the Ka and Q/V band demonstrated during the recent period by the development of ESA OLYMPUS, ASI ITALSAT and CNES STENTOR satellites. The baseline design foresees a transmit-only payload radiating stable Ka and Q band coherent beacon signals from a geostationary platform. It is foreseen that the coverage area will be at least continental Europe with the possibility of a global coverage being considered; the polarization will be circular in order to ease depolarization measurements where possible and the reception shall be possible with antennas with diameter of the order of one meter. [C947]

"A Hybrid Spatio-Temporal Model for Radio Propagation in Urban Environment"

Although deterministic propagation models are physically meaningful and potentially accurate, they still have some limitations to reliably reflect some propagation effects known from measurements such as diffuse multipath and keyhole effect for MIMO or smart antennas applications. Our measurement results in urban environments also observed diffused multipath components of the walls. In this paper, a hybrid physical spatio-temporal model is proposed for radio wave propagation in macrocellular urban environments. The hybrid model combines a deterministic model with a geometry-based stochastic model. The former model is a 3-D site-specific model employing a ray-tracing algorithm to describe the direct wave, specular-reflected waves, and diffracted waves due to plane surfaces or rectilinear edges of the buildings in urban. The latter model describes the diffuse multipath components (non-specular contributions) of the dominant walls and the scattered fields due to randomly positioned local scatterers around mobile stations (MSs). According to our broadband measurement results, the total number of point scatterer depends on signal bandwidth. Our model has been validated by comparing the computed TOA (Time-of-Arrival), AOA (Angle-of-Arrival), r.m.s. angle spread and r.m.s. delay spread of radio propagation in urban environments with the measured ones. It is also found that the hybrid model including the scattered fields has better prediction accuracy than the deterministic model especially in predicting the temporal channel parameters, which is because that the scattered fields of the clustered scatterers yield broader temporal responses. [C948]

"Fluctuations Effects of GPS Signals on High Latitude Transionospheric Links"

The paper presents the analysis on the storm-time occurrence of phase fluctuations of GPS signals observed at high latitude ionosphere using both north and south hemisphere GPS stations. GPS phase measurements provide information about TEC variations. The fluctuations are caused by different scales ionospheric irregularities which were associated with auroral oval and polar cap. During storm intensity phase fluctuations essentially increased. The strongest fluctuations associated with polar patches which were usually observed in the polar ionosphere. During storm strong TEC fluctuations were detected at geomagnetic latitudes lower than 60N. [C949]

"The Accuracy of a Radiowave Simulation Model at 20.7 GHz"

The use of EHF and SHF systems operating above 20 GHz is becoming increasingly popular for high-capacity communication systems. This popularity is driven by a number of factors, the most common being the congestion at lower-frequency bands and the potentially high capacities available. One of the main disadvantages of using these higher frequencies is that the attenuation caused by atmospheric effects can become large. Attenuation caused by clouds, rain and atmospheric gases become very large. In this paper an

attenuation forecasting algorithm is demonstrated with a 20.7 GHz satellite beacon measured at two locations separated by 7.5 km. The algorithm deliberately uses data-sets that are in common use and represents the gains available with current technologies, without the use of high-resolution Numerical Weather Prediction systems. The model is compared to 20.7 GHz beacon measurements made at two sites in the South of England. The model demonstrates statistics that match those of the beacon and the timeseries of the model and the beacon also match well. The diversity gain demonstrated by the two locations is also modelled well using this technique. This makes the system ideal for modelling earth-space propagation at EHF and SHF frequencies. [C950]

"A Radiowave Propagation Study in an Urban Environment using the Fourier Split-Step Parabolic Equation"

This paper presents the application of the split-step Fourier transform parabolic equation to propagation modelling in urban scenarios with respect to complex boundary conditions modelling. Impedance boundary modelling is achieved using a domain decomposition algorithm enabling individual impedance boundaries to be treated using mixed sine and cosine transform. Simulation results for several two-dimensional scenarios are shown. The results obtained are compared with geometrical optics/UTD. [C951]

"The Dynamics of Rain Attenuation in Northern Italy"

A model to derive the dynamics of rain attenuation from rain rate data, which was previously derived using data measured in southern England, is compared to measurements in northern Italy. Some discrepancies are found, and some improvements to the model are made. It is found that the frozen-storm hypothesis should be abandoned in this climate. [C952]

"Analysis of Scattering in Physically Nonstationary Mobile Radio Channels"

The results of propagation measurements in an outdoor urban environment using a recently developed 3-D high-resolution channel sounder are analysed. Measurements are performed at a fixed position as well as along a trajectory to characterise the angular dispersion in both azimuth and elevation. A clustering algorithm is used to separate and group the estimated multipath components. The rms cluster angular spread in both elevation and azimuth of the different clusters is analysed over space and time and related to its physical scattering sources. [C953]

"Polarization Behaviour in Urban Macrocell Environments at 2.2 GHz"

This paper investigates the polarization behaviour of the propagation channel in urban macrocell environments at 2 GHz. The study is based on a dual polarized single-input multiple-output (SIMO) measurement campaign. The beamforming algorithm which computes the direction of arrivals (DoA) is explained. Two examples of spatio-temporal results representative of the street guided propagation and diffraction over rooftop mechanisms, are analysed. Thereafter, the study focuses on the polarization analysis. The average polarization matrix is computed and compared with previously published results. The polarization dependency with the physical propagation parameters is also investigated. [C954]

"The Spectral Method of the Decision of Problems of Propagation, Diffraction and Reflection of Narrow Millimeter Waves Radiobeams"

The aim of the paper is the development and realization of a spectral method of the decision of problems of propagation, diffraction and reflection of narrow millimeter wave's radiobeams. [C955]

"Signal Processing Perspectives to Radio Channel Modelling"

In this paper, we show that a proper data-model for a measured radio channel consists of deterministic and stochastic components. The deterministicdescribing the part maps channel parameters to the radio channel using an algebraic function, while the stochastic part is parameterized using second order statistics. We focus our discussion on the stochastic part describing the dense multipath component (DMC) of the channel. We propose to use the von Mises-Fisher distribution to describe the power angular profile at the transmitter and the receiver in azimuth and elevation. This distribution is appropriate for angular data. Furthermore, the uniform angular distribution, used so far to model the DMC, is included as an extreme case. We identify the basic components necessary to implement this channel model for analysis and synthesis purposes. Finally, using channel sounding measurements, we demonstrate that uniform as well as concentrated distributions occur in real world radio propagation scenarios. [C956]

"Analysis and Ray Tracing Modelling of Co- and Cross-Polarization Radio Propagation in Urban Environment"

The co- and cross-polarization behaviour of the urban propagation channel has been studied through both MIMO measurements and ray tracing (RT) simulation. A ray tracing model including diffuse scattering has been adopted, allowing the role of diffuse scattering to be highlighted through comparison between measurement and simulation. The high degree of cross-polarization power transfer observed in both measurement and simulation seems to be partly due to multipath propagation (and to diffuse scattering in particular), and partly due to the polarization behaviour of the antennas. [C957]

"Prediction of Propagation Charachteresitics in Indoor Radio Communication Environments"

In this work, we present a unified approach to predict the total path loss in various indoor communication links, taking into account the new analytical methods of the derivation of the fading phenomenon along corridors and between floors. We take into account the stochastic method of slow and fast fading estimations, caused by diffraction and multipath phenomena, respectively. The statistical parameters required for statistical description of the diffraction and multipath phenomena, such as the standard deviations of the signal strength due to slow and fast fading are obtained from the corresponding measurements. Based on strict and completed path loss prediction, an algorithm of link budget performance is presented for different scenarios of radio propagation within indoor communication links. Results of proposed unified approach are compared with the analytical model (Bertoni's) and the empirical model (Rappaport's), which are well-known and usually used in link budget design in various indoor environments The results are also compared with measurements carried out for different propagation scenarios, along corridor and between floors, occur in the indoor communication channels. A better agreement with experimental data is obtained compared with the models in consideration. [C958]

"Impact of the Introduction of Diffuse Scattering on Radio Channel Parameters in Urban Environments"

The paper presents an implementation of the diffuse scattering within a 3D urban propagation simulation method, based on ray-launching. New contributions representing the diffuse scattering are added to the traditional specular rays, leading to a more realistic model, especially when radio terminals are in the close vicinity of buildings. The impact of this enrichment on the simulated wideband propagation channel is analysed in this paper. In particular, it is found that the wideband signal predicted at street-level is strongly modified when taking into account the diffuse scattering phenomenon. The implemented method is illustrated by comparing simulations taking into account or not the diffuse scattering. Key radio channel parameters are analysed: power-delay profile and angular profile. [C959]

"Efficient Finite Difference Method for Simulating Radio Propagation in Dense Urban Environments"

MR-FDPF method (multi resolution frequency domain ParFlow) was initially developed to simulate radio propagation in indoor environments. This approach started from a formalism similar to the famous TLM approach in the frequency domain. Since the problem reduces to a linear system resolution, a multi-resolution approach has been developed to solve the system with a lower complexity than standard time-domain TLM algorithms. In this article we show that MR-FDPF method, by adapting some parameters and doing approximations to reduce the complexity, could be also efficient to simulate bigger environments like outdoor. An advantage of this method is that the complexity does not depend on the number of buildings, but only on the size of the area to compute. This could be a good alternative to compute radio propagation in dense urban areas, for which ray tracing suffers a high complexity for a high number of buildings. [C960]

"Time Domain Model of Multipe Convex Objects Transition Zone Diffraction"

In the paper there is derived the 2D time-domain model of a bare convex obstacle model, which includes an application of an amplitude and the first order transition zone diffraction process, called slope diffraction. It is done trough the usage of an UTD formulated for a frequency domain. The obtained result can be useful for the time-domain modelling of a channel containing bare convex objects. [C961]

"Wideband Channel Characterization in a Tropical Forested Area"

This paper presents a wideband measurement and characterization of a tropical forested channel. Complex channel impulse response measurements were carried out at 240 MHz for static transmit and receive antennas. Measured power delay profiles indicate significant multipath components following the dominant propagating

wave. Relevant parameters such as RMS delay spread, Rician K factor et al. have been estimated. The measurement results indicate that the coupling effect of the antenna array at the receiver side and the tropical weather can influence the quality of the received signal significantly. [C962]

"Modification and Tuning of the Universal Okumura-Hata Model for Radio Wave Propagation Predictions"

In this paper, a new definition is proposed for the transmitter antenna height of the universal Okumura-Hata model. The parameters of this modified model is tuned based on a Levenberg-Marquardet method. The electric field strength predictions of this modified tuned model is compared with the measurement data obtained by utilizing the IS-95 pilot signal in a commercial CDMA network in the rural Australia. [C963]

"Tunnel Propagation Channel Characterization for DSRC Applications"

The propagation channel characteristics of a transportation tunnel for DSRC applications is discussed. One problem in DSRC applications is that the received power in the adjacent (non-coverage) zone can be higher than the maximum allowed threshold. To identify its cause, a wideband directional channel sounding was conducted inside the tunnel. From the sounding data, the propagation path parameters are estimated by a multidimensional maximum likelihood estimation algorithm and scatterers are identified based on the angle-of-arrival and delay information. These propagation paths together with simulated DSRC application antennas are then used to predict the probability of the received power in the adjacent zone. The power contribution of the scatterers are calculated and the dominant scatterers are found to be from ground and sidewalk scatterers. [C964]

"Generalized Path Loss Model for Wireless Channels in Homogenous Propagation Environments"

We propose a novel generalized path loss model for wireless channels, where propagation environments are suitable to be described by stochastic structures rather than being deterministically characterized. The model is combined with two dominant terms: a logarithmic function and a fractional power function of propagation distance. We validate the model by the experimental data under typical propagation environment. The well accordance between numerical and experimental results implies that the model would be useful for characterization of radio propagation in wireless networks. [C965]

"Directional Channel Characteristics from Microcell Measurement and Simulation"

In this paper, the channel predicted by using a ray- tracing simulator is presented and compared to microcellular measurement results performed inside a university campus. For data processing, the conventional beamforming is utilized to compare the directional wideband channel properties of both simulation and measurement results. Ray-tracing algorithm can investigate most of the radio propagation mechanisms. However, there are some scattering effects that are not included. Therefore, the objective of this study is to analyze and compare directional wideband channel characteristics such as azimuth-delay spectrum and azimuth-coelevation spectrum from the ray-tracing results with measurements to gain insights on the significant propagation mechanisms in microcell scenarios. [C966]

"One Base Station Approach for Indoor Geolocation System using RFID"

The proliferation of mobile computing devices and wireless geolocation networks has fostered a growing interest in location-aware systems and devices. Most technologies always use at least three base stations for computing the position of the target objects, including RFID (radiofrequency identification). This paper suggests a novel algorithm, using the RFID-system, to support one reader for localizing target tags amid the clutter of indoor interference environments, based on the metrics of the received signal strength and the time of flight. This algorithm attempts to specify the target tag among four-nearest neighbors as the four-reference tags, and adapt the weighted-center of gravity technique. The method provides a level of accuracy of about 1.07 m as the total error average of positioning 10-target tags in various interference environments that are generated on all sector-functions. The total error averages of the 3-6 sectors functions are 1.18 m, 0.74 m, 1.6 m, and 0.78 m on one reader in an area of 12 m by 10 m. The effects of interference in the simulation indicated that the accuracy is better for the even-sector-functions as the input-signals' generator for this algorithm. [C967]

"A computational model for calculating the electric field strength of radio transmissions"

This paper presents a computational model to calculate the electric field strength of radio waves due to a given transmitter. The developed software is based on ray optics theory and it can determine the field strength in double quick time and the electric field strength can be graphically illustrated. This model can also be used to

predict the location of a new transmitter providing optimum coverage. By using this model we attempted to identify the field strength distribution in selected areas of the Rathnapura district, Sri Lanka, from a given transmitter. Good agreement was seen in the computed shadow areas and the areas where no radio signals were observed in the field strength measurements carried out by the Sri Lanka Broad Casting Corporation in 1997 for the Yatiyanthota and Radella transmissions. Where measurable signals were present, the measured and computed signal strengths were different. This is possible since atmospheric absorption, reflections from mountains among other effects were not considered in the computations. This computational model is useful in planning and operation of radio communication systems so as to optimize radio coverage and cost. [C968]

"Ray-tracing propagation prediction for wireless mesh networks (WMNs)"

Nowadays, a lot of research efforts and technical papers are done on ad-hoc networks and wireless local area networks (WLAN). Recently, however wireless mesh networking is attracting significant interest from academia, industry, and standard organizations because it is offer several favorable characteristics such as dynamic self-organization, easy maintenance and reliable services. A network with several transmitters and receivers that communicate to each other will form a mesh network topology. Once the transmitter launches a ray, it will be reflected, refracted or diffracted to any kind of surfaces such as the concrete wall. That process will decrease the received signal strength at the receiver. So, ray-tracing technique can be used to analyze the network performance. It is a method that used to determine the ray paths that emanate from the transmitter (Tx) and arrive at the receiver (Rx), and also an efficient approach in determining the propagation issues in wireless environment. So, this paper will be focused on Ray-Tracing techniques and WMNs theories. [C969]

"TOA Estimation using Music Super-Resolution Techniques for an Indoor Audible Chirp Ranging System"

An indoor TOA-based ranging system which uses an audible spread spectrum signal is presented. The indoor acoustic environment is modeled with a dense multipath propagation channel whose characteristics are very different from those of outdoor environments. The complexity and site-specific nature of indoor acoustic propagation, when using traditional correlation techniques, often lead to the creation of undetectable direct-line-of-sight (DLOS) situations. It is shown that by using an LFM signal and MUSIC super-resolution techniques, namely the root-MUSIC, the substantial TOA errors can be reduced significantly and the range accuracy improved by a factor of at least 3. [C970]

"Measurement Based Physical Layer Modeling for Wireless Network Simulations"

Simulation methods have become an integral part of almost all aspects of networking research and particularly in the area of wireless networks. Any new protocol or methodology that is proposed for wireless networks almost always will be demonstrated using simulations. However, there is little evidence that existing models of physical layer signal propagation and signal strength calculations produce realistic or meaningful results. Indeed, there have been a number of empirical studies that have shown little predictability in measured signal strength and packet receipt probability for deployed networks. Common assumptions used in simulation models about the behavior of the wireless signal have been shown to often be invalid. These prior works motivated us to design a stochastic model for wireless signal propagation in our GTNetS simulator. Our model is based on a detailed empirical measurement study and uses random variations to produce more realistic behavior for wireless packet transmissions and reception modeling. [C971]

"Ionospheric TEC and scintillation during the 15-16 May 2005 major storm over equatorial anomaly region at ARAU"

The ionospheric TEC and scintillation measurements were investigated at ARAU, Malaysia station based on GPS measurements during major storm on 15-16 May 2005. The major storm was observed for the period from 12 to 17 May 2005 and was accompanied by a moderate solar activity with F10.7 > 100 and SSN > 100. The maximum readings of geomagnetic indices Dst, Kp and Ap recorded by the World Data Centre (WDC) are -263 nT, 9 and 105 respectively. The solar wind index, Bz showed a sharp incursion to the south with a peak reaching -37 nT. The 15-16 May 2005 storm has only one SSC and is the most intense storm recorded during the solar minimum 2005. The results show pronounced phase and amplitude scintillations and sudden increase in TEC is clearly observed during the storm. The peak phase scintillation recorded during the storm is 0.19 m and the measured amplitude scintillation and S4 index on both L1 and L2 bands are > 13 dB-Hz and > 0.7 respectively. [C972]

"Long-term rain attenuation probability and site diversity gain prediction"

The increasing growth of wireless communication systems has caused the usage of higher frequencies in order to have wider bands. However the increase of frequency will lead to the degradation of satellite communication performance. Rain attenuation is one of the most fundamental reasons of the degrading quality of services. Thus fade mitigation techniques used in order to compensate for excessive attenuation such as diversity protection schemes, power control and adaptive processing techniques. Among these techniques the most efficient is site diversity (SD). In this paper, the effect of SD under the rain conditions, combine both categories for the estimation of slant path rain attenuation and SD gain has been the objective to enhance the existing satellite services at Ku-band under the rain conditions. The local experimental data is used as function to enhance the prediction techniques for satellite path instead of using the theoretical models, which mainly based on experimental data of temperate regions. [C973]

"Month-to-month variability of the melting layer boundaries"

The Bright-band is the typical enhancement in radar reflectivity during the melting process, which is still not completely determined. The seasonal variation over the year can give the characteristics that are valuable for designing and planning of a satellite link. The Malaysian meteorological radar data, from Kluang radar station (Johor), is used to trace the signature of the melting layer during stratiform precipitations events. The trends of the boundaries of the melting layer were studied by considering data extended to cover a six-month period (January-June 1998). It was observed that the boundaries and the thickness of the melting layer are found to be seasonally dependent. [C974]

"Artificial Neural Network for Wireless Field Strength Prediction under Power lines in Taiwan Railway"

A new model based on artificial neural network for the wireless field strength prediction for the message communicated to trolleys and level-crossings under Power lines inside Taiwan Railway. The purpose used with wireless communication, linked with level-crossings, and uses the radio propagation to dispatch message from the wireless equipments to the trolleys along Taiwan Railway. In contrast to other prediction models, the new method shows a better prediction result and generalization, so the forecast results are very accurate in Taiwan Railway. We perform some practical measurements under power lines, and then use the neural network model to verify the measured data. This model is particularly suited for application in Taiwan Railway planning from Tainan to Fangliao separated by Western Line, Pingtung Line, and Kaohsiung city local line respectively. The consequences for static and dynamic measurement of this wireless system, concerned with the level-crossing and the trolley, is able to present an improved mission regulation in railway. [C975]

"UWB propagation modelling of building penetration using ray tracing and FDTD techniques"

Propagation effects are studied within buildings to examine their influence on the performance of wideband communications systems that might operate under the FCC ultra-wideband (UWB) and IEEE802.16 specifications. In this ray-tracing and finite difference time domain (FDTD) techniques are used to consider propagation in the light of changing building techniques. Data from this is seen to agree quite well with measured data available in the literature, and identify propagation mechanisms and characteristics. In an indoor point to multipoint scenario involving line of sight and non-line of sight propagation a multiband frequency diversity scheme appears to show much promise. [C976]

"Frequency Dependence of the UWB Indoor Propagation Channel"

Ultra wideband (UWB) is seen as a major technology for future high rate, short range radio links. For the development of UWB-based communication systems for indoors, an accurate knowledge of the propagation channel is necessary. However, most of the available studies regarding the UWB radio channel concentrate on the lower frequencies of the FCC-defined spectrum mask, and experimental data is generally missing for the evaluation of the frequency dependence of the channel parameters. In this paper, an extensive sounding campaign is presented, where the UWB channel is probed from 3.1 GHz to 11.1 GHz in a typical indoor environment. Following a thorough analysis of the effect of the antennas on the measured data, a characterisation of the main propagation parameters is presented, with a specific interest on their frequency dependence. A frequency power decay close to the theoretical loss of 20 dB per decade is observed. Other typical parameters, such as the environment dependent path loss exponent, the delay spread or the power delay profile decay exponent show limited variations with increasing frequency. This behaviour may be explained by the characteristics of the main building materials constituting indoor environments, which present a relative stability in the frequency range of interest. [C977]

"Hiperlan and Wi-Max Propagation Experiments over Huge Distances"

The paper illustrates configuration and preliminary results of an experiment aimed to test the behaviour of low cost hardware components for the realisation of long distance wireless infrastructures. For this purpose, a star topology network made of links ranging from 100 to 300 kms was implemented. Performance analyses were run for about two months, showing extraordinary stability and reliability and excellent data transport performance. [C978]

"Design and Calibration of Antenna Arrays for Outdoor MIMO Channel Measurements at 3.5 GHz"

The use of antenna arrays at emission and reception is an attractive solution for future wireless systems in order to improve data rates and quality of service. The performance of these systems is very dependent on propagation channel. In this context, channel characterization and modeling are crucial. In this paper, we present the design and calibration of two antenna arrays at 3.5 GHz for MIMO (Multiple Input Multiple Output) channel sounding. This frequency band concerns Wireless Local Loop applications. The beam patterns of these two arrays are measured in anechoic chamber, and then a calibration algorithm is applied on these measurements. The calibration results are presented. The importance of this work is shown by ESPRIT algorithm simulations for better multi-path parameters estimation. This work is needed to obtain accurate measurements results to model propagation channel. [C979]

"Ultra Wideband Path Loss Modelling in a Line-of-Sight Office Environment"

Modelling of path loss behaviour in ultra wideband radio channels was revisited. Although simple but realistic standardized channel models have already been established, this paper attempts to provide detailed insights about the precision of the standardized model based on an extensive measurement campaign which covered whole areas inside an office room. Attention was paid to the frequency and distance dependency of path loss and their interrelation. It was found that the two dependencies can be modelled separately as the standardized UWB channel model assumed. Furthermore, this paper clarified the path loss modelling methodology to combat an ambiguous and non-unified model parameter derivation procedure. Finally, model parameters for path loss and shadow fading were derived based on the clarified method to complement the channel model parameter set. [C980]

"On the use of ECMWF-Scale Meteorological Estimates for Statistical and Real-Time Radiowave Propagation Prediction"

The design of fade-mitigation techniques (FMTs), required to efficiently combat the effects of meteorological phenomena when operating at K-band and above, is of current interest to many researchers. One of the key requirements in the design of FMTs is data able to describe the statistical and dynamical variations of attenuation. At K-band and above cloud, rain and gaseous absorption can all lead to significant attenuation. The availability large volumes of global-scale numerical weather prediction model output, such as that available from the European Centre for Medium-Range Weather Forecasting (ECMWF) model, has lead to its use in radio propagation prediction modelling. [C981]

"Link State Based Annulus Localization Algorithm for Wireless Sensor Networks"

Most of the state-of-the-art localization systems assume an idealistic radio propagation model that is far from the reality, and will lead to lower localization accuracy in real wireless sensor networks. In this paper we describe a coarse-grained link state based annulus (LSBA) localization algorithm that takes into account the anisotropic feature of real radio propagation to improve the localization accuracy and adapts to deployment irregularity as well. We compare LSBA with four typical coarse-grained localization algorithms: centroid, APIT, DV-HOP and amorphous in simulated realistic settings, and experimental results show that LSBA achieves the best tradeoff between localization accuracy and convergence speed in networks with moderate number of anchors. Based on our observation, we also make an improvement suggestion on DV-HOP and Amorphous to redefine the concept of neighboring nodes to reflect the radio irregularity, and simulation results show that both improved algorithms see increased localization accuracy. [C982]

"Decentralized Collaborative Uplink Beamforming with Robustness Against Channel Mismatches"

We present a distributed algorithm for collaborative uplink transmit beamforming that provides robustness against uncertainties in the channel state information. Our algorithm is derived using the available information about the second-order statistics of the channel and the possibly erroneous channel state. It can be applied to both line-of-sight propagation and flat fading channels. The beamforming coefficients of each terminal are computed locally using the available information about its channel and a single parameter that is broadcasted from the base station to all the cooperating terminals. [C983]

"Propagation modeling based on measurements and simulations of surface scattering in specular direction"

Accurate channel modeling for future THz communication systems requires knowledge of the reflection properties of typical building materials. Using Fresnel's equations it is possible to obtain this data from simple measurements of the dielectric properties in case of smooth material surfaces. We extend this method to model rough surfaces in the specular direction and verify our model with direct reflection measurements on two common building materials, namely ingrain wallpaper and concrete plaster. [C984]

"POPTD near-field scattering and diffraction method for path loss prediction in urban mobile radio-systems"

In this paper the 3-D mathematical formulation and study for the simulation of the radio-propagation mechanisms in urban cellular environments are presented. The proposed methods and techniques are applicable to the 3-D radiocoverage prediction model, currently being developed by the authors' research group. In the far field area, the proposed analysis is based on the well-known deterministic methods of Physical Optics (PO) and Physical Theory of Diffraction (PTD). In the near field and Frenel zone, a novel and time-efficient technique for the computation of the scattered and diffracted field is applied. Emphasis is also given to the time efficiency of the proposed approach since the high simulation time is one of the most important drawbacks of such radio-propagation prediction codes. [C985]

"Effects of Soft Handover Margin under various Radio propagation parameters in CDMA Cellular Networks"

CDMA based cellular networks support soft handover, which makes smooth transition and enhanced communication quality. It is designer's challenge to optimize handover parameters under varied propagation environmental conditions. In this paper, we have investigated the effect of soft handover margin and characteristic parameters of the radio propagation environment on the soft handover performance. We have shown handover performance depends upon characteristic parameters-path loss exponent, standard deviation, correlation coefficient of the shadow fading, window size and soft handover margin. Simulation results have shown that dependence of handover performance on radio propagation characteristic parameters can be reduced by choosing the optimum value of soft handover margin. [C986]

"Slow-Time MIMO STAP with Improved Power Efficiency"

This paper concerns a multiple-input multiple- output (MIMO) generalization of space-time adaptive processing (STAP) to mitigate radar clutter subject to multipath propagation between transmit and receive arrays. Slow-time MIMO transmit channels are phase-coded to be orthogonal post-Doppler processing at the receiver (";slow-time";) and are easily implemented without receiver modification before range pulse-compression. Slow-time MIMO STAP methods coherently combine orthogonal received waveforms, steering virtual transmit nulls in cone angles responsible for multipath clutter [1]. A potential problem with MIMO STAP is the occurrence VSWR peaks over the course of a dwell. Herein, we consider sub-array designs that improve power efficiency by reducing VSWR. [C987]

"Tracking of MIMO Propagation Parameters under Spatio-Temporal Scattering Model"

The paper presents novel, computationally efficient methods for tracking radio propagation path parameters from measured tensor-valued MIMO observations. The measurement covariance model is comprised of spatio-temporal scattering plus measurement noise, leading to a shifted Kronecker structure. We derive novel expressions to handle these large (105times 105) covariance matrices in the extended Kalman filter, used for tracking the dominant propagation paths. Furthermore, we introduce a method to model signals with a given angular distribution, observed with arbitrary antenna arrays. Finally, results for estimating dominant propagation paths from simulated data having an angular (von Mises-Fisher), and temporal (exponential) distributed scattering component are presented, accompanied by a real world example. [C988]

"Theoretical model of space weather impact on GPS ionospheric delay"

Space weather is a common name for the group of physical and chemical processes taking place in the vast space between the Sun and the Earth. Caused primarily by the solar activity, those processes create a flow of materia and energy. When directed to the Earth and its surroundings, this flow disrupts magnetic and ionospheric conditions, affecting numerous technical systems that utilise characteristic of electromagnetic waves propagation. Satellite positioning systems are among technical systems affected by space weather conditions. The impact of

space weather and ionospheric disturbances is especially pronounced in periods of severe solar activity. Numerous attempts have been performed in order to model satellite positioning error in relation to space weather, with limited application to certain special cases. Here a theoretical model is presented that represents the relation between characteristic parameters of space weather, ionosphere and GPS positioning error. [C989]

"Relative surface of the WiMAX cell covered with modox of the signal"

The first part of this paper gives a short introduction in WiMAX technology. Second part of the paper shows transmission modes in the WiMAX system air interface, followed in the third part by mathematical approach for calculating the cell relative area covered with respective types of transmission modes. Fourth part of the paper presents simulations results that are obtained by using typical terrain and WiMAX system features, and is followed with conclusion at the end of this paper. Emphasis of this paper is in revealing propagation properties that shape relative surfaces covered with certain mode of signal in a WiMAX cell. [C990]

"A comparison of neural network models for indoor field strength prediction"

This paper presents a comparison of the field strength prediction in indoor environments based on ray tracing, multilayer perceptron and radial basis function networks. It has been already shown for neural networks as powerful tool in RF propagation prediction. It is very important to choose proper algorithm for training a neural network, so we compared several training algorithms for the case of multilayer perceptron model. As the case used a corridor of university building in Dubrovnik, for which calculation, simulation and measurement of signal strength were obtained. The results show an improvement in field strength prediction with neural models over conventional models if training algorithm and neural network architecture are carefully chosen. The best results are obtained by the radial basis function neural network model. [C991]

"An Ultra-Wideband Indoor Radio Channel Model"

A multipath model of UWB pulse propagation in the indoor environment is addressed in this paper. The simulation utilizes the principles of geometrical optics (GO) for direct and reflected paths' tracing and time domain technique for describing the transient electromagnetic field reflected from wall, floor, ceiling, and objects. The closed-form time domain analytic solution for UWB impulse signal reflection, which takes into account the frequency range from 3. 1 to 10.6 GHz, is proposed, and it is suitable for dry concrete, wood, glass, etc., which are envisioned as common building construction materials for indoor environment. A specific house with two cube-like objects, which is thought to be a more realistic environment, is investigated. The simulation results provide the three-dimension (3D) space-time distribution of received pulsed field, which give more intrinsically interpretations for the mechanics of UWB impulse signals propagation in indoor environment. [C992]

"Site-Specific Propagation Prediction for UWB Indoor Non-line-of-sight environment"

A site-specific propagation prediction for UWB impulse signals within indoor non-line-of-sight (NLOS) environment is addressed in this paper. The transmitter and the receiver are placed in two rooms respectively with a concrete wall blocking the line-of-sight (LOS) propagation path. The simulation utilizes the principles of geometrical optics (GO) for reflected and transmitting paths' tracing and time domain technique for describing the transient electromagnetic field transmitting through as well as reflected from the wall, the floor, the ceiling, and the objects. Based on the simulation results, the time dispersion as well as antenna effect for the received impulse signals within the NLOS environment is analysed. [C993]

"Towards forecasting and mitigating ionospheric scintillation effects on GNSS"

The effect of the ionosphere on the signals of global navigation satellite systems (GNSS), such as the global positionig system (GPS) and the proposed European Galileo, is dependent on the ionospheric electron density, given by its total electron content (TEC). Ionospheric time-varying density irregularities may cause scintillations, which are fluctuations in phase and amplitude of the signals. Scintillations occur more often at equatorial and high latitudes. They can degrade navigation and positioning accuracy and may cause loss of signal tracking, disrupting safety-critical applications, such as marine navigation and civil aviation. This paper addresses the results of initial research carried out on two fronts that are relevant to GNSS users if they are to counter ionospheric scintillations, i.e. forecasting and mitigating their effects. On the forecasting front, the dynamics of scintillation occurrence were analysed during the severe ionospheric storm that took place on the evening of 30 October 2003, using data from a network of GPS ionospheric scintillation and TEC monitor (GISTM) receivers set up in Northern Europe. Previous results [I] indicated that GPS scintillations in that region can originate from ionospheric plasma structures from the American sector. In this paper we describe experiments that enabled confirmation of those findings. On the mitigation front we used the variance of the output error of the GPS receiver DLL (delay locked loop) to modify the least squares stochastic model applied by an ordinary receiver to

compute position. This error was modelled, as a function of the S4 amplitude scintillation index measured by the GISTM receivers. An improvement of up to 21% in relative positioning accuracy was achieved with this technique. [C994]

"Bistatic scattering from bare soils: Sensitivity to soil moisture and surface roughness"

The sensitivity of bistatic scattering coefficient sigmadeg to soil moisture (smc) is investigated on the whole upper half space by means of model simulations of the incoherent scattered fields. The achieved results, represented as maps of sigmadeg as a function of azimuth and zenith angles, are evaluated by means of a quality index which takes into consideration the effect of roughness on smc measurement. [C995]

"Avalanche beacon magnetic field calculations for rescue techniques improvement"

Nowadays, many of the deaths on account of snow avalanches are related to an excessive delay during the rescue. The best way to locate an avalanche victim, when there is no sign, is by an avalanche beacon. The current techniques based on this device assume the condition of nearfieldunder the free-space propagation model. This work shows that this model is not adequate during the first steps of the search, and a half-space model, with air and soil layers, has to be used. In the region close to the buried victim, the classical propagation model performs well enough but depending on the orientation of the emitter avalanche beacon and the type of ARVA used to detect it, some errors are unavoidable. [C996]

"Scattering from 2D-dielectric random surfaces effect of roughness and moisture of seedbed surfaces upon the bistatic scattering coefficient"

We propose a statistical model to describe the seedbed surfaces and we study the roughness and moisture influence upon the backscattering coefficient and the scattering patterns by means of Monte-Carlo predictions. For each realization, the scattering amplitudes are obtained by the C method. [C997]

"Validation of the soil dielectric spectroscopic models with input parameters based on soil composition"

In this paper, a comparative analysis of dielectric spectrum predictions for moist soils in the microwave band was carried out, regarding a well known and prevalent semiempirical dielectric model proposed in [1]-[3], on the one hand, and recently developed generalized refractive mixing dielectric model [5], on the other hand. The analysis is based on the measured dielectric data borrowed from [4], in which a set of soils measured includes all of grain-size distributions that are observed in nature, with measurements being performed over the range from 40 MHz to 17 GHz. In the case of the soil measured in [4] that has an intermediate position in terms of its texture parameters, input data for the semiempirical model were attained, using the texture and soil mineralogy data available in [4], and dielectric spectra predictions both for the dielectric constant and loss factor were calculated. Simultaneously, with the use of the dielectric data of [4], input parameters for the generalized refractive mixing dielectric model were derived, and dielectric predictions for the same moistures were calculated. Comparative analysis based on the measured data together with both predictions showed the semiempirical dielectric mixing model to generate dielectric constants and loss factors that have a noticeable bias relative to the measured ones, correlation coefficients being on the order of 0.93. At the same time, the GRMDM predictions appeared to correlate with the measured values with noticeably better accuracy both in the frequency and moisture domains. As a result, the ability to make accurate predictions for dielectric spectra with the use of the SDMM was shown to be doubted, regarding the moist soils, which falls out of the scope of soils measured and fitted to develop the SDMM in [1]-[3]. On the contrary, the GRMDM [5] has proved to be able to make predictions for the dielectric spectra of moist soils with the same error as that of initial dielectric measurements. [C998]

"Localizing metallic small spheres by a linear distributional approach"

The problem of determining the number and the locations of "small" metallic spheres from scattered far-field measurements under plane waves incidence is considered. The problem is formulated by neglecting the mutual scattering between the spheres and by representing their locations as the support of delta-functions. This allows to cast the problem as the inversion of a linear integral operator we tackle by means of a Truncated Singular Value Decomposition. The performance of the inversion scheme are analyzed for both the cases of a multi-view/single-frequency and a single-view/multi-frequency configuration by exploiting synthetic exact data. [C999]

"Measurement and analysis of depolarization generated by scattering over constructive obstacles at 5.8 GHz"

The interest on the scattering due to constructive obstacles appears in different knowledge areas, mainly radar

theory and mobile communications. In radar terms, a target can be identified by means of its scattering pattern. Those patterns are also useful in radio communications, in order to obtain confident models for planning the deployment of networks. If co- polar scattering itself gives an important amount of knowledge, the definition of the obstacle is better done when cross-polar data is incorporated. In order to characterize the scattering patterns due to constructive walls, a measurement campaign has been developed, using an automated system, which integrates the mechanical movement to the vector network analyzer control. The aim of the campaign was to check the reflection behavior of different constructive materials. All the experimental work has been performed at the frequency band around 5.8 GHz. Materials considered are a metallic surface, used as a reference, a brick wall, and a chip wood panel. All sample sizes are large enough to ensure that the 3-dB illuminated area, an ellipse with a major axis of 80 cm, falls within the limits of the slabs, thus reducing any diffraction effects on the edges of the samples. As measurements were performed in co-polar and cross-polar polarizations, both co-polar scattering pattern analysis and depolarization index computations could be made. By means of cross-polar measurements, depolarization indexes can be extracted. This magnitude indicates the percentage of the incident wave that is reflected in the orthogonal polarization. The values obtained for the chip wood panel are between 2 and 3%, and those corresponding to the brick wall are clearly polarization-dependent, being 8% for parallel incidence and 0.4% for perpendicular incidence. [C1000]

"Wind effect on the scattering from vegetation at cellular phone frequencies"

The presence of vegetation in the radio channel could affect the coverage areas of cellular mobile phone systems. The different components of a tree have influence in the performance of the radio system. Whereas the trunk is commonly in a fixed and stable location, the leaves could be in continuous movement forced by the wind. This time variation, which can be correlated with the wind speed and direction, could strongly modify the attenuation and scattering effects of the trees on the radio channel performance. The present paper contains the results of a measurement campaign of scattering and attenuation effects of isolated trees, under the action of artificial wind of different controlled speeds and directions. Both long-term and short-term results are presented. They show that the median effect of the presence of the tree is the induction of higher attenuation in the shadow areas and a new distribution of the scattering pattern all around the specimen. Whereas, the wind on the leaves forces their movement and an increment in the time variation around the median received power values. [C1001]

"Research of the Characteristics of Radio Wave Propagations around the High-Speed Railway"

High-speed railway is the trend of our national railway. Research of the radio wave propagation is very important for the development of railway wireless communication system. In the paper, the simulation model of channel is formed using the theory of sine superposition. The parameters of the model are confirmed using the method of equidistance. Then, on the base of this channel, the characteristics of radio wave propagations of high-speed railway are analysed. At last, the relevant conclusions are given. [C1002]

"Prediction of Line-of-Sight Microwave Signal Fading Through Meteorological Parameters"

The variability of troposphere in certain cases pose serious problems in achieving microwave communication and there are situations when the line-of-sight (LOS) link may deviate from its expected path of propagation. LOS microwave links though found to be reliable and widely used, but the tropospheric medium through which the signal propagates is found to create problems in such links. Bending of LOS path from its desired trajectory along with deviation in angle-of-arrival of the signal causes much degradation in the energy levels of the signal in well-designed links. In this paper effort has been made to predict fade depth of a microwave signal of frequency less than 10 GHz. through a model associating with the radio refractive index gradient (RRI grad), which is a function of temperature, pressure and humidity. The RRI is calculated at the surface, at 100 m. height and 500 height levels. In cases where RRI increases or decreases uniformly then the slope is defined by a single parameter 'N1'. But for a non-uniform atmosphere, another parameter 'N2' is introduced. Here 'N1' is the RRI grad between the surface and 100 m. height and 'N2' is the gradient for the upper atmosphere. Model is then developed correlating different situations of the atmosphere (whether N1 or N2 is in normal, sub-refractive or super-refractive state) with the fade depth of a 7 Ghz. 42 km. line-of-sight microwave link. [C1003]

"UWB propagation channel measurements for WPAN scenarios"

In this paper, we perform UWB propagation channel measurements for scenarios when transmit antenna is located on a human body. Measurements were done for different antenna locations: on a head, on a torso, on a belt. For reference purposes we measured signal propagation when the transmit antenna was in free space. We investigated influence of a human body at the link budget for a different frequencies and antenna polarizations. The minimal blockage was found for the antenna located on a head. For a vertically polarized antenna located on a torso or on a belt the signal blockage in backwards and sideward directions is smaller then for horizontally

polarized antenna. [C1004]

"Determination of Material Characteristics for Optimizing WLAN Radio"

The experiment described in the following paper was performed to investigate RF propagation through different common building materials over a wide band of frequencies. The characterization is based on transmission power measurement. Results for the complex dielectric constant of each material over a frequency range of 2 to 16 GHz are presented. An internal multireflection model is used to compare experimental and theoretical transmission coefficients. A propagation loss model is developed using the attenuation induced by various walls. Finally, this path loss model is used to estimate coverage prediction of an indoor WLAN network at different frequencies. [C1005]

"Computer Simulations of the Propagation Channel for Various Indoor Environments"

This paper presents the results of computer simulations performed as a part of EU VI FP RESOLUTION project. Conducted research concerns propagation of radio waves inside large halls. Channel characteristics influencing on accuracy of microwave positioning system were determined by means of ray-tracing method. Various propagation scenarios, locations of transmitter and radiation patterns of transmitting antenna were taken into consideration. [C1006]

"Rain attenuation prediction along terrestrial paths in South africa using existing attenuation models"

Different rain attenuation prediction models proposed by different authors on terrestrial paths are presented. These models are used to estimate the rain attenuation in different climatic rain zones in South Africa. In our previous paper, four new climatic rain zones N, M, P and Q are proposed from the locally observed data as against the ITU-R zones of C, D, E, K and N. The specific rain attenuation gammaR(dB/km) for frequencies up to 50 GHz is computed using a 1-minute integration time rain rate exceeded for 0.01% of the time for these 4 different climatic rain zones from an available 5-year local rain rate data. Finally, the rain attenuation A0.01(dB) exceeded for 0.01% of the time is estimated and predicted for different geographical locations that are within these climatic rain zones based on the comparison of the different existing attenuation models at different frequencies for path lengths not exceeding 22 km. [C1007]

"Use of spatial interpolation technique for determination of geoclimatic factor and fade depth calculation in Southern Africa"

Different authors have adopted various techniques to resolve the clear-air radio-propagation effect problems. These authors have presented different modeling techniques based on the radio propagation variables of the region in question. These variables are determinable from the local radio propagation data of the region in question. This paper uses the radiometeorological data collected in Durban, South Africa and in Maun, Botswana to determine the geoclimatic factor (K) variable. This is then used in implemented link designs to calculate the fade depth and worst month for these two locations. [C1008]

"Measurements of digital TV signals in the UHF band in the metropolitan region of Sao Paulo"

This work describes a campaign of measures of the characteristics of the propagation channel for Digital TV, recently carried on the metropolitan region of Sao Paulo. The measurements had been aimed to determine the propagation loss, the reception threshold and signal delay profiles in different situations of reception in urban environments. This paper presents preliminary results including the analysis of the propagation loss with in the distance in blockage and visibility conditions. Examples of measured delay profiles in conditions with and without line of sight are also presented. [C1009]

"Microwave propagation over the south ocean"

We present the results of meteorological and radio- meteorological observations as well as the results of measurements of the attenuation factor of ultrahigh frequency (UHF) radio waves during the 28th Soviet Antarctic expedition in January- March 1983. It is shown that radio-meteorological parameters over the South ocean area in summer almost coincide with the corresponding averaged parameters over the land in winter. The main mechanism of radiowave propagation at distances over 100 km is single scattering by turbulent fluctuations of the atmospheric refractive index. Absolute values of the running attenuation at high frequencies are low compared to those in other climatic areas. [C1010]

"Indoor fading distributions for GPS-based pseudolite signals"

During the past few years, accurate positioning of terminals has received much attention in wireless communication. One reason is that of the requirement for emergency call positioning imposed by the authorities. The positioning algorithms based on the Navstar satellites have limitations in the indoor environment because the signal experiences severe attenuation in the indoor environment. The characteristics of the indoor propagation is still not well understood. In many cases, it is assumed that with the deployment of pseudolites, indoor navigation can show better performance. In this paper we analyze the indoor channel propagation using pseudolites, based on the measurement data collected in different scenarios. [C1011]

"Scintillation Time Series Synthesis for Satellite Links with Hidden Markov Model"

This paper introduces a method to model the rapid attenuation fluctuations (the scintillation) on satellite links with generating the time series of attenuation levels. The applied model is a hidden Markov model which is parameterized from an appropriate filtered Gaussian white noise signal. For the parameterization of the Markov chain the Baum-Welch expectation-maximization algorithm has been used. The resulting Markov model is applicable to generate scintillation time series for any desired duration with the time and amplitude resolution of the original training data. From the synthesized time series the statistical properties like the cumulative distribution and the dynamics of the scintillation can be also determined. To prove the accuracy of the model at first the cumulative distribution function of the original and synthesized time series are compared. A further test of the model validity is the comparison with real scintillation measurement on a land mobile satellite link. Finally, the spectral test of the filtered Gaussian model, the hidden Markov model and the satellite link measurement shows that the constant and decreasing parts in the periodograms are showing similarities what confirms the good quality of the model. [C1012]

"Evaluation of radio propagation parameters for field strength prediction using neural network"

This work utilizes artificial neural network to determine the electrical characteristics of the ground. This neural simulator is trained through the field strength of the surface wave, using the smooth spherical earth propagation method equations. To obtain the electric parameters of the ground, a campaign of measurements of the received electric field strength was carried out in around of Brasilia city. A radio station transmitter was used operating in medium wave (MW). The results of the electric parameters of the ground were found as: 4.23 mS/m for conductivity and 15 for relative permittivity. These results allows to conclude that the electrical characteristics of the ground described in the ITU-R P. 832-2 Recommendation, "World Atlas of Ground Conductivities" cannot translate the reality for the area studied in Brasilia. [C1013]

"Bistatic radar cross section of two-dimensional random rough layers in the high-frequency limit"

Few fast asymptotic models have been developed on stacks of rough interfaces. Nevertheless, the specific case of very rough surfaces comparatively to the incident wavelength has not been treated before, which is the context of this paper. The model starts from the iteration of the Kirchhoff approximation to calculate the fields scattered by a rough layer, and is reduced to the high-frequency limit in order to fast obtain numerical results. The shadowing effect, important under grazing angles, is taken into account. The model can be applied to any given slope statistics. It is validated by comparison with a reference numerical method based on the method of moments, in the high-frequency limit for lossless and lossy inner media separating ID surfaces. Then, the model is extended to 2D surfaces. [C1014]

"Microwave propagation over the South ocean"

We present the results of meteorological and radio-meteorological observations as well as the results of measurements of the attenuation factor of ultrahigh frequency (UHF) radio waves during the 28th Soviet Antarctic expedition in January-March 1983. It is shown that radio-meteorological parameters over the South ocean area in summer almost coincide with the corresponding averaged parameters over the land in winter. The main mechanism of radiowave propagation at distances over 100 km is single scattering by turbulent fluctuations of the atmospheric refractive index. Absolute values of the running attenuation at high frequencies are low compared to those in other climatic areas. [C1015]

"Path-loss Characterization for PTP in an Urban Area Propagation Prediction via 5.8 GHz"

This paper discusses path-loss characteristics as a function of tree effect to the signal during the rain in an urban line-of-sight link optimization for intelligent traffic light management system. Measurements were made in metropolitan Bangi area covered by high density of building and trees, using spectrum analyzer at an antenna height of 18 m for data collection. Dependence of path-loss on the distance between antenna transmit and

antenna connected to spectrum analyzer was analyzed. This observable fact can be interpreted by the existence of an effective environment. The attenuation coefficient of the rain and trees, tend to be larger at lower antenna height. [C1016]

"An Approximate Numerical Model for Simulation of Long-Distance Near-Ground Radiowave Propagation over Random Terrain Profiles"

A numerical solver for analyzing long-distance near-ground radiowave propagation over a randomly rough terrain surface is described. As the rough terrain section located in between but in the far field of the transmitter and receiver points appears to be electrically flat to the forward propagating wave, an approximate simplified model is derived with the replacement of this section with a physically flat section of an effective height, resulting in a problem with three physical sub-domains. This model implies that the mean received power and its fluctuation are primarily dictated by the statistics of the rough terrain local to the transmitter and receiver. Wave propagation over the three sub-domains is solved using a recursive, 2D NystrГґB¶m-discretized-integral-equation-based forward marching scheme. Since the majority of the final terrain profile is flat and over which field interactions can be cast in terms of a block-Toeplitz matrix, large memory savings and computational speedup are achieved. The accuracy of the three-sub-domain model is demonstrated, and simulation results for the path-loss of LOS and NLOS (non-line-of-sight) links are presented for rough terrain with various random statistics. The new solver as detailed here is an attractive tool for simulating radio coverage for near-ground wireless networks. [C1017]

"Analysis of the Influence of Different Resolutions on Radio Propagation Models at 900 and 1800 MHz"

The accuracy of propagation models strongly depends on the geographical database which is the basis for the predictions. The accuracy of the predictions increases with increasing accuracy in the geographical database. However, a high accuracy in the geographical database leads to higher computation times for the predictions. Thus, more inaccurate predictions are often accepted due to faster predictions. The effect of different resolutions of the geographical database on the prediction accuracy is analysed in this paper. Furthermore, the influence of the carrier frequency (900 MHz and 1800 MHz) on the prediction results is determined. [C1018]

"Efficient Parallel Simulation of Mobile Wireless Networks by Run-time Prediction of Multi-hop Propagation Delay"

In this paper, we propose a method to improve the performance of parallel and distributed simulation of multi-hop mobile wireless networks. We assume that the simulation field is divided into several pieces and is simulated by multiple parallel processes which synchronize conservatively, i.e., without violation of causality. The basic idea of our approach is to predict the lower bounds of timestamps of "potential" upcoming events which cause inter-process messages based on the timestamps of the currently scheduled events plus minimum multi-hop propagation delay estimated in run-time. By this prediction method, we are able to enlarge the lookahead of parallel processes, and their concurrency can be enhanced. We have implemented the parallel and distributed version of our network simulator MobiREAL, and have also implemented this mechanism. The experimental results have shown that we could achieve 50% speed up in average compared with the version using static lookahead in the simulation of end-to-end communications over 1,200 nodes. [C1019]

"Estimation of electromagnetic parameter of stratum based on Kriging interpolation"

The distribution of electromagnetic parameter in stratum is a basis of the design of the through-the-earth communication system and selecting of the equipments' electrical parameters. Because there is great difference of electromagnetic parameter between different geological strata, a great bias will be brought out during the research of the electromagnetic propagation characteristics of the through-the-earth communication based on the simplified stratum media model. In order to solve this problem, Kriging interpolation algorithm is originally adopted to setup a stratified stratum media model and estimate the distribution of the electromagnetic parameters in the mutant stratum media. By this interpolation method, the high precise electromagnetic parameters and stratum media model can be provided for the design of communication system and the numerical calculation of electromagnetic propagation. [C1020]

"Radio propagation model for long-range wireless sensor networks"

Wireless sensor networks are ideal for monitoring environmental conditions, but typical nodes are limited by their short transmission range. This paper presents a long-range node with a tested range of 13.2 km. A novel radio propagation model is presented, which has been experimentally verified. This paper also presents a unique method to determining the number of multipath reflections in a suburban environment. [C1021]

"Mobile Communication Antennas in Uniform and Gaussian Propagation Channels"

In this paper, diversity performances are compared using two different propagation channel models. The models of interest are the statistically uniform and Gaussian ones. Very compact antenna systems that consist of two printed monopoles are used. At such terminals, antennas are so closed to each other that envelope cross-correlation coefficients are low whatever the channel model used. Diversity gains are then independent of correlation coefficient. Any difference of performances may then come from mean effective gains, so from Mean Signal level of each antenna in the channel models. After, parametrical studies of Gaussian environments point out enriching conclusions. [C1022]

"Performance Study of Dual-Hop Transmissions in Millimeter Wireless Mesh Networks"

The ever increasing demand for multimedia services has led to the extensive use of modern wireless mesh networks, where the transmitted signals arrive to the final destination through cooperative relay nodes. Due to the increased demand for bandwidth, these networks operate at frequencies above 10 GHz where rain attenuation is the dominant fading mechanism. In this paper, the outage performance analysis of a dual hop transmission is presented and a physical propagation model is calculated. Extended numerical results investigate the impact of various operational, geometrical and climatic parameters to the outage analysis. [C1023]

"Assessment of Millimeterwave Propagation over Sea by Experiment and Simulation"

To be able to assess the capability of maritime radars under different conditions at differing radar bands simulation programs for the refractivity profile of the atmosphere and the wave propagation, based upon a solution of the parabolic equation have been developped. These have been used to model the propagation for a series of measurements which have been conducted using an experimental radar operating simultaneously at frequencies of 10 GHz, 35 GHz and 94 GHz against reference reflectors onboard a vessel for outbound and inbound courses. Simultaneously environmental measurements using wavebuoys and meteosonds have been conducted to generate a complete data set. Moreover an approach was initiated to retrieve the vertical profile of the refractive index from sea clutter data by an inversion method. The method is based on the LS-SVM (Least-Squares Support Vector Machines) theory. The paper describes the experimental approach and the simulation methods. Results of simulations retrieved from the classical method and the new inversion approach are compared. [C1024]

"Time Series Generators to Simulate Earth Satellite Links Affected by Scintillations"

The earth satellite links may in some cases be affected by signal scintillations due to the propagation through ionosphere and more precisely due to the occurrence of electron density bubbles inside the ionosphere. These signal scintillations affect the navigation systems performance. In order to assess the receiver capabilities to operate in such an environment it is of interest to generate signals exhibiting the same random characteristics for testing receivers testing. The algorithm allowing creating such a signal is the object of this paper. [C1025]

"Measured Performances of a SIMO Multi-Standard Receiver"

SIMO algorithms ensure important increasing of radio communications robustness, but their performances strongly depend on channel propagations conditions and antenna characteristics. This article presents performances of different SIMO treatments applied on WLAN (802.11b and 802. llg) transmissions in a multi-standard and multi-channel context. These performances are obtained by measure, under different propagation channels and for realistic working conditions. [C1026]

"Rain Drop Size Distribution Modelling in Singapore-Critical Diameters"

This paper analyzes and presents the measured drop size distribution (DSD) for five rain rates 4.20, 22.80, 66.54, 100.57 and 141.27 mm/hr in Singapore (1deg20'N, 103deg41'E). The ranges of rain drop diameters that are critical to the DSD are identified and the significance of their relationship is analyzed. The modified gamma model is used to describe the DSD in Singapore. Root mean square error (RMSE) in percentage is calculated for all the rain rates for both lognormal (using maximum likelihood estimators and using moment estimators) and modified gamma models. Over the critical diameter range (0.771 mm to 5.3 mm), the modified gamma model fits very well with the measured data and produces least RMSE compared with other models except at the lower rain rate considered. [C1027]

"Propagation Impairments Mitigation Techniques for Broadband WLANs"

Radio propagation experiments have been conducted to analyze the need of fading mitigation techniques in

indoor scenarios at 40 GHz and 60 GHz. Results show that, for mobile terminals with omnidirectional antennas, some kind of fading mitigation technique could be necessary, while for fixed terminals using a directive antenna, no fast fading could be appreciated. It has also been found that fading depth is more severe at 40 GHz than at 60 GHz. [C1028]

"Support Vector Machine and Polynomial Fitting Approach for radio effective zones under Power Lines in Taiwan Railway"

The purpose of this paper is to research the radio effective zones related to the service of a radio system for the dispatch of trolleys and the operation of level-crossings in the service of Taiwan Railways. The service uses radio and radio propagation to dispatch messages to trolleys and level-crossings throughout the railway system when the critical situation is occurred or the emergency button is pressed by users to allow the train driver to break subsequently. In order to estimate the radio effective zone, we perform some realistic measurements related to level-crossings and trolleys. Then, the data is analyzed using a combination of support vector machine (SVM) and polynomial approximation to estimate the radio effective zone, and create a new optimal model specific to the needs of Western Line, Pingtung Line and the Kaohsiung City local line in the Taiwan Railway context. [C1029]

"Measurement and analysis of scattering from periodic surfaces at 5.8 GHz"

One-dimensional periodic surfaces are present in many constructions. When a wave encounters a surface of this kind with oblique incidence, a scattering phenomenon is produced. This can not be modelled accurately by standard specular reflection coefficient models. In order to improve the planning tools, mainly for indoor environments, specific models have been developed and tested by comparison with actual measurements. Three different plastic materials have been used in the measurement campaign, and their surfaces were carved in various shapes: flat, cosine, triangular, and rectangular waves. The measurement frequency was 5.8 GHz, which falls into a band assigned to wireless local area networks. The scattering pattern in the incidence plane has been modelled applying the classical formulation of Beckmann by segments. This option provides improved results, compared to the direct application of the model. [C1030]

"Simulation studies of forest structure using 3D lidar and radar models"

The use of lidar and radar instruments to measure forest structure attributes such as height and biomass are being considered for future Earth Observation satellite missions. Large footprint lidar makes a direct measurement of the heights of scatterers in the illuminated footprint and can yield information about the vertical profile of the canopy. Synthetic Aperture Radar (SAR) is known to sense the canopy volume, especially at longer wavelengths and is useful for estimating biomass. Interferometric SAR (InSAR) has been shown to yield some forest canopy height information. There is much interest in exploiting these technologies separately and together to get important information for carbon cycle and ecosystem science. More detailed information of the electromagnetic radiation interactions within forest canopies is needed and backscattering models can be of much utility here. A three-dimensional (3D) coherent radar backscattering model and a 3D lidar backscatter models were used to investigate the use of large footprint lidar, SAR and InSAR for characterizing realistic forest scenes. The tree height indices derived from lidar waveform and heights of InSAR phase centers were compared. Results will address the possible synergies between lidar and radar data in terms of forest structural information. [C1031]

"Multi-baseline polarimetrically optimised phases and scattering mechanisms for InSAR applications"

An interesting, but rarely used technique in polarimetric SAR interferometry is the enhancement of interferometric coherence by projection into an optimal polarimetric state. In particular, newly developed methods for polarimetric optimisation of multi-baseline coherences provide the possibility of simultaneous constrained coherence optimisation for more than one baseline. This technique can significantly improve the usefulness of long-term interferometric pairs and time-series, and appears, therefore, of interest to various fields of application. The aim of this paper is to discuss the correct derivation of multi-baseline differential interferograms with polarimetrically optimised coherence and to outline several possible areas of application, particularly in the field of differential interferometry and permanent scatterers. [C1032]

"Transpolarizing surfaces for polarimetric SAR systems calibration"

A novel transpolarizing or crosspolarizing surface has been proposed to be applied in polarimetric SAR calibrating systems, like trihedrals, since they can not provide initially a crosspolar response. So the trans-

surface has been designed and measured in an anechoic chamber, providing good results for normal incidence. [C1033]

"Comments on hybrid-polarity SAR architecture"

Recent work on compact polarimetry is reviewed in the context of the fifty-year history of polarimetric diversity. One promising form of this genre is hybrid-polarity (CL-pol), in which a synthetic aperture radar (SAR) transmits circular polarization and receives on two orthogonal mutually-coherent linear polarizations. The CL-pol technique is compared and contrasted to alternative compact polarimetric schemes. Useful characteristics that are unique to the hybrid-polarity architecture are described, especially rotational invariance and polarimetric calibration. [C1034]

"ASCAT scatterometer ocean calibration"

The European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) is responsible for the absolute calibration of the new Advanced scatterometer (ASCAT), onboard MetOp-A, which mainly relies on the use of transponders. An alternative calibration method, which uses scatterometer measurements over the ocean, is presented here. The method is based on the knowledge of the backscatter signal modulation by the ocean surface, which is derived from previous C-band scatterometer missions, and on the use of numerical weather prediction wind output as calibration reference. The method proves to be very useful in providing guidance to EUMETSAT calibration efforts and provides continuity of the C- band scatterometers. Moreover, the ocean calibration results in very good quality winds. As such, within the framework of the EUMETSAT Ocean & Sea Ice Satellite Application Facility, the Royal Netherlands Meteorological Institute has released a demonstration ASCAT 25-km wind product, which is available at http://www.knmi.nl/scatterometer since 28 March 2007. [C1035]

"Statistical classification methodology of SHOALS 3000 backscatter to mapping coastal benthic habitats"

The scanning hydrographic operational airborne LiDAR survey (SHOALS) consists of a bathymetric LiDAR system which provides high precision measurements of water depth. Even though the acquisition is focused on depth accuracy, the return signal, i.e. waveform, contains other relevant information because of integration signatures from the water surface, the water column and the sea-bed. This paper highlights the benthic characterization in extracting statistical parameters derived from the bottom backscatter. In applying multivariate analysis (K-means), it is significantly proven that signals derived from habitat, described as statistically homogeneous throughout ground-truth analysis, are (1) similar within an intra-habitat view, while they are (2) different between themselves. [C1036]

"A GNSS-reflections simulator and its application to widelane observations"

This paper discusses an effort to create a fast, yet accurate GNSS-R simulator capable of spacecraft-altitude studies. A number of new techniques will be presented which were developed to significantly increase the simulation speed. The end goal of this work is to assess measurement fundamentals such as ocean altimetry accuracy as a function of altitude and antenna size. The first application of this new simulator was to evaluate the GPS L2-L5 widelane signal for altimetric applications. It has been suggested that this widelane signal could result in an accurate, coherent phase-delay height observable. Simulation results, along with a simple physical model, indicate this widelane combination does not produce a coherent phase observable under typical conditions. The incoherence appears to be due to the surface area corresponding to the signal's autocorrelation function being much larger than the widelane Fresnel zone. [C1037]

"Mitigating propagation errors for indoor positioning in wireless sensor networks"

Implementing positioning systems for indoor environments is notoriously difficult. The vast array of interacting parameters such as furniture, room shape and materials mean that the simulation of such an environment is of limited value. We present in this paper results from an empirical investigation as to the attainable accuracy of a Radio Frequency (RF) positioning system based on received signal strength (RSS). Methods to improve confidence, such as frequency averaging and bi-directional ranging, are explored. Finally we present and evaluate a novel method for calibrating the channel propagation exponent with no prior knowledge of the sensor network layout or room shape. [C1038]

"The wideband characteristics of radio propagation at 8 GHz band"

The wideband characteristic, a delay spread of multipath signals, was measured with a channel sounder at

various environments. The environments were divided by three parties. The measurements in each environment were done in line-of-sight case at carrier frequency of 8.05 GHz. The channel sounder was acted by PN mode, 100 Mcps, 10 ns resolution, and maximum delay time was 40.96 mus. From the measurement results, RMS delay spread at downtown area of a large city is the biggest among them. The reason is some multipaths due to dense arrangement of high-rise buildings, lower height of transmitter antennas than height of buildings, and heavy traffic. [C1039]

"Measurements of eddies in the ocean surface wind field by a mix of single and multiple-frequency HF radars on monterey bay california"

To properly assess the impact of global climate change and plan for remediation, accurate regional climate models are necessary, functioning on 10 km size scales rather than the typical 100 km scales. Examples of 10 km size scale phenomena are coastal wind eddies at 10-40 km scales, studied over Monterey Bay,California by Archer,Ludwig et al. using shore and buoy anemometers and satellite images. Most frequent in the evening and early morning hours, these, typically cyclonic, eddies are often responsible for fog in the Santa Cruz California area. We have previously demonstrated the ability of multifrequency HF radar (4.8 to 21.8 MHz) to map the ocean wind field. Observations over a year time span indicate standard errors of prediction of 1.7 m/s for wind speed and 25deg for direction with biases of 0.1 m/s and 0.3deg respectively. Combining HF radar wind vector estimates with shore based anemometer data in the WOCSS surface wind field model allows formation of detailed (3 to 5 km resolution) images of wind eddies over Monterey Bay and observation of their creation and decay. We discuss requirements for wind field observations with HF radars and demonstrate how multiple radar sites can be used to produce HF radar wind field maps. We report observations of 10-20 km cyclonic eddies in the northern and eastern parts of Monterey Bay. [C1040]

"Soil parameter estimation and analysis of bistatic scattering X-band controlled measurements"

In this paper, we will present well controlled experimental bistatic X-band measurements of rough surfaces, which have been recorded in the Bistatic Measurement Facility (BMF) at the DLR Oberpfaffenhofen, Microwaves and Radar Institute. The bistatic measurement sets are composed of soils with different statistical roughness and different moistures controlled by a TDR (Time Domain Reflectivity) system. The BMF has been calibrated using the Isolated Antenna Calibration Technique (IACT). The validation of the calibration was achieved by measuring the reflectivity of fresh water. In the second part, the first validation of the specular algorithm by estimating the soil moisture of two surfaces with different roughness scales will be reported. Additionally, a new technique using the coherent term of the Integral Equation Method (IEM) to estimate the soil roughness will be presented, as well as evaluation of the sensitivity of phase and reflectivity with regard to moisture variation in the specular direction. [C1041]

"Statistical description of tropospheric delay for InSAR: Overview and a new model"

This paper focuses on statistical modeling of water vapor fluctuations for InSAR. The structure function and power spectral density approaches are reviewed, summarizing their assumptions and results. The linking equations between these modeling techniques are reported. A structure function model of zenith tropospheric propagation delay is then derived from a two-regime power spectral density function presented in literature. The novelty lies in the fact that a closed form expression is derived and a free model parameter is allowed, which may be tuned to available measurements or, in the absence of these, to atmospheric statistics. The latter approach is used to compare the derived model with previously published results. [C1042]

"Analytical Propagation Models for Body Area Networks"

Using wireless sensors worn on the body to monitor health information is a promising new application. To realize transceivers targeted for these applications, it is essential to understand the body area propagation channel. Several numerical, simulated, and measured body area propagation studies have recently been conducted. While many of these studies are useful for evaluating communication systems, they do not directly consider physical propagation mechanisms forcing researchers to rely on ad-hoc modeling approaches that are not always motivated by fundamental electromagnetic principles. This can result in less insight into expected propagation trends and inappropriate modeling choices. To address this problem, we have developed a simple and generic body area propagation model derived directly from Maxwell's equations. We then verify the resulting analytical model by comparing it with measurements around a body in an anechoic chamber. This paper describes the analytical derivation of this model and compares it with measurements of the electric field close to the body. [C1043]

"Accelerating Radio Wave Propagation Predictions by Implementation on Graphics Hardware"

Fast radio wave propagation predictions are of tremendous interest, e.g., for planning and optimization of cellular radio networks. We propose the use of ordinary graphics cards and specialized algorithms to achieve extremely fast predictions. Our implementation of the empirical COST-Walfisch-Ikegami model allows the computation of several hundred predictions in one second in a 7 km urban area. Further, we present a ray-optical approach exploiting the programming model of graphics cards. This algorithm combines fast computation times with high accuracy. [C1044]

"A UAPO Based Model for Predicting the Field Propagation Near a Tunnel Entrance"

A propagation model is developed for predicting the field level near a tunnel entrance when considering a wireless communication system in automotive environments. The entrance has a rectangular cross section and its walls consist of a nonmagnetic lossy material, which is assumed to be nonpenetrable. The proposed approach allows one to evaluate the field at each observation point by summing the geometrical optics contributions and those due to the diffraction by the corners of the tunnel entrance. These two contributions are here determined by adopting a uniform asymptotic physical optics solution ad hoc derived. It is obtained by using a physical optics approximation of the equivalent surface currents induced by an incident field and by performing a uniform asymptotic evaluation of the resulting radiation integral. Numerical simulations are presented. [C1045]

"Accelerated Ray-Tracing for Indoor Ultra-wideband Propagation Modelling"

Ray-tracing is an established technique for modelling wireless propagation over a large area in an efficient manner. Legacy ray-tracing simulators were based on frequency domain computations of channel responses. While this can be extended to model the ultra-wideband propagation there are inherent prohibitive computational burdens associated with computing channel responses over bandwidths of several GigaHertz. The proposed algorithm allows ray tracing to be applied to UWB signals without the need to compute fields at an excessive number of frequency samples, by approximating the frequency domain response of individual rays using a reduced set of sample frequencies. By reducing the number of frequency samples required, faster execution times for frequency domain based ray tracing simulations can be achieved. Result show time savings up to 38% with an error in the region of 2.6%. [C1046]

"UWB Radiowave Propagation within the Passenger Cabin of a Boeing 737-200 Aircraft"

Past efforts to develop measurement-based models of the UWB propagation channel have focused on residential, office, and industrial environments. However, with its confined volume and cylindrical structure, the geometry of the passenger cabin of a jet aircraft is fundamentally different from those environments considered previously. Here, we characterize large-scale aspects of UWB propagation within the passenger cabin of a typical mid-size airliner. Our measurement database consists of hundreds of frequency responses over the range 3.0-10.6 GHz that we collected aboard a Boeing 737-200 aircraft. The data were collected in a point-to-multipoint configuration in which a biconical UWB transmitting antenna was mounted at one of three locations near the cabin ceiling and an identical receiving antenna was mounted at headrest, armrest, and footrest level at over 50 locations throughout the cabin. We have accounted for the effects of human presence by collecting this data with the cabin empty, with passengers occupying half of the seats, and with passengers occupying virtually all of the seats. Our initial data reduction efforts have focused on the manner in which human presence and/or receiving antenna mounting location affects five large scale aspects of UWB propagation, i.e., those that affect coverage and reliability: (1) the distance dependence of path loss, (2) the frequency dependence of path loss, (3) the ratio of the energy in the line-of-sight component to the scattered components of the channel impulse response, (4) the RMS delay spread, and (5) the locations and distribution of the poles of the corresponding autoregressive frequency domain model. [C1047]

"A Measurement-Based Model for Mobile-to-Mobile UMTS Links"

In this paper we propose an empirical radio propagation model for the relaying system with low height terminals. The model differentiates line-of-sight (LOS) and non-line-of-sight (NLOS) propagation paths for increased accuracy by employing an easy-to-use expression. It takes into account the effect of transmitter height, receiver height, receiver location and environmental parameters and it is also complemented by shadow fading statistics, namely the distribution and autocorrelation function estimation. Finally, cell coverage for mobile-to-mobile systems is also discussed. [C1048]

"Achievable Rate of Wireless Sensor Networks with Multi-Antenna Sinks"

This paper investigates wireless sensor networks where nodes, which are uniformly and randomly distributed in a given area, transmit information to a sink that is equipped with smart antennas. The framework proposed herein, which considers a propagation environment composed by a distance-dependent loss, shadowing and

Rayleigh fading permits an analytical evaluation of the achievable rate. [C1049]

"The Power Balancing Problem in Energy Constrained Multi-Hop Wireless Networks"

Power efficient operation is very critical in energy constrained multi-hop wireless networks. One important technique is to intelligently assign transmission powers to nodes while maintaining network connectivity. Previous work has focused on assigning a single transmission power to each node. This often leads to "power imbalance", where some nodes use much more power than other nodes. This can reduce network lifetime. In this paper, we investigate the problem of two power assignments where nodes alternate the use of these assigned powers. We rigorously formulate the problem of two power assignment under the constraint that the network connectivity is maintained. The objective here is to minimize the maximum average power used by the nodes. We show that, in general, the problem is not just NP-hard but also hard to approximate. We then propose a distributed localized heuristic to compute the two power assignments. We perform extensive simulations to show that the algorithm can reduce the average power significantly when compared with algorithms that assign a single power. By assuming some properties on radio propagation, we also present a centralized algorithm with bounded worst case guarantees for the two power assignment problem. [C1050]

"NLOS Error Mitigation for Mobile Location Estimation in Wireless Networks"

Most radio positioning methods are based on the measurements of distance between different wireless nodes. Owing to the existence of non-line-of-sight (NLOS) radio propagation, unfortunately, not all the measured distances are reliable. One way to tackle the problem of positioning is therefore to take two-steps: (i) identifying the NLOS measurements; (ii) smart signal processing of the mixed LOS and NLOS measurements. This paper is focused on the second issue. Under the assumption that the NLOS measurements have been identified, we first propose a simple method to suppress the effect of the NLOS error. Simulation results demonstrate that the proposed method achieves similar or better accuracy than several other known methods and the computational complexity is reduced considerably. We also present an optimal location estimator under the assumption of Gaussian distributed measurement noise and Rayleigh distributed NLOS error. Although it is difficult to achieve the optimal performance in practice due to modeling uncertainties, the optimal estimator provides a performance benchmark. [C1051]

"Precise Estimation of WCDMA Downlink Pole Capacity in Multipath Propagation Channel by Monte Carlo Method"

There are two parameters ought to be evaluated in estimating downlink pole capacity of the WCDMA radio network. One is the downlink interference ratio, which can be precisely calculated with the link quality equation for all covered cells. Another is the downlink orthogonality factor, which is usually unknown for different multipath propagation channels in various clutter environments. When radio signal propagates in multipath channel, the orthogonality is destroyed and varies within 0.2 ~ 0.9. This gives a quite large range in estimating the cell capacity. Once the RMS delay spread of the multipath propagation channel has been measured, we can simulate the local multipath propagation channel by Monte-Carlo method for radio signals concatenating short orthogonal spreading code and long scrambling PN code to propagate. Then, in this paper, we propose a new algorithm to calculate the orthogonality factor for different spreading codes and derive a linear equation for the orthogonality factor with respect to the log-rate of data bit. With that equation, an exact solution of the downlink pole capacity for an isolated cell or a cluster of cells can be estimated when loading distribution for all services are assigned and the downlink interference ratio is calculated as well. [C1052]

"Performance Analysis of Rake Receiver with M-BOK Keying in DS-UWB System"

In this paper, the principle of M-BOK keying was analyzed and the performance of Rake receiver on direct sequence ultra-wideband (DS-UWB) system was studied, based on a S-V multi-path statistical propagation channel model which can describe propagation characteristic of UWB signal more precisely. The simulation results show that in the UWB channel model, M-BOK keying not only achieves two functions of spreading coding and BPSK modulation, but also improves the system performance. As to different receivers, selective rake (S-Rake) receiver is much more applicable than the Partial Rake (P-Rake) receiver. For S-Rake receiver, there isn't notable difference between MRC and EGC, but EGC combination could simplify the structure of receiver [C1053]

"Near-Earth Performance Analysis and Optimization of Low-Profile Antennas"

An investigation into the design of optimal low-profile, small antennas for unattended ground sensor (UGS) networks operating at VHF or higher frequencies is featured in this study. Because UGS transceivers are intended for operation near the ground, ground proximity effects become extremely important for considerations

related to antenna efficiency, input matching, radiation pattern, and the overall path loss between the transmitter and receiver nodes. While vertical wire antennas are shown to be less susceptible to path loss, a low-profile alternative is required in fabricating cheap, monolithic on-chip, miniaturized systems. In seeking an optimal design, the performances of different transceiver systems utilizing different types of antenna structures including the dipole, loop, ordinary circular slot, and cavity-backed circular slot are analyzed using a full-wave hybrid approach consisting of the moment method in conjunction with an asymptotic field propagation model. The figure of merit for comparison among the various configurations is identified as the efficiency factor calculated from the ratio of the radiated power at the transmitting terminal to the received power at the receiving terminal [C1054]

"Hierarchical Radiosity Model for the Prediction of Propagation in Micro-Cellular Urban Environment"

As mobile networks are growing fast in size and complexity, radio network planning needs to be optimized to cope with both increased traffic demand and spectrum scarcity. During this process, these objectives are achieved by an accurate propagation models and precise analysis of mobile user's behavior in terms of mobility and traffic. Nowadays, we can find in the literature many propagation models for radio network planning. These models can be classified in two different categories. The first one, called empirical models are deduced from statistics based on measurements, and express the mean attenuation as function of many parameters like distance, antenna height, frequency, etc... The major drawback of this kind of model is the lack of accuracy especially in micro-cellular environment where the presence of many obstacles is the dominant characteristic and accuracy of coverage required. The second category of models is qualified as exact; it has been introduced to recover the drawbacks of the empirical models, like radiosity. Our previous study done on this model has shown that this kind of model, although it is more accurate than empirical one, it requires a huge memory space and takes long processing time to generate results. In this paper, we focus our attention on the optimization of radiosity algorithm by introducing the concept of hierarchical radiosity. An implementation of this method is done to evaluate its performance and to compare it with progressive refinement radiosity. After, we compare the generated result for the two models with real measurements to determine their accuracy. [C1055]

"Inter-vehicle communications: assessing information dissemination under safety constraints"

The main goal of inter-vehicle communication technologies is to provide each vehicle with the required information about its surrounding in order to assist the driver avoiding potential dangers. The required information level, or awareness, can be achieved by the exchange of periodic status messages (beacons) among neighboring vehicles together with the quick dissemination of information about potential hazards. In previous work, we proposed an algorithm (D-FPAV) to control the beaconing load on the medium by adjusting the transmission power in a fair and distributed fashion. In this paper, we adapt a promising position-based message forwarding strategy in order to disseminate time-critical safety information. Moreover, we evaluate its performance when making use of D-FPAV, i.e., limiting the beaconing load on the medium, in a realistic highway environment with probabilistic radio propagation characteristics [C1056]

"A Novel Indoor Location Sensing Mechanism for IEEE 802.11 b/g Wireless LAN"

Wireless LAN, now a day exists in most of the organizations. Hardware is inexpensive to buy and easily available off-the-shelf. More and more offices, organizations and public places are installing it for its ease of utilization. Developing location aware services using WLAN has therefore gained tremendous interest in recent years. It is however, still a daunting challenge for the research community to improve location accuracy inside a building to a few meters by means of computing path loss to find distances based on signal strength of a received RF signal. The accuracy offered by various top-of the-range products using signal strength methods within the indoor environment is not very good. This paper presents a novel method to achieve improved consistency in received signal strength of an RF signal by effectively reducing the multi-path affect on RF propagation inside the building, thus enabling development of better location estimation system. [C1057]

"Applicability of UWB Double Directional Propagation Modeling for Evaluating UWB Transmission Performance"

This paper investigates the applicability of deterministic ultra wideband (UWB) propagation modeling for evaluating UWB system performances. The modeling explores the wave propagation characteristics on both transmitting and receiving antenna sides, which is known as the double directional modeling. In evaluating the applicability, bit error probability (BEP) performances were derived using two kinds of channel impulse responses: 1) raw data which were measured by channel sounding campaign and 2) reconstructed data from the propagation modeling results. In the BEP simulation, the direct sequence UWB system was considered. Comparison of the BEP performances from two kinds of channels revealed that the concept of the double

directional modeling was capable of evaluating BEP performances accurately. However, it was also found that the limitation of our double directional modeling approach based on the model-based ray path extraction method resulted in the limited capability in modeling the total received power. As a consequence, fading statistics of the reconstructed channels were different from the measured data, ending up with less accuracy to predict BEP performances depending on the data rate. Finally, possible solutions to improve the double directional propagation modeling were suggested. [C1058]

"An Analytical Model of Microcellular Propagation in Urban Canyons"

The fast growth of cellular coverage demand for multimedia services based on wireless communication requires an increasing use of microcells to guarantee the satisfactory connectivity. In urban environments, especially in old town centres, the application of this solution is heavily limited by difficulties concerning coverage prediction and planning. The purpose of this paper is the investigation, development and testing of an analytical propagation model based on 2D ray-tracing approach for path loss prediction. Formulas are derived taking into account multiple reflections along street walls as well as diffractions at street corners, while ground reflections are neglected. Validation of the model has been carried out by using a data set collected during a measurement campaign in Genoa's old town centre. [C1059]

"A Novel Mobile Positioning Algorithm Based on Environment Estimation"

In this paper, we propose a novel mobile positioning algorithm based on estimation of radio propagation environment in cellular networks. Accurate and effective mobile positioning is imperative for successful location based services (LBS). Since radio propagation characteristics vary in different environments, knowing the environment of the mobile user is essential for accurate location estimation. The key feature of our algorithm is its capability to estimate the environment of the mobile user and utilize this information for enhancing Received Signal Strength (RSS) based distance calculations. The proposed algorithm has been evaluated using field measurements collected from a GSM network in diverse geographic locations. Typical examples and measurements statistics are provided. The proposed algorithm turns out to be significantly successful, achieving high estimation accuracy, and thereby enabling high-performance mobile positioning. [C1060]

"Investigation of the Effect of Fading Correlation on Performance of MIMO Systems Using an RCS Channel Model"

In this paper, the effect of receive and transmit antenna correlation on the performance (BER vs. SNR) of MIMO (multiple input multiple output) systems is determined by using an RCS (radar cross section) channel model. In this physical model, the scatterers existing in the propagation environment are modeled by their RCS so that the correlation of the receive signal complex amplitudes, i.e., both magnitude and phase, can be estimated. The proposed RCS channel model is then compared with classical models. [C1061]

"ANTENNAS AND PROPAGATION FOR BODY CENTRIC COMMUNICATIONS"

Body centric wireless communication is now accepted as an important part of 4th generation mobile communications systems. The design of antennas and the characterisation of radiowave propagation on the body are now being considered, by many groups around the world. The paper gives a brief overview of the current position and reports on some recent advances in the topic. [C1062]

"Body Loss Modeling for Wireless Communications Standards Bands"

In this paper, a study is performed to understand the human body effects on antenna's characteristics and try to establish a model of these alterations on the proximity of the human body. Using the EM simulator CST-Microwave Studio, simulations of different dipoles covering the standards bands for wireless communications (GSM, DCS, PCS, UMTS) in close proximity of a homogenous human head model were done with the appropriate dielectric parameters for each band. Two parameters were investigated: the distance between the head and the dipole (e) and the dipole orientation referring to the head (thetas). The quality factor (Q) variation in presence of the body (head) was studied for the different bands through the variation of three parameters (Fmin, Fmaxand Fresand Q= Fres/ (Fmin-Fmax))*. Finally, two types of antennas (a multi-band and an UWB antenna) were measured close to the human body in different positions (head, torso and hip). The results are compared to illustrate the body influence across the different standards bands which can help in the Radio Cognitive context where frequency change is considered. [C1063]

"Space-Time-Frequency Characterization of 3D Non-Isotropic MIMO Multicarrier Propagation Channels Employing Directional Antennas"

In this paper we propose a new model for multiple-input multiple-output (MIMO) multicarrier channels in a 3D scattering medium. The proposed model describes the cross-correlation function (CCF) between two sub-channels of an outdoor MIMO channel employing directional antennas in the presence of non-isotropic wave propagation in the 3D space. The derived CCF consists of some correlation terms. Each correlation term is in the form of a linear expansion of averaged Bessel functions of the first kind with different orders. In practice, each correlation term has a limited number of components. Our evaluations of the CCF show the impact of different parameters of the propagation environment and the employed antennas. Our numerical results appear as a good match to the available reported experimental data of some 3D outdoor propagation media. [C1064]

"Performance Evaluation of Wireless Transmissions in an Amazonian Climate"

This paper presents the INFOCLIMA project, which aims to study wireless transmissions in the Brazilian Amazon. The simulation results are useful for our initial research, showing that data transmissions over a long range wireless link in Amazonian climate adversely affects the network performance. Therefore, environmental monitoring projects should pay special attention to the probability of data loss; since, for this application, delay and throughput do not much affect the monitoring application. [C1065]

"Hybrid TOA/RSSI Wireless Location with Unconstrained Nonlinear Optimization for Indoor UWB Channels"

In this paper, a hybrid TOA/RSSI wireless positioning technique is proposed for gaining favorable position accuracy in indoor UWB systems. One major problem encountered in indoor wireless location is the effects caused by non-line of sight (NLOS) propagation. To mitigate the NLOS effects, an unconstrained nonlinear optimization approach is utilized to process time-of-arrival (TOA) and received signal strength (RSSI) in the location system. Path loss models and geometrical cell layout based on the TOA's are used in formulating the LOS/NLOS decision boundary. The weighting factors, used in solving the objective function in the unconstrained nonlinear optimization approach, are related to the credibility of the TOA measurements, and are determined from the LOS/NLOS identification. Computer simulations are conducted to investigate the performance of the proposed technique in different scenarios of the NLOS errors. The results show that the proposed technique outperforms other algorithms and achieves improved location accuracy under severe NLOS conditions. [C1066]

"A Resource Allocation Scheme for QoS Provision in Multi-beam Mobile Satellite Communication Systems"

To develop large capacity high quality mobile satellite communication systems in the future, a multi-beam that can cope with extremely high levels of frequency reuse must be used. We describe a novel resource allocation scheme that enables systems to contend with ever-changing user distribution and inter-beam interference conditions. The proposed scheme simultaneously controls various kinds of radio resources, such as transmission power, frequency bandwidth, and modulation parameters. It adapts them to each user depending on the radio propagation environment. Our performance evaluations demonstrate that the scheme can satisfactorily allocate multi-beam satellite resources to greatly increase communication capacity and still improve the communication quality, thus ensuring QoS under various user distribution and traffic conditions. [C1067]

"The Institution of Engineering and Technology Seminar on Antennas and Propagation for Body-Centric Wireless Communications-Title page"

The following topics are dealt with: antennas and propagation; body-centric wireless communications; body sensor networks; body implant communication; medical body area networks; e-textile antennas; and UWB on-body radio propagation. [C1068]

"Antenna and Propagation Effects in UWB Communication-a whole systems view"

UWB communication link performance prediction depends heavily on the propagation channel including antenna performance, due principally to the dispersive nature of these effects causing time dilation of the pulse (late arrival multipath) and differential angular dispersion. By the use of a full propagation model, these effects have been studied for specific environments. The importance on the antenna on achievable bit rate in both single and multi-user systems is noted. [C1069]

"Models and Predictions of Scattered Radio Waves on Rough Surfaces"

Scattering of radio waves on rough surfaces is investigated using ray tracing techniques, which results in a sinusoidal model with time varying amplitudes. An AR(d) model with nonzero mean is proposed to characterize and predict the time variation of the amplitudes. A covariance sequence based method is proposed to estimate

the autoregressive coefficients from the channel observations. An adaptive channel predictor using a Kalman filter is proposed to predict the complex amplitudes of the scattering signal. The proposed method outperforms other sinusoidal modeling based channel predictors and linear predictors with single scattering scenarios in simulations. [C1070]

"Simple estimate of signal to interference ratio with randomly located antennas"

We consider a propagation model under path loss, shadowing and multipath effects, where each cell are a Voronoi tessellation and the generating points of this cells are a uniform Poisson point process in R2. In addition, the antennas are located in each point generated by the Poisson process. With this model, we calculate the mean interference to signal ratio ISR, which actually gives us a physical information, but once we are interest in apply this mean in the Shannon's formula, we simulated the real mean value of signal to interference ratio SIR and compared the result with the calculated ISR-1. [C1071]

"VHF/ UHF Building Penetration Characteristics When Using Low Antenna Heights"

Measurements and propagation models for building penetration are shown for a VHF/ UHF system that uses low antenna height (<3 meters). Measurements show that excess building loss, even when line-of-sight conditions exist, can easily exceed 30 dB. Additionally, variations of the channel frequency response in excess of 20 dB were observed over a 5 MHz bandwidth. Also, paths with maximum excess delays (25 dB) up to 5.2 mu seconds were observed. These factors as well as others presented in detail in this document will have a significant impact on the air interface specification for the cognitive radio in- building communication system. [C1072]

"Stochastic Modeling and Performance Evaluation of Fading Channel for Wireless Network Design"

Characterization of temporal variations in wireless channel impairments plays an important role in the design of a reliable and efficient mobile communication system. Such channels are termed as fading channels since various random phenomena in the propagation path result in fading of the received signal envelope. Simulation models are often used to estimate channel behavior due to higher complexity in developing analytical models for such channels. In this paper, Finite State Markov Model is developed for the evaluation of multi-path fading channel. Cumulative states and frequency duration analysis approach is used for computing rate of transition between satisfactory states and outage states, and outage time, of the channel. Simulation results obtained for Rayleigh channel are then used to find correspondence between fade depth and outage time for a sample system. These results may be used in the estimation of bit error rate and deciding optimum sampling instant of the received signal. It will also assist in selection of appropriate channel code and interleaver design for a future wireless networks with enhanced channel capacity. [C1073]

"High-Resolution Imaging using Capon Beamformers for Urban Sensing Applications"

A wideband synthetic aperture radar system based on beamspace Capon beamforming is presented for urban sensing applications. Various effects of signal propagation through building materials are incorporated into the beamformer design. Proof of concept is provided using real data collected in a laboratory environment. Comparison between data-independent and scene-dependent beamformers is provided. The results show that the beamspace Capon beamformer outperforms the nonadaptive delay-and-sum beamformer [C1074]

"A fast time-domain wireless channel simulation tool for radio-wave propagation courses"

The application of current implementations of electromagnetic simulators to realistic wireless communication problems requires excessively large computational time. As a result, computational electromagnetic tools have not been incorporated into the electromagnetics curricula yet. Building on a recent breakthrough in FDTD technology, we developed a novel simulation environment that enables the educational study of wave propagation in wireless links [C1075]

"A new propagation model for cellular planning"

In cellular planning, it is important to guarantee the system capacity in order to ensure the minimum power necessary to provide acceptable levels of the received signal at the mobile terminals. The transmission effects in adjacent areas must be estimated, to identify the limiting zones, where the signal level is minimum and the ones where there is a possibility of signal interference. Therefore, it is important to choose an adequate prediction model for the cell planning. This paper presents the description of a new propagation model for cell planning. [C1076]

"3D ray-tracing parallel model for radio-propagation prediction"

A computational parallel model based on 3D ray- tracing for radio-propagation prediction is presented. This approach considers that the main tasks in a 3D ray-tracing technique can be evaluated in an independent and/or parallel way. The workload distribution among the participant nodes of the parallel architecture (cluster of PC's), is performed through a random assignment of the initial rays and the field points for them. Simulations are realized in order to validate and evaluate the performance of the proposed model. [C1077]

"Observation of VHF broadcast radio waves propagating from China"

We have observed broadband VHF radio waves to investigate the propagation of distant TV broadcast waves. From the end of January to the middle of February, 2006, in the evening various radio waves at several frequency in 47.5-76.0 MHz have been often received with high intensity at Tateyama observatory(34deg59'N, 139deg54'E). Many of them are considered to come from China because their frequencies are used for TV broadcasting waves in China. As the value of foEs is high in occurring this event, we examine relationship between this event and Sporadic E layer (Es). [C1078]

"Investigation of a tessellated meta-material planar circuit"

In this paper we investigate the propagation behavior of a square shaped planar meta-material guiding structure comprised of left-handed and right handed square unit cells each of the same size and arranged in a checker-board tessellation. The size of the planar structure is 19 cells by 19 cells and each cell is 8 mm by 8 mm. At 1 GHz, the left-handed unit cells have an insertion phase of 11deg and the right-handed unit cells have an insertion phase of -11deg. Both types of cells have the same Bloch impedance. The structure was fed at the centre unit cell, and there are a total of 76 peripheral ports each terminated in matched loads. At 1 GHz the power to each peripheral is equal and the phases at each port alternate between two values that differ by 11deg. Moreover, the planar structure exhibits the so-called infinite wavelength phenomenon in two dimensions and could be used in place of a circular radial power divider. [C1079]

"Oversized waveguides for TEM propagation using hard surfaces"

We propose a new structure to force a quasi-TEM mode to propagate inside an oversized closed rectangular waveguide. A hard surface is employed. Simulation results confirm a good performance. The structure means a promising first step toward a waveguide slot array with high efficiency and directivity [C1080]

"The remote HF-Doppler detection of the sunrise effect"

The information about the ionospheric change is of great significance for the research of geophysical phenomenon and the communication guidance. In this paper, according to the year-round data of the HF-Doppler detection of the ionosphere, we induced and generalized the curves of Doppler frequency shift during the sunrise and analyzed the basic characteristic and the rule of the daily and seasonal variation of the Doppler detection of the sunrise effect. [C1081]

"MIMO multidimensional propagation channel modeling"

MIMO has a high flexibility for realizing reliable and/or high capacity communication systems utilizing various signal domains such as space, time, frequency and antenna polarization. For analyzing MIMO performance quantitatively, a multidimensional propagation channel model is inevitable. Our study on the MIMO multidimensional propagation channel modeling is introduced in this paper. [C1082]

"A new computational parallel model applied in 3D ray-tracing techniques for radio-propagation prediction"

A computational parallel model based on 3D ray-tracing for wireless channel modeling is presented. This approach considers that the main tasks in a 3D ray-tracing technique can be evaluated in an independent and/or parallel way. The workload distribution among the participant nodes of the parallel architecture (cluster of PC's) is performed through a random assignment of the initial rays and the field points for them. Simulations are realized in order to validate and evaluate the performance of the proposed model. [C1083]

"Leaky wave radiation from left-handed transmission lines composed of a cut-off parallel-plate waveguide loaded with dielectric resonators"

Leaky wave radiation from a one- dimensional left-handed transmission line is investigated that is composed of a

cut-off parallel plate waveguide loaded with dielectric resonators (DR). The left-handedness is established by the combination of negative effective permittivity due to the cut-off TE parallel plate waveguide mode and negative effective permeability originating from the macroscopic behavior of DRs under the fundamental TE resonance. The DRs are placed near an aperture on the side wall of the parallel plates. The numerical simulation and the measurement of the radiation patterns verify the backward wave propagation along the proposed waveguide, and the promising characteristics for applications to leaky wave antennas. [C1084]

"A Dual Least-Square Approach of Tuning Optimal Propagation Model for Existing 3G Radio Network"

This paper provides a fast and precise dual least-square approach to tune the generally used propagation model, like COST231-Hata model, optimal for the 3G radio network which is in operation already. Different from traditional approach, using CW measured signal, this approach collects the combined pilot aggregate Ec signals of the on-air 3G radio network from different cells at different heights. The operating 3G radio network will not be disturbed while the experiments are taken. With the tuned propagation model, each cell could have its own propagation model depending on its antenna height, which is more optimal for its own propagation environment. These tuned 3G propagation models adapted for local clutter environment are extremely important in the network performance optimization process. The experiments were taking within the Banciao city. The tuned model called Banciao model has been verified in static Monte-Carlo simulation and proved to be more optimal for local environment area [C1085]

"Effect of Mobile Motion on the Temporal Characteristics of the Channel"

Propagation models are low-cost and handy means to accurately predict radio wave propagation behavior. In this paper we discuss the change in temporal statistics of the multipath signals when a mobile station (MS) traverses a distance inside the coverage area. The paper emphasizes the delay spread of the multipath signals received at each instant of time during MS motion. We identify two different cases for the change in the scattering environment regarding the terrain and clutter surrounding MS as it moves. The derived formulae, in closed form, can easily be used to simulate time variability of temporal spread as a result of MS motion. Proposed theoretical results can therefore be extended to design efficient equalizers to combat intersymbol interference (ISI) in time varying frequency selective fading channels [C1086]

"A Matrix Channel Model for Transmit and Receive Smart Antennas Systems"

The availability of realistic propagation channel models and, computationally affordable channel simulators are a fundamental brick to test the performance of wireless communication systems, during initial design phases. Nowadays, when fading mitigation techniques in both temporal and spatial domains attract designers' interest, such models need to convey reliable information on both spatial and temporal correlations of the fading processes affecting the transmitted signal. This paper presents a novel channel model and related channel simulator conceived for link-level simulations of point-to-point wireless outdoor communication links, wherein both the transmitter and the receiver, possibly in movement, may be equipped with an array of antennas. Physical effects of the propagation channel are taken into account, so as to generate realistic simulations of the fast and possibly frequency selective fading process affecting the transmitted signal. The structure of the channel simulator guarantees an affordable computational burden [C1087]

"A Novel MIMO-STBC Scheme for Inter-Vehicle Communications at Intersection"

This paper proposes an inter-vehicle communication (IVC) scheme for safety driving support systems that transmits collision avoidance warnings at intersections. In order to realize high communication reliability, a transmission scheme based on multiple-input multiple-output (MIMO) with space-time block coding (STBC) is proposed. A key transmission feature of MIMO systems is determined by radio wave propagation. Therefore, the radio wave propagation at an intersection is analyzed by computer simulations using the ray-tracing method. In addition, this paper verifies the effectiveness of the proposed scheme using the propagation characteristics in computer simulations [C1088]

"Requirements for Standard Radiowave Propagation Models for Vehicular Environments"

Although interest in deploying short-range wireless communications technology in vehicular environments has increased markedly in recent years, there is a remarkable dearth of information that can assist antenna designers and wireless system developers who are working in such environments. Under the auspices of the IEEE VT-S Technical Committee on radiowave propagation and channel modelling, the University of British Columbia's Radio Science Laboratory and the BMW Group Technology Office have formed an informal study group in order to elucidate the requirements for standard radiowave propagation models for vehicular

environments. The work of the study group is proceeding in three stages. First, a framework for developing appropriate use cases is being proposed. Second, criteria for assessing the suitability of the models for practical applications are being developed. Finally, possible forms of these models are being proposed. It is anticipated that the efforts of this informal study group stimulates interest in this important, but so far underexplored, area [C1089]

"CMA/Fractional-Delay Sequential Beamforming for Wireless Multipath Communications"

This paper presents a new adaptive antenna-array structure using CMA/fractional-delay sequential blind beamforming for multipath correlated signals in environments, such as indoor, confined or underground areas where the multipath problem is more severe than the co-channel interference. The new receiver uses a new synchronization approach for multipath propagation, based on combining a CMA adaptive antenna array and an adaptive fractional time delay estimation filter. This approach is designed to sequentially recover multipath rays based on adaptive time delay estimation for fractional time path arrival delays. The bit-error rate is evaluated for different operating conditions. Simulation results show the promising performance of the new adaptive antenna-array structure [C1090]

"Wideband Spatial Channel Model for MIMO Systems at 5 GHz in Indoor and Outdoor Environments"

This work presents a spatial channel model developed within the EC WINNER project. The channel model is mainly based on double-directional measurement campaigns carried out in the 5 GHz ISM band with bandwidths of up to 120 MHz. The model is based on a unified structure for indoor and outdoor environment. It covers 6 different propagation scenarios, namely indoor small office, indoor hall, urban microcell, urban macrocell, suburban macrocell, and rural environment. Both line-of-sight (LOS) and non-line-of-sight (NLOS) propagation conditions are modeled [C1091]

"Interaction of light beams propagating in 2S, 2P atomic hydrogen ; III: applications in astrophysics."

First Page of the Article [C1092]

"Channel capacity of a handset MIMO antenna influenced by the effects of 3D angular spectrum, polarization, and operator"

The purpose of this study is to evaluate a handset MIMO antenna under practical use conditions, involving multipath radio wave propagation and the influence of the body of the user. To this end, a Monte Carlo computer simulation has been carried out to investigate the distribution of eigenvalues and channel capacity [C1093]

"Correlation interferometer geolocation"

Geolocation solutions based on the correlation interferometer geolocation (CIGL) equation depend on searching over (xi,y i) space and identifying the transmitter location as the (x,y) value that maximizes the correlation value. Under cross-polarized incident field conditions this correlation depends on both the array manifold calibration polarization and the targets transmission polarization. Computation of the transmitted polarization is accomplished by maximizing the CIGL equation over polarization parameters for each measurement. Modifying CIGL to include superresolution and copy aided exploitation techniques is a straightforward process which improves geolocation accuracy under many operation conditions. Operational systems must contend with numerous error sources which will degrade geolocation accuracy, but CIGL accuracy improvements relative to conventional direction finding (DF) transmitter fixing are observed [C1094]

"Time varying channel modeling for ad-hoc mobile wireless networks"

Due to node mobility and environmental changes in mobile ad-hoc networks, the ad-hoc channel is time varying and subject to fading. As a consequence of these variations, the statistical characteristics of the received signal vary continuously, giving rise to a Doppler power spectral density (DPSD) which varies from one observation instant to the next. As a result, the traditional models can no longer capture and track complex time variations in the propagation environment. These time variations compel us to introduce more advanced dynamical models in order to capture higher order dynamics of the ad-hoc channel. A stochastic ad-hoc short term fading channel model, in which the evolution of the dynamical channel is described by a stochastic state space representation, is derived. The parameters of the stochastic state space model are determined by approximating the band

limited DPSD. Inphase and quadrature components of the ad-hoc channel are derived. Numerical results show that link performance for ad-hoc case is worse than cellular case, but the performance gap shrinks with increased mobility [C1095]

"Modeling environmental mobility and its effect on network protocol stack"

In this paper we address the effects of environmental mobility, that is, the ambient motion of entities like people and vehicles in the vicinity of wireless communication, on the channel characteristics and wireless network performance. We present a three step process of measurements, modeling and network simulations to quantify the significance of environmental mobility. Our field experiments show that presence of people not only cause deep fades but also distorts the fading distribution. We model the shadowing loss by three knife-edge diffraction model and propose a two-state Markov process channel fading behavior. The models are validated against measurement data and implemented in a network simulator. The models are scalable and incur execution overhead less than 15%. We also show the impact of environment mobility on protocol performance by means of two simulation case studies. We show that MAC layer data rate adaptation behavior is sensitive to environmental mobility and can result in 40% packets being delivered at lower rates. Second study on ad-hoc network performance show the throughput is decreased by 20%. We have identified that with environmental mobility the links are more sensitive to interference and the routes are less stable [C1096]

"Indoor wLAN Planning with a QoS constraint based on a Markovian Performance Evaluation Model"

This paper proposes an automatic base station planning approach. This approach does not only try to assess usual objectives such as radio coverage, but further implements a quality of service (QoS) constraint. This criterion is here defined as the mean available bandwidth per user. Its computation takes the medium access control (MAC) layer behavior, the multiple bit rates of IEEE 802.11b and the coverage area of each access point (AP) into account. A Markov chain is used to evaluate the available bandwidth of each cell independently. This is sensible because a non-overlapping criterion between cells is used during the planning phase to avoid interference between adjacent cells. The planning process estimates an optimal number of APs and their placement minimizing an aggregate criterion using a Tabu meta-heuristic. The AP's coverage is estimated with a powerful multi-resolution radio propagation simulator previously described. This paper presents results for a QoS oriented planning process providing a predefined minimum peruser throughput. The example provided herein applies for 100 users distributed over a 12600 m 2building floor [C1097]

"Measurements and Wideband Channel Characterization for Over-the-sea Propagation"

This study focuses on sea propagation environments and presents results on the characterization of the over-the-sea wideband mobile radio channel. Conducted measurements led to the development of path loss, log-distance models. The behavior of the power delay profile is also investigated in detail. In general, the mean excess delay and delay spread values were estimated below 0.5 musec for line-of-sight propagation. However, loss of line-of-sight can cause rapid worsening of the propagation parameters [C1098]

"FDTD for tropospheric propagation with strong cold plasma effects"

In this paper, the FDTD algorithm has been modified to allow one to investigate dispersive mediums in long range propagation. There are restrictions applied to the solution by using the techniques outlined in this paper which when obeyed conservatively produce results to difficult problems. An example of a bushfire profile has demonstrated the usefulness of this modified algorithm for application to new and complex propagation problems [C1099]

"Seasonal Variation for Rain Fading. An Approach for HAPS Systems"

When is used a statistical methodology to model the rain attenuation, is not take in count the variability that this attenuation present in agree with the year season. Other alternative to characterize this attenuation is using a time series generator. In this paper is used a time series generator based on conditional probabilities to model this effect and is applied to analyze the system based on HAPS systems performance [C1100]

"UWB Wave Polarization Measurements in Indoor Channels with a Hertzian Dipole Antenna Approximation"

UWB polarization measurements in three indoor multipath channels were studied for a transmitted UWB impulse signal. A polarization estimation process with low calculation complexity was tested on multipath signal waveforms. The waveforms were measured for three orthogonal receiving antenna orientations which reflect

polarization sensitivity. With the polarization estimate, a received signal energy bound with respect to the receiving antenna orientation was provided in closed form [C1101]

"Measurements and modeling of propagation losses in buildings at 1.8 GHz and 2.1 GHz"

This paper compares the measured results at two frequencies, f=1.72 GHz and f=2.156 GHz, and the simulated results of the radio coverage in an open area office by ray-tracing and statistical tools. The propagation measurements have been performed by transmitting a 1.72 GHz and 2.156 GHz test signal from a fixed antenna to a mobile receiver, and by recording the received signal as a function of receiver location [C1102]

"Proposal for an ELF Radar of D-Region Ionospheric Anomalies Analyzed using a 3-D Geodesic FDTD Model of the Earth-Ionosphere Waveguide"

This paper proposes a novel extremely low frequency (ELF: 3-300 Hz) radar for locating and characterizing ionospheric anomalies within ~100 km of the Earth's surface. Employing a well-characterized controlled ELF source (as opposed to natural sources having a random occurrence and random properties), the proposed radar could provide continuous, inexpensive monitoring capabilities of the ionosphere within ~100 km of the Earth's surface. For this study the recently developed three-dimensional (3D) geodesic whole-Earth electromagnetic wave propagation model based upon the finite difference time domain (FDTD) solution of Maxwell's equations is used [C1103]

"Use of the FDTD method for computing the VLF-LF propagation in the Earth-Ionosphere waveguide"

This paper briefly summarizes the application of the FDTD method to the VLF-LF propagation and shows a numerical comparison with the waveguide method. Results also are provided to illustrate the possibility of accounting for non-plane grounds and the possibility of computing the propagation of lightning pulses [C1104]

"BER Measurement on a Handset Adaptive Antenna Array in a Rayleigh-Fading Channel by a Variable-XPR Spatial Fading Emulator"

This paper presents an empirical study of the bit-error-rate (BER) performance of a handset adaptive antenna array in a Rayleigh-fading channel with a cross-polarized signal generated using a variable cross-polarization power ratio (XPR) spatial fading emulator. We have investigated the BER characteristics of a handset adaptive antenna consisting of a 1/4-wavelength monopole antenna and a planar inversed-F antenna (PIFA) as a function of XPR. It can be concluded that the measured average BER of an adaptive antenna array with both theta and phi components has an excellent BER performance in a multipath propagation environment with a cross-polarized component [C1105]

"Evaporation Duct Refractivity Profile"

This paper discusses the principles of evaporation duct refractivity profile estimation using bulk meteorological measurements. Four prevailing models among a number of developed ones were examined. Simulation results were compared with direct refractometric measurements. The sensitivity of the models to the measurement accuracy of the meteorological parameters was analyzed. As result LKB and RSHMU models can be recommended for farther use in oversea radiowave propagation calculation [C1106]

"Effect of Mutual Coupling on BER Performance of Alamouti Scheme"

This work presents a study on the effect of mutual coupling on the performance of Alamouti scheme by studying the bit error rate (BER) performance under different propagation scenarios and for different coupling cases. We show that the presence of mutual coupling may have positive or negative impact on the achieved power gain depending on the correlation properties of the propagation environment in absence of the coupling effect and on the mutual coupling matrix [C1107]

"Measurement of MIMO Capacity in a Hallway at 2.4 GHz"

This paper reports measurements of the capacity of a 2.4 GHz 4times4 MIMO system in which both ends of the wireless link are located in a hallway. This scenario is of interest due to the increasing mobility of ISM-band wireless devices, and because hallways have previously been reported to create difficulties for MIMO propagation. The capacity along horizontal and vertical cuts through the center of the hallway is found to be between 6 bps/Hz and 12 bps/Hz for a reference signal-to-noise ratio of 10 dB and a range of 12 m. Capacity in the horizontal plane was observed to be position-dependent and lower on average, due in part to a reduction in

field strength with increasing distance from the center of the hallway. Also, it is inferred that the fading statistics are probably different in the vertical and horizontal cuts [C1108]

"Input Signal Profile Influence on Output Spectra of Running Wave Amplifying Interferometer for Terahertz Spectroscopy"

The influence of the input signal temporal profile on output spectra of running wave amplifying interferometer (RWAI) is studied by mathematical modeling with the aim to make use of RWAI in terahertz spectroscopy. Two ways are considered: two frequency signal obtaining for further difference frequency signal extracting and reception of the required frequency as the spectrum component of sinusoidal signal modulated by terahertz frequency [C1109]

"Deterministic UWB Wave Propagation Modeling for Localization Applications based on 3D Ray Tracing"

For the assessment of radio based localization applications deterministic channel models are required that allow for the simulation of wave propagation in realistic environments. This paper describes the extension of the deterministic narrow-band wave propagation modeling approach of ray tracing to ultra wideband (UWB) channels. A channel model is presented that permits the simulation of wave propagation in realistic three-dimensional environments over the entire frequency range of UWB applications from 3.1 to 10.6 GHz. Simulation results for the impulse response and the power delay profile in a typical indoor scenario are shown. From a set of simulation results statistics are extracted and compared to already standardized statistical UWB channel models [C1110]

"UWB System Coverage using the complex envoltory in 2D TLM Power Flow (TLMPF)"

This paper proposes a new approach for planning the ultrawideband (UWB) system deployment based on statistical formulation of the amplitude of instantaneous electric field using the bidimensional transmission line matrix method TLM (Russer, 2000). The proposed algorithm uses the complex envoltory formulation of the simulated excitation in the TLM mesh to achieve a subresolution to describe the environment without compromising the accuracy of the path-loss for electromagnetic wave propagation in free-space. The two dimensional transmission line matrix power flow (TLMPF) is a numerical approach to make a statistical formulation for the RMS value of the discretized electric field mapped in the TLM mesh. The wide sense stationarity (WSS) characteristic of the electric field amplitude in the free space propagation, the path loss is computed using the correlation matrix of the TLM mesh. A numerical example considering a typical pico-cell in an indoor environment is presented. The simulation results were validated with the measurements using the central frequency (Durgin, 1998), the simulations are performed computing the pathloss in each point of the environment considering the material characteristics (epsivrand mur) of the existing obstacles in the area [C1111]

"Accuracy enhancement of a multi-resolution indoor propagation simulation tool by radiation pattern synthesis"

This paper presents an innovative approach that offers both a precise modeling of the propagation environment and a reduced computational load taking advantage of a multi-resolution algorithm. In this approach, radiating sources are simulated as point sources and are thus obviously omnidirectional leading to an important limit of the method. This paper tackles this problem by introducing multi-point sources. A regularized radiation pattern synthesis is then proposed for modeling particular radiation patterns. This approach enhances the accuracy of the predictions while preserving fast calculation times [C1112]

"Accuracy improvement of ray-launching approach for indoor wave propagation through high lossy walls"

This paper focuses on the transmitted wave through an indoor wall, which is composed by high lossy dielectric material. According to the Snell's law, refracted propagation (real) angle thetastmay be extended to a complex angle thetascirctfor such lossy dielectric case. Especially, if the lossy effect of the wall material is large, Jfrm{thetascirct} may not be negligible small. In the ray-launching procedure, the complex angle thetascirct must be replaced with real shooting angle thetast, when one needs to calculate the transmitted ray through the wall. However, it is not clear how one determines the appropriate real shooting direction thetastinside the wall when the refracted angle becomes complex. In order to clarify the above question, this paper considers how to determine the appropriate real refracted angle thetast, by comparing the numerical ray-launching solution with the analytically derived reference solution. Accuracy improvement for higher lossy material cases is also

discussed. Here time harmonic factor e-iwtis assumed and suppressed throughout the context [C1113]

"Effects of passengers and internal components on electromagnetic propagation prediction inside Boeing aircrafts"

An electromagnetic propagation prediction tool was used to predict the effect of passengers and internal components on the electromagnetic field strength inside airplane cabins. A commercial software package, Wireless Insitereg, was used to predict power levels inside aircraft cabins and the data was compared with experimental data collected. It was concluded that internal component in an airplane significantly alter propagation [C1114]

"Real-time S-MRTD simulation of electrically large indoor wireless channels with commodity GPUs"

Asymptotic and statistical models have been the only practical means, in terms of cost, performance and accuracy, for simulating electrically large environments. We show, in practice, how the combination of commodity graphics processing units (GPUs), and higher-order scaling function based multi-resolution time-domain (S-MRTD) techniques realize an unprecedented high-fidelity full-wave simulator that is orders of magnitude faster (134x) than otherwise previously possible [C1115]

"A reciprocity related result and its application to radio wave propagation"

In the paper, we consider a reciprocity related result that incorporates perturbations in the propagation medium. From this, we derive equations that describe radio wave propagation in a disturbed medium [C1116]

"An adequate channel model for ultra wideband localization applications"

In this paper a suitable approach to the deterministic modeling of ultra wideband channels has been presented. The developed channel model allows for wave propagation modeling within realistic three-dimensional environments and thus builds an ideal basis for the assessment of localization applications. The presented simulation results and the comparison with the IEEE 802.15.3a model show that this model delivers accurate and realistic channel impulse responses [C1117]

"Radio channel models for UWB body-centric networks with compact planar antenna"

In this paper a compact planar UWB antenna has been presented and characterised in frequency and time domain with respect to human body presence for applications in wireless body area networks (WBAN). The CPW-fed antenna performance agrees well with UWB requirements. The CPW-fed antenna demonstrated excellent characteristics, specifically for on-body propagation channels, considering the minimal change in path loss models slope values when body posture changes. A multi-slope linear power fit was proved to be most suitable for path loss modelling of the on-body channel due to changes in wave characteristics with distance from transmitter and also due to human body shadowing effect [C1118]

"Performance of an indoor/outdoor RSS signature cellular handset location method in Manhattan"

This paper presents handset location results in a live cellular network using a received signal strength (RSS) signature method that can locate handsets in the ultradense urban environment like Manhattan. Our results show that RSS location techniques are accurate for both outdoor and indoor users, surpassing the United States' rigorous E911 guideline of location estimate errors of less than 100 m 67% of the time and less than 300 m 95% of the time. A unique indoor propagation model presented in this paper may enhance location-based services and (in the US) enhanced 911 safety service offered by cellular carriers [C1119]

"Modeling realistic wide-band indoor propagation channels by using an efficient ray-tracing simulator"

This paper proposes a novel procedure to extract the wide-band propagation channel parameters, that employs a RT simulation carried out at different frequencies and followed by a proper processing of the simulated data. In particular, a RT-based tool suitable to be used for accurate and reliable site-planning in the framework of wide-band indoor wireless systems has been implemented, which shows an excellent agreement between simulation results and measured data [C1120]

"A statistical model for radio propagation in office buildings"

This paper proposes a statistical model for radio propagation in indoor office buildings, where the orientations of the reflecting surfaces are not random. The important channel parameters including PAS and PDS have been derived. Multiple angular clusters were clearly observed in the PAS profiles, which have been previously presented for similar building types. The PDS profiles exhibit an exponential distribution, which agrees well the empirical observations reported in the existing literature. It is concluded that a reasonably accurate description of propagation in buildings of this type can be obtained with the proposed model [C1121]

"Indoor Propagation of Diffracted Signals"

The incident signals at an indoor receiving antenna in a 2-D room are analyzed. A room with an aperture and walls of standard building materials was considered. An incident plane wave to the room with TE polarization was used. Diffraction for an aperture, multi-reflection into the walls and propagation into the room were contemplated. FDTD, ray tracing, and image methods were applied to obtain the receiving indoor signal [C1122]

"A New Double Counting Cancellation Technique for Three-Dimensional Ray Launching Method"

A new efficient algorithm is proposed to avoid the ray double counting problem in the three-dimensional ray launching method. This new method is very simple and is based on the angle between the received rays and the total distance traveled by them. These two parameters have to be saved in every ray launching method and therefore the proposed method does not need any extra memory. Comparison between the simulation results shows the good performance of the proposed method [C1123]

"Spaceborne submm-wave interferometry"

The primary advantage of a geostationary Earth orbit (GEO) for remote sensing, compared with a low-Earth orbit (LEO), is that continuous monitoring is possible over a large area of the Earth's surface and atmosphere. The main technical challenges are the very large antenna aperture required for achieving the required spatial resolution (40 folds increase in the distance to the Earth as compared to the LEO) and the necessity for imaging of two-dimensional scanning due to the absence of a relative spacecraft-Earth movement. The requirements derived from this application includes an effective aperture diameter of more than 8 m, which can not be fulfilled by a classical reflector-based instrument. Hence, an interferometric concept has been studied. In this paper a theoretical derivation of the minimum number of receivers that is required is presented along with a discussion on the implementation of such a system in space within a 10-year time frame [C1124]

"Propagation Parameter Tracking using Variable State Dimension Kalman Filter"

The development of future wireless communication systems requires modeling of the radio propagation environment. These models need the estimation of the model parameters from channel sounding measurements. In this paper, we build a state-space model, and estimate the propagation parameters with the extended Kalman filter in order to capture the dynamics of the channel parameters in time. The model also includes the effect of distributed diffuse scattering in radio channels. The issue of varying state variable dimension, i.e., the number of propagation paths to track, is investigated. For this purpose, we rely also on maximum likelihood based estimation techniques. The proposed algorithm is investigated using both simulated and measured data [C1125]

"Capacity and spectral efficiency of MIMO wireless systems in multipath urban environments with fading"

This work describes theoretical and numerical investigations of data stream parameters, such as capacity and spectral efficiency of multiple-input-multiple-output (MIMO) wireless communication systems taking into account fading phenomena caused by the multipath of radio propagation in urban environments. The propagation characteristics of urban wireless channel are described using a unified stochastic approach, which allows to obtain the Ricean parameter as a ratio of coherent and incoherent component of the total signal after multiple scattering reflection and diffraction. A simple formula to predict the channel capacity and spectral efficiency for MIMO wireless systems are derived. These formulas are numerically calculated for different urban areas and fading situations and are compared with those obtained for single-input-single-output (SISO) wireless systems. Obtained results allow us to conclude that the proposed method can be very useful as a tool for a network planner in predicting MIMO system performance for various urban and sub-urban environments. [C1126]

"Surface emitted THz-wave generation/amplification using ridge type PPLN"

Surface-emitted THz-wave generation using difference frequency mixing with ridge-shaped periodically poled lithium niobate (PPLN) was demonstrated. The PPLN produces THz-waves in opposite directions, and overlapping each THz-wave increased the total THz-wave intensity about 2.7 times. [C1127]

"Study of propagation effects of wideband radiated RF signals from PD activity"

Location of partial discharge sources via the recording of wideband VHF/UHF signals is well known. Having obtained good accuracies, researchers in this area now aim to develop characterization techniques comparable to those of more traditional contact systems. One obstacle hindering this development is the lack of a complete mathematical understanding of the means of propagation and effects on the properties of the signals recorded. This paper puts forward an initial description of the factors involved and affecting the radiated signal. It then describes, based on initial site experiments, propagation effects which need to be considered at the time of developing algorithms for partial discharge classification based on time/frequency and apparent charge levels [C1128]

"Measuring and modeling the wideband mobile channel for above the sea propagation paths"

This paper presents the results on mobile channel characterization for the above the sea propagation paths at 1.9 GHz. The study is based on measurement campaigns conducted in various locations, carefully selected in order to cover all kind of environments that can be met in the Aegean Sea. The purpose was to model the over-the-sea channel. This study presents conclusions and results on large scale as well as on small scale characterization (time dispersive and time variant nature of the channel). Large scale modeling was accomplished with the use of the log-distance model. As far as the time dispersive nature of the channel is concerned, the study focuses on the Power Delay Profile (PDP). A simple methodology for predicting the delays of possible incoming signal echoes is also included. Moreover, mean excess delay and rms delay spread were calculated and empirical cumulative density functions of these quantities for each group were estimated. Finally the envelope distribution for each identified path (direct or not) was estimated. Results on the average estimated K-factor for various types of environment are also presented. [C1129]

"Assessment of performance of a Ka-band broadcasting reconfigurable satellite antenna with adaptive mitigation for atmospheric attenuation"

The flexibility given by a reconfigurable antenna can be exploited in various ways: redirecting capacity, tailoring the shape so as to match the borders of the served region, maximizing the total throughput etc. Another possibility, particularly valuable above the Ka-band owing to the sensitivity to atmospheric attenuation, is that of minimizing the number of non served users in a broadcasting system. This is achieved by redirecting the power flux so as to concentrate more power towards regions affected by rain. The efficient utilization of the limited power available on board allows the achievement of the same system availability of a fixed antenna but with lower power levels. Modern satellite-antenna technology could reach a spatial resolution on ground which is comparable to that of the atmospheric weather features to be mitigated. In the case of Europe this goal could be obtained by reflector antennas of about 2 m diameter illuminated by a focal array composed by about 100 feeds. The paper presents a first step towards an extensive assessment of the performance of such a system operating in the ka band based on simulations utilizing high resolution weather spatial fields provided by the European Centre for Medium-range Weather Forecast (ECMWF) and concurrent Meteosat images. The simulation will cover a significant period of time (some years) so as to provide a statistically sound estimate of the adaptive gain. A balance of the adaptive gain vs the limitations of reconfigurable beam-forming network will be attempted so as to assess the cost- and risk-effectiveness of such technique for systems in the near future. [C1130]

"Ultra-wideband indoor propagation channel: Measurements, analysis and modeling"

In this paper, the results of ultra wide band (UWB) measurements carried out in indoor environments are presented and a statistical propagation model for the UWB channel covering the frequency band from 3.1 to 10.6 GHz is proposed. The measurements have been performed in the time domain by exciting the channel with very short pulses of 50 ps width. Both line-of-sight (LOS) and non-line-of-sight (NLOS) propagation with a maximum distance of 10 m are considered. Inspection of measured data after processing shows that the multipath components of the UWB channel tend to arrive in clusters. Therefore, the Saleh-Valenzeula (S-V) model has been adopted as starting point for our modelling analysis. Important channel parameter statistics of the model are extracted from the measured data. The obtained results show some discrepancies with respect to the IEEE channel model. The results presented here illustrate that the conventional single Poisson process is not sufficient to model the cluster and ray arrival times. Therefore, a Gamma distribution is proposed to model the cluster inter-arrival times and a mixture of two Poisson processes to model the ray intra-arrival times. It is found that the amplitude fading statistics can be modelled by the log-normal distribution with a standard deviation decreasing linearly with the excess delay. Other parameters like cluster and ray power decay constants are determined to complete the statistical UWB channel model. [C1131]

"Trust-Propagation Based Authentication Protocol in Multihop Wireless Home Networks"

In this paper, we propose an authentication and secure channel establishment protocol that is reliable and adaptable for multihop wireless home networks. The main idea is that a home server hands over its authenticating capability to some already authenticated devices to enable these devices to be able to authenticate other devices which cannot reach the home server directly due to their physical location and radio power constraints. Key to our design is a neighbor device authentication protocol, based on pre-user-injected network password, with minimal reliance on public key cryptographic operation. In addition, our protocol supports a secure channel establishment among heterogeneous devices after authentication. Through the evaluation, we show that our protocol is resistant to various attacks [C1132]

"The AFRL demonstration and science experiments (DSX) for DoD space capability in the MEO"

The Air Force Research Laboratory (AFRL) space vehicles directorate has developed the demonstration and sciences experiment (DSX) to research the technologies needed to deploy space assets in the harsh MEO radiation environment. The DSX comprises three basic research experiments: 1) wave particle interaction experiment; 2) space weather experiment and; 3) space environmental effects experiment. The wave particle interaction experiment will explore the transmission, propagation and amplification of very low frequency (VLF) waves in the magnetosphere. The experiment will be performed using a mission architecture that includes space transmitters and receivers on DSX, ground transmitters such as high frequency active auroral research program (HAARP), and other space receivers on satellites such as IMAGE (imager for magnetopause-to-aurora global exploration). The specific objectives are to explore the effect of VLF waves on scattering energetic particles in the radiation belts, global wave propagation, amplification, and efficiency of VLF injection from a space antenna through the plasma sheath. The wave particle interaction experiment is under development through the strong support of DARPA's Sleight of HAND program. The space weather experiment uses a combination of seven particle and field sensors to precisely measure high and low energy particle dose rates and pitch-angle distributions as well as local magnetic fields in the poorly characterized MEO environment and slot region. the space environmental effects experiment on DSX is centered around the NASA GSFC space environmental testbed (SET) payload which will perform basic research on the performance of a number of electronics components in the MEO environment. In addition, AFRL radiometers and photometers will be used to characterize the radiation effects on select optical and thermal coatings. Grouping these experiments on a single platform provides a low-cost opportunity for AFRL due to the experiments' common--requirements and goals. All three experiments need a 3-axis stabilized spacecraft bus, a suite of radiation sensors, and extended duration in a MEO orbit. The DSX spacecraft is currently in fabrication. The DSX program enjoys the continued support of SMC Det 12, space test program, in the process to secure a launch manifest. The satellite is planned to be launch ready by late 2008 with one year of on-orbit operations [C1133]

"Efficient Ray Tracing for Radio Channel Characterization of Urban Scenarios"

This work presents an efficient ray tracing algorithm for radio channel characterization of urban environments by the use of classes of rays. It is based on a two-dimensional image theory, which is properly modified to yield the desired three-dimensional ray trajectories [C1134]

"The Cauchy Problem for the Helmholtz Equation in a Domain with a Piecewise-Smooth Boundary"

The Cauchy problem for the Helmholtz equation is investigated in the case when a piecewise-smooth boundary of a domain is determined in a parametric form. The condition at infinity is taken in the form of the absence of in-coming waves from infinity. The formula that expresses a Fourier image solution through its boundary values is obtained by using the Fourier transformation method in a class of slowly-growing generalized functions. The conditions that the boundary values of the functions have to satisfy are derived. It is proven that these conditions are the necessary and sufficient solvability conditions for the original problem [C1135]

"An Attenuation Function of the Ground Wave Field Over Two-Dimensional Inhomogeneous Radio Paths"

Ground wave field propagation of electromagnetic waves transmitted by a vertical electric dipole in LF-MF ranges is considered. A new method of calculation of an attenuation function of the radio wave propagation taking into account two-dimensional model of inhomogeneities is offered. The solution is in form of totality of one-dimensional attenuation functions within several first Fresnel zones. EM wave propagates over an inhomogeneous irregular surface [C1136]

"Radiowave VHF Propagation modelling in forest using finite elements"

In this paper, propagation modelling of electromagnetic waves at VHF inside the forest is presented by using parabolic equation method. Solution of parabolic equation using split step Fourier algorithm requires high computational demands, so finite element method is propose here which is more accurate and computationally efficient. This method can be used in case of irregular terrain, multi-layer forest model and range dependant propagation in the forest. Results are compared with well known Tamir's results. It can be seen that wave propagation in forest can be solved by using parabolic equation method. Use of finite element method gives efficient and computationally efficient solution of the problem [C1137]

"Fractal modelling of rain fields: From event-on-demand to annual statistics"

Rain is the dominant attenuator for radio systems operating above 10 GHz. Correctly configuring systems that can dynamically compensate for rain fading requires a detailed knowledge of spatial and temporal rain field variation. Ideally, this would be provided by a database of meteorological radar measurements. Unfortunately, such data is scarce. Alternatives to radar measurements are methods for simulating rain fields in time and space. This paper discusses a monofractal, additive (in the logarithmic domain) discrete cascade model for simulating rain fields in two spatial dimensions. The model produces events-on-demand, customised to an input rain rate parameter and desired rain event type (stratiform or convective). In order to test the long term statistics of a proposed radio system, simulated rain field datasets are required which will reproduce the annual rain statistics for the average year. Work towards a method to convert from a set of single events into a set capable of reproducing annual statistics is presented in this paper. [C1138]

"A ray optical wave propagation model for the prediction in time variant scenarios"

With the growing demand for wireless communication systems, wireless concepts for the data exchange in time variant scenarios in indoor and urban domains become more and more interesting. In order to describe and thus assess the mobile radio channels in such scenarios, simulations are required. The main aspect is the time-variance of the channel impulse response. This paper discusses the demands for models to describe the radio channel in time variant environments and presents an appropriate ray tracing approach. The performance of the ray tracing algorithm is demonstrated by a comparison from predictions to several measurement campaigns. [C1139]

"Propagation millimeter waves in the urban and the rural conditions"

The aim of the paper is models development and experimental validation of millimeter waves narrow beam propagation in shadow zone of the urban building. Establishment dependence of interference fading from parameters for a narrow beam, height of antennae, distance between antennas by propagation above terrestrial cover in rural conditions. [C1140]

"Parametric characterization and estimation of Bi-Azimuth and delay dispersion Of individual path components"

In this contribution, we derive a distribution that is suitable for characterizing biazimuth (azimuth of arrival and azimuth of departure) and delay dispersion of individual path components in the response of the radio channel. This distribution maximizes the entropy under the constraint that its first and second moments are specified. We propose to use the density function of the derived distribution to characterize the shape of the biazimuth-delay power spectrum of individual path components. The applicability of this characterization in real conditions is assessed using measurement data. [C1141]

"Effect of scintillations on the correlation of different frequency L-band satellite navigation signals on the same transionospheric link"

In satellite positioning, a linear combination of 2 signals is used to eliminate the error due to the background ionosphere. State-of-the-art semi-codeless techniques rely on cross-correlation of the signals received at L1 and L2. Thus it is important to determine how well these signals are correlated. Lack of correlation will also introduce range error in the 2-frequency correction. A significant factor in reducing this correlation is scintillation resulting from propagation through time-varying small-scale irregularities in the ionosphere. In the paper the estimated errors of the 2-frequency range determination and the correlation coefficients of the phases at 2 different frequencies are presented depending on the strength of the electron density fluctuations for 4 different pairs of frequencies (L1/L2, L1/L3, L2/L3, L1/L5). The results show that their dependence on the variance of the electron density fluctuations diverges from a linear relationship, the stronger are scintillation effects. [C1142]

"Oceanic propagation measurements for beyond line-of-sight links at Q band"

This paper presents results from two experiments that were conducted to characterize propagation over the ocean at upper Q-band frequencies. Measurements of propagation loss versus path length were made off the Mid-Atlantic coast of the United States in February and November 2005. The results show that the propagation loss can be more than 100 dB less than the loss due to diffraction and refractive effects caused by a standard atmosphere. Comparison of the measurements with theoretical predictions suggests that the observed propagation enhancement at high Q-band frequencies is primarily due to tropospheric ducting; however, troposcatter may also play a role at Q band and above. An attempt was made to find simple regression rules that fit the measured propagation loss dependency on path length. It was discovered that the measured path loss in dB depends linearly on the logarithm of the path length and that the slopes and intercept values of the linear regressions are dependent on receiver height and environmental conditions. The results in this paper address a frequency band that is under represented in the open literature. [C1143]

"Optimization of propagation prediction hybrid model for the cellular network design"

A hybrid optimization model useful to predict the electromagnetic field in a cellular network is proposed. The proposed hybrid prediction model allows to obtain accurate results in considerable shorter calculation time than that necessary for the traditional ray-tracing. These methods mainly consist in a statistic prediction on limited extension areas, based on deterministic techniques. The proposed hybrid algorithm works in two different steps: the former calculates the electric field in a subset of the original observational points; the latter evaluates the power received in the remaining points by a statistic analysis of the values previously simulated. In this work we compare different methods such as linear regression, minimum mean square error and higher order regression curves to be applied in the statistic analysis in order to obtain more accurate results in the path loss calculation. [C1144]

"Analytic tropospheric ray-tracing model for constant refractivity gradient profiles"

Prediction methods in tropospheric electromagnetic wave propagation primarily rely on ray-tracing and parabolic equation. While the parabolic equation approach represents a full-wave method of wave equation solution, ray-tracing methods make use of the ray-concept taken from physical optics. Although ray-tracing is not capable of giving exact field strength/phase in general cases, it does provide a useful tool for illustrating atmospheric refraction effects. The main advantage of the ray-tracing concept lies in the relative simplicity of its implementation. The aim of this paper is to introduce an analytic ray-based method of field amplitude/phase computation to consider the refractive properties of the atmosphere, represented by a refractive index gradient. [C1145]

"A method for predicting the scattering by a lossy wedge in automotive radio propagation environments"

The aim of this work is to propose a useful method for predicting the scattering by a penetrable wedge when a linearly polarized plane wave is orthogonally incident on it. The wedge is here treated as a junction of two nonmagnetic lossy dielectric slabs. The proposed approach is based on the extension of the Burnside and Burgener's method to determine the geometrical optics response of the structure and on the construction of the corresponding Uniform Asymptotic Physical Optics solution for predicting the diffraction contribution. Planar and right-angle junctions of lossy layers are here considered as canonical structures usually present in automotive radio propagation scenarios. [C1146]

"Initial comparisons of forecast attenuation and beacon measurements at 20 and 40 GHz"

The use of frequencies above 20 GHz for Earth-Space communication has many advantages, primarily substantially increased capacity. Unfortunately at these frequencies the attenuating effects of the troposphere become very large; clouds, rain and atmospheric gases all contribute significant attenuation. The Italsat propagation experiment demonstrated the large fade margins that would be required to achieve a high availability network. At the University of Bath we have developed a technique that is able to forecast link fades (in terms of cloud attenuation, rain attenuation and the attenuation from water vapor and gaseous oxygen and an estimate of the scintillation variance) a number of days into the future. This technique exploits concepts from numerical weather prediction (NWP) systems in order to characterize the meteorological environment. A propagation model is then applied to forecast the fade level. [C1147]

"Advanced modelling of the space-time behaviour of the propagation channel for future Satcom systems"

The objective of this paper is to describe recent activities carried out in the field of Earth-Space propagation for

ESA and CNES or in the framework of European projects. In a first part, the temporal behaviour of the propagation channel is briefly addressed thanks to the development and validation of time series synthesisers. In a second part, which is the main core of the paper, it is shown how space variation of propagation impairments can be described with the development of generators of rain attenuation fields from two studies carried out by Politecnico di Milano for ESA and by ONERA for CNES. Then, the "hot topic" of the space-time variability of the propagation channel is dealt with, thanks to current research activity carried out by ONERA and Politecnico di Milano. [C1148]

"Propagation modeling in subway tunnel using FDTD"

The next generation mobile access network system design needs more precise characterisation of the radio channel and and needs sophisticated propagation models because of the decreasing cell sizes and of higher data rates. Especially planning coverage in tunnels and indoor spaces causes design problems without these models. The FDTD based model is able to characterise the above scenarios and using this a costly measurement effort can be reduced using simulation methods. In this article nearly circular subway tunnel is modeled in absence and presence of vehicle. The model can be applied for determine the field strength distribution on a cut plane of the tunnel with leaky cable excitation. [C1149]

"Characterization of time and space variability of the rain cells and fronts"

This paper presents the study of rain cells in the geographic area of the Basque Region in order to a later application in radio communication systems. It will be analyzed both, space and time variability of rain rates, to obtain a reliable characterization by parameters like size, speed or direction of propagation of rain cells. This work will obtain the necessary conclusions to apply the results on the design of dynamic fade countermeasures, in those radio links working at frequencies over 10 GHz. [C1150]

"Intrinsic Finite Dimensionality of Random Multipath Fields"

We study the dimensions or degrees of freedom of random multipath fields in wireless communications. Random multipath fields are presented as solutions to the wave equation in an infinite-dimensional vector space. We prove a universal bound for the dimension of random multipath field in the mean square error sense. The derived maximum dimension is directly proportional to the radius of the two-dimensional spatial region where the field is coupled to. Using the Karhunen-Loeve expansion of multipath fields, we prove that, among all random multipath fields, isotropic random multipath achieves the maximum dimension bound. These results mathematically quantify the imprecise notion of rich scattering that is often used in multiple-antenna communication theory and show that even the richest scatterer (isotropic) has a finite intrinsic dimension [C1151]

"Positioning for NLOS Propagation: Algorithm Derivations and Cramer-Rao Bounds"

Mobile positioning has drawn significant attention in recent years. In dealing with the non-line-of-sight (NLOS) propagation error, the dominant error source in the mobile positioning, most previous research in this area has focused on the NLOS identification and mitigation. In this paper, we investigate new positioning algorithms to take advantage of the NLOS propagation paths rather than cancelling them. Based on the prior information about the NLOS path, a least squares based position estimation algorithm is developed and its performance in terms of root mean square error (RMSE) is also analyzed. Furthermore, the maximum likelihood based algorithm is presented to jointly estimate the mobile's and scatterers' positions. The Cramer-Rao lower bound on the RMSE is derived for the benchmark of the performance comparison. Finally, the performances of the proposed algorithms are evaluated analytically and via computer simulations. Numerical results demonstrate that the simulated results closely match the derived analytical results [C1152]

"A Block Factor Analysis Based Receiver for Blind Multi-User Access in Wireless Communications"

In this paper, we present a technique for the blind separation of DS-CDMA signals received on an antenna array, for a multi-path propagation scenario with inter symbol interference. Our method relies on a new third-order tensor decomposition, which is a generalization of the parallel factor model. We start with the observation that the temporal, spatial and spectral diversities give a third-order tensor structure to the received data. This tensor is then decomposed in a sum of contributions by means of an alternating least squares algorithm, where each contribution fully characterizes one user [C1153]

"Exploiting multipath propagation for GMTI in urban environments"

This paper evaluates the potential for exploiting multipath propagation for improved radar detection of moving ground targets in dense urban environments. In particular, the radar coverage offered by exploiting non-line-of-

sight (NLOS) propagation from an airborne radar platform is considered. A quasi-analytical model for NLOS propagation assuming multiple specular reflections off buildings is derived to evaluate radar coverage as a function of target range, aircraft altitude, building height and separation, and relative target position on a street. A statistical characterization of the urban environment is used to compute probabilities of line-of-sight versus non-line-of-sight propagation and surveillance sweep width. Comparison of sweep width for LOS versus at least one NLOS path indicates that NLOS could offer a significant improvement in coverage rate. In essence, NLOS propagation permits radar surveillance at longer ranges with lower altitude radar platforms. In addition to radar coverage, the Cramer-Rao lower bound (CRLB) for estimation of target position in a specular multipath environment is derived. The CRLB indicates that, in theory, range accuracy improves with multiple paths and that only three paths are required to jointly estimate target range, position within the street, and street width. [C1154]

"A general presentation about the OTH-Radar NOSTRADAMUS"

ONERA, funded by the French Ministry of Defence has conducted the realization and experimentations of the Doppler Skywave OTH Radar called NOSTRADAMUS. One of the main characteristic of Skywave OTH Radar is the dependence to the ionosphere for successful operation. The use of the HF band allows to Skywave OTH Radar to bounce radio waves from the ionosphere, receiving tiny signals back from reflecting surfaces as the sea, islands, ships and aircraft. The knowledge of the behavior of the ionosphere in a real time configuration is of primary importance because of it influences on the choice of frequencies. Radars systems require developing a real-time frequency management system (FMS) using prediction program or measurements supplied by vertical or oblique sounders. The French OTH Radar concept has been developed and implemented so that the radar could be completely autonomous with respect to others 'ionospheric information providers'. This paper presents the NOSTRADAMUS system, the frequency management system and shows some results obtained during the past years. [C1155]

"The Investigation of 3G Cellular System Performance Based on Echo Statistics"

In 3G cellular systems, WCDMA air interface will be used. A transmission bandwidth of 5 MHz will enable the use of Rake receivers, which can capture more multipath energy. This work investigates the effect of number of Rake fingers and relative power levels of multipath components on system performance. Data from radio channel propagation measurements in UMTS bands in Manchester city center were used to obtain multipath statistics. Four channel profiles were selected to be used in simulations for performance analysis of a 3G system that employed a Rake receiver with 1-5 fingers. The simulations were performed for spreading factors of 16, 32 and 64. Results showed that the optimal number for fingers depends on channel profile [C1156]

"Time-Spatial Path Modeling with Multi-Scattering Attenuation Factors for Wideband Mobile Propagation"

In order to accurately assess spatial processing techniques such as adaptive array antenna (AAA) and MIMO for wideband mobile communications, we proposed a time-spatial path model that allows the delay profile and angle profile of the traveling wave to be simulated at the same time. In order to explain the field measurement results in various environments, this paper proposes an advanced time-spatial path model that uses several attenuation factors instead of the one attenuation factor used in our previous proposal [C1157]

"An Adaptive Positioning Scheme Based on Radio Propagation Modeling for Indoor WLANs"

This paper presents an adaptive location estimator based on radio propagation modeling and Kalman filtering for indoor wireless local area networks. In this positioning scheme, the location of a mobile terminal is extracted from the constant-velocity trajectory by linear equations and the radio propagation model by nonlinear equations. Results from simulation exhibit that the positioning error can be reduced with smaller sampling time of the Kalman filter. The simulation results also show that more than 95 percent of the estimated locations have error distances less than 1.55 meters [C1158]

"Impact of Building Database Accuracy on Predictions with Wave Propagation Models in Urban Scenarios"

The accuracy of predictions with wave propagation models depends significantly on the quality of the building databases, as they show discrepancies when compared to reality. This is due to the inaccuracies of the photometric methods used to create these databases, but also to the fact that new buildings are raised or old buildings are pulled down. However, propagation models should feature a certain robustness against these inaccuracies. In this paper, the sensitivity of different propagation models for urban scenarios with respect to

building database inaccuracies is analyzed. The main focus is the comparison of the dominant path model with a Ray Tracing model, but the results are also put in relation to the empirical COST 231 Walfisch-Ikegami model. Furthermore, the possibilities of an automatic database simplification to reduce calculation times are investigated, and it is shown that ray tracing computation times can be reduced up to 50% with only slight decreases in the accuracy by applying suitable simplification algorithms. For the evaluation of the influence on the accuracy also path loss measurements in different scenarios were used [C1159]

"On the Practical Issues in Hop Count Localization of Sensors in a Multihop Network"

Simple algorithms have been developed in the area of node localization in a wireless sensor network. For these simple algorithms to work, several assumptions were made. However, the accuracy of such assumptions affects the effectiveness and performance of such algorithms. For example, the irregular propagation pattern of transmission range is often neglected in both simulation and analysis. This paper investigates the accuracy of these assumptions and proposes some modifications to improve the hop count localization algorithm in an actual physical implementation [C1160]

"Database Correlation using Bayes Filter for Mobile Terminal Localization in GSM Suburban Environments"

In this paper we present a database correlation method combined with Bayes filtering as a pattern matching technique for mobile terminal localization in GSM suburban environments. A 3D deterministic radio wave propagation prediction model is used for the database construction. Bayes filter provide a robust technique to deal with multi-hypotheses situations usually occur in cellular localization when the location dependent parameter considered is the radio power level. Furthermore, three methods used to yield a location estimate from the resulted hypotheses are presented and compared according to their performance. Results show very acceptable location accuracies relative to the considered suburban area, which is a typical environment in many populated parts of Germany [C1161]

"Performance Analysis for a Two-Ring Distributed MIMO-OFDM System"

Distributed MIMO technology is an effective way of dealing with the inter-cell interference problem in single frequency wireless communication networks. This paper studies the generic channel capacity formula for a distributed MIMO-OFDM system. A practical two-ring STBC distributed MIMO-OFDM transmission scheme is introduced. The cell throughput formula for this distributed scheme is derived. The impact of inner cell radius on cell throughput performance is analyzed for a multi-cell simulation model. From simulation results, we show that the two-ring distributed scheme can effectively mitigate inter-cell interference and provide good radio propagation channel quality, particularly for users at cells' boundary. Moreover, we show that, with proper inner cell radius, the two-ring distributed MIMO-OFDM scheme can achieve significant cell throughput gain compared with that of conventional centralized MIMO-OFDM scheme [C1162]

"Impact of the ionosphere on an L-band space based radar"

We have quantified the impact that the ionosphere would have on a L-band interferometric synthetic aperture radar (SAR) mission using a combination of simulation, modeling, Global Positioning System (GPS) data collected during the last solar maximum, and existing spaceborne SAR data. Using the Jet Propulsion Laboratory's Global Ionospheric Maps (GIM) total electron content (TEC) estimates derived from the worldwide array of GPS stations, we determined that the sun synchronous orbit which would minimize TEC at the time of imaging has dawn and dusk equator crossings. Such an orbit also avoids the equatorial post-sunset irregularities. We used the GIM data to examine the day-to-day variability in the background ionosphere and to quantify the impact of the background ionosphere on single pass SAR performance. With the exception of Faraday rotation related effects on single polarization systems, degradation due to the background ionosphere can be avoided if a reasonable model for the ionosphere is used during processing. Our studies reveal that Faraday rotation angles rarely exceeded the 10° threshold that impacts biomass retrieval and that repeat pass interferometric SAR decorrelation due to variations in the background ionosphere causing variable Faraday rotations is a negligible effect. Even a dawn-dusk orbit will not avoid high latitude ionospheric irregularities. We evaluated the strength of the ionospheric irregularities using GPS scintillation data collected at Fairbanks, Alaska and modeled the impact of these irregularities on azimuth resolution, azimuth displacement, peak sidelobe ratio (PSLR), and integrated sidelobe ratio (ISLR). Our examination of ionospheric artifacts in InSAR data has revealed that the artifacts occur primarily in the polar cap data, not auroral zone data as was previously thought. [C1163]

"Mobile path loss characteristics for low base station antenna height in different forest densities"

This paper presents studies of propagation in a suburban forest based on a measurement campaign at a frequency of 1.8 GHz. We investigated how tree density affected path loss-distance and the fast fading characteristic depending on the base tree size and base station antenna height in a range of 3, 4, and 5 m above ground while the receiving antenna height was fixed at 1.8 m above ground. The path loss exponent is found that to average 3.8, 3.7 and 2.2 for the measurement areas of high, medium, and low densities respectively. The high density area with low tree heights provides maximum path loss exponents. Path loss in the same density area depends on the number of trees in the direct path between the transmitter and the receiver. The measurement of signal variation shows that a multi-path contribution becomes more significant as the base station antenna is raised. [C1164]

"Ad-hoc network routing using co-operative diversity"

One important goal of communication systems is to establish a point-to-point connection between two end users. Previous and current generations of the systems that provide for such communications are most often based on wired links (including optical fiber). Currently wireless multi-hop ad hoc networks utilize protocols that relay packets of data node-by-node along a path connecting the source node to the sink node. This paper describes a new cooperative diversity (CD) methodology for wireless network communications that leverages the fact that RF energy scatters and propagates to many users simultaneously. Specifically, we describe and evaluate a protocol designed to establish end-to-end communication within a large field of autonomous wireless devices producing reduced latency and greatly increased robustness against signal fading and interference. In addition, this new protocol often requires less transmit power than existing techniques. [C1165]

"Mobile location estimation by density-based clustering for NLoS environments"

For the mass demands of wireless communication services, the mobile location technologies have drawn much attention around the world. In wireless communication, one of the main problems with accurate location is nonline of sight (NLoS) propagation. To solve the problem, we present a new location algorithm with clustering technology by utilizing the geometrical feature of cell layout, time of arrival range measurements, and three base stations. The mobile location is estimated by solving the optimal solution of the objective junction based on the high density cluster. Simulations study was conducted to evaluate the performance of the algorithm for different NLoS error distributions and various upper bound of NLoS error. The results of our experiments demonstrate that the proposed algorithm is significantly more effective in location accuracy than range scaling algorithm, linear lines of position algorithm, and Taylor series algorithm, and also satisfies the location accuracy demand of E-911. [C1166]

"Effects of Solar Flare to Shortwave Communication"

In order to solve the obstruction of shortwave communication, we studied the effects of the solar flare to the shortwave communication and its reason on the basis of up-to-date experimental data. We discussed theoretically the refractive index of radio wave in the ionosphere and the rule of the wave propagation of the radio communication in detail and presented the formula for skip distance calculation. We brought forward the method of real-time frequency selection which solved the obstruction of remote communication [C1167]

"Propagation of lightning electromagnetic pulse (LEMP) through ionosphere"

The electrically conducting region of the upper atmosphere of earth's surface, the ionosphere, plays a major role in all sorts of radio communication. In 1901 when Marconi was carrying out the experiment, surprisingly the signal was found to be received on the area behind the Atlantic Ocean. The presence of signal could not be justified considering only ground wave propagation. Ground reflection and diffraction effect would be insufficient to permit such a long distance transmission and reception of signal around the earth's curvature. This finally led to the discovery of ionosphere which surrounds the earth. Later details study of ionosphere leads to the discovery of different layers (D, E, F1 and F2) and variation of characteristics from day to night and vice-versa. Lightning is considered to be the strongest natural source on the ground so far. Lightning discharges radiate the bulk of their electromagnetic energy in the very low frequency and extremely low frequency ranges. Radio wave in ELF and VLF are either penetrate through or reflected back from these ionized layers. If the lightning burst takes place not far from ionosphere it will modify the electronion density of ionosphere thereby modifying its characteristics. [C1168]

"Impact of double-Rayleigh fading on system performance"

Double-Rayleigh amplitude distribution, induced by double scattering in the radio channel, occurs in a variety of propagation scenarios, including propagation via diffracting wedges. It is unknown, however, how double scattering affects communication link performance. In this paper, an expression for symbol error probability for

some common communication schemes over double-Rayleigh fading wireless channels is derived. It is shown that double scattering results in severe degradation in symbol error probability. Interestingly, our analysis suggests that for the double-Rayleigh channel there exists no meaningful diversity order for the SNR values of practical interest. [C1169]

"Finite Element based Beam Propagation Method for 3D Wave Propagation in Troposphere"

A three dimensional finite element solution of the parabolic equation for beam propagation in troposphere is newly formulated. The model represents propagation over a spherical earth and allows specification of frequency, polarization, beam width and antenna height. An efficient three dimensional form of the helmholtz equation with height dependant refractivity is used to model radio wave propagation in troposphere. By using this method, horizontal and vertical tropospheric characteristics are assigned to every element, and different refractivity profiles can be entered at different stages. We also implement some abnormal environmental conditions to assess our method, and investigate ducting phenomena in troposphere [C1170]

"Total information efficiency in multihop wireless networks"

The performance analysis of multihop wireless networks requires appropriate performance measures in order to take into consideration the intrinsic characteristics of this type of networks. The information efficiency is a measure of how efficiently bits of information are transmitted in multihop networks. In this paper we investigate the performance of a multihop network, by evaluating its total information efficiency, defined as the sum of the amount of information efficiency of all active one-hop links at a given time. By using the total information efficiency as a performance measure, we are able to evaluate the effects of channel reuse throughout the network and analyze the resulting tradeoffs involving different modulation schemes, different transmission ranges and the propagation effects [C1171]

"On the VLF/LF radiation pulse shapes at the initial milliseconds of lightning discharges"

This report examines the shape and amplitude of the VLF/LF radiation pulses within the initial milliseconds of lightning discharges. A simple model regarding the discharge process and channel condition is proposed to compute the radiation pulses. With some reasonable assumptions regarding the current propagation speed and the current damp length, the modeled pulses are in good agreement with the observations. Based on our analysis, we infer that lightning channel becomes increasingly active during the first hundreds of mus and then becomes continuously less active thereafter [C1172]

"A New Approach for Locating Mobile Stations under the Statistical Directional Propagation Model"

Recently, mobile location estimation is drawing considerable attention in the field of wireless communications. Among different mobile location estimation methods, the one which estimates the location of mobile stations with reference to the wave propagation model is drawing much attention on the grounds that it is applicable to different kinds of cellular network. However the estimation accuracy of the signal propagation model deteriorates as the distance between the mobile station and the receiving base station increases. In view of this, we have designed a new location estimation approach which has divided the location estimation into two phases, the data collection phase and the location estimation phase. In this paper, we report our study of the new location estimation approach. We tested the approach with real life data collected from a major mobile operator of Hong Kong. Results show that the new location estimation approach has improved the existing statistical signal propagation model by 30.94%. This improvement can be further enhanced if more data are collected [C1173]

"A study on bandwidth broadening of dual-band slot antenna using matching patch"

Wide beam-width antenna based on slot antenna that used microstrip feeding was designed. As using reflector, it was characterized forward direction propagation, and it can convert the backward propagation to forward, so we can achieve more high gain. And we achieve VSWR 2:1 not only 2.4 GHz band but also 5 GHz band, so it can use any wireless-LAN system, its size is 60 mm times 55 mm times 5.8 mm and it was designed to use as set up on ceiling [C1174]

"Propagation characteristics of UWB radio in a high-rise apartment"

Among many other applications, ultra wideband (UWB) is considered a promising technology to be deployed for the future wireless personal area networks (WPAN) . The objective of our work is to investigate the indoor propagation characteristics of a UWB signal of which its equivalent isotropically radiated power (EIRP) is limited by the Federal Communications Commission (FCC) of the U.S.. A 90 m2residential flat in a high-rise building of Hong Kong is a typical example to exhibit the scenarios for a WPAN application. This paper presents the

empirical results from various aspects of the propagation characteristics by employing a pair of FCC-compliant UWB transceivers [C1175]

"A Multibands Wideband Propagation Channel Sounder from 2 to 60 GHz"

This paper describes a wideband radio channel sounder. Such a device is able to measure the complex time variant impulse response of the propagation channel. The impulse response is obtained by inversion of an optimal multisine sequence (flat spectrum, low crest factor). In standard configuration, this device is able to measure the propagation channel impulse response with a maximum bandwidth of 2 GHz in the 26 GHz frequency range. The bandwidth can be extended up to 2 GHz in UWB configuration. Up to 1 antenna can be connected to the channel sounder for the analysis of multiantenna technologies. The receiver digital part is based on a 1 Gs/s digitizer with 26 Mb embedded memory. The large memory capacity enables high measurement rates (s) without limiting the maximum number of measurement points (32768). RF and digital parts have been integrated into a VXI system. VXI systems are well suitable for the design of measurement prototypes by providing useful facilities (power supply, fan cooling, data bus, and trigger) [C1176]

"Wideband Propagation Channel Parameters Measurement Inside an University Building"

Contemporary communications are predominantly wireless. Wireless systems propagation parameters are greatly influenced by multipath fading, even more so in an "indoor" environment. Theoretical parameters commonly used for describing multipath are coherence bandwidth and multipath delay spread. The goal of this paper is presentation of results of impulse response measurements in 2.4-GHz frequency band, conducted inside FESB building, using vector analyzer method. From the obtained channel impulse response delay spread was calculated, and the estimate of coherence bandwidth was made. Measurements were divided in four sets, each showing fair correlation of coherence bandwidth and delay spread results [C1177]

"Polynomial Fitting Approach for Wireless Signal Field under Power Lines in Taiwan Railway"

The purpose of this paper is to research wireless systems for the message communicated to trolleys and level-crossings under power lines. The purpose used with wireless communication, linked with level-crossings, and uses the radio propagation to dispatch message from the wireless facilities to the trolleys along Taiwan railway when the urgent situation is taken place or the emergency button is pushed by passersby to permit the train driver to practice the critical situation previously. The results for static and dynamic measurement of this wireless system, concerned with the level-crossing and the trolley, is able to offer an improved assignment regulation. In order to estimate the wireless signal field, we perform some practical measurements under power lines, then use the polynomial approximation to verify the wireless signal field, therefore we create a optimal propagating model for Taiwan railway from Tainan to Fangliao separated by Western Line, Pingtung line, and Kaohsiung city line respectively [C1178]

"An Adaptive Location Estimator Based on Kalman Filtering for Dynamic Indoor Environments"

This paper presents algorithms for calibrating and tracking the location of a mobile terminal based on radio propagation modeling (RPM) and Kalman filtering for indoor wireless local area networks (WLANs). In this Kalman filter-based (KF-based) tracking algorithm, the observed location information is extracted from the empirical and RPM positioning methods. Not only can the proposed RPM algorithm calibrate the change of different environmental conditions in a real dynamic environment but also the KF-based tracking algorithm can reduce the location error with smaller sampling time and vanquish the phenomenon of the aliasing in the signal space. Our experimental results show that more than 90 percent of the estimated locations have error distances less than 2.3 meters. [C1179]

"Evaluation of a Tunnel Ground to Train UWB Communication"

This paper considers the use of the UWB radio technology for railway signalization. UWB potentially offers simultaneous ground to train communication, train location and obstacles detection using basically the same radio technology. This paper concentrates on the communication issue. It theoretically starts an evaluation of the performances of such UWB signals propagating into a railway tunnel. The first part of this paper presents some conventional UWB waveforms that could be used to propagate efficiently into a railway tunnel environment. A second part develops the propagation model used in order to simulate the frequency selective tunnel channel propagation. A third part presents the effect of this frequency selective tunnel propagation on these original waveforms. Considering different modulation schemes, some receiving performances are then analyzed. [C1180]

"Radio Link Characterization using Real Antenna Integration Scenarios for UWB Consumer

Electronic Applications"

The radio link performance of short range but high data rate UWB systems is affected by both the antennas and the channel. Both aspects have been widely investigated in related literature. With respect to the antenna it is often the goal to minimize the ringing to affect less the impulse radiation. Unfortunately, in most studies the antenna integration into the chassis of the specific application is not taken into account. Investigations in this paper show that the integration significantly affects e.g. the ringing of the antenna. In order to investigate the impact of this degradation on the radio link between different applications like DVD player and PDA in a typical indoor environment propagation modeling is performed. The results show that the delay spread of the channel dominates the performance of the entire radio link. The increased ringing due to the antenna integration adds only minor to the overall performance. [C1181]

"ESPARSKI: Encryption Scheme Parasite Array Radiator Secret Key Implementation"

This paper presents a novel physical-layer approach to information security. Unlike conventional mathematical-based encryptors, a secret key is generated from a natural phenomenon, i.e., the multi-path fading of a radio wave. The reciprocity in wave propagation is exploited to share the key with a party on the air. An array of electronically steered parasitic radiators provides time variation in the faded amplitude. This variation exhibits strong spatio-randomness which can never be practically solved by any other party. We show proof-of-concept experiments carried out in an actual indoor environment. [C1182]

"Polarisation of Electromagnetic Waves Analysis for Application in Mobile Communication Systems"

The polarisation property of electromagnetic waves for applications in mobile communication systems has not been examined into detail yet. Due to multi-path effects and changes in the underlying coordinate systems of the involved antennas, the polarisation state of an electromagnetic wave at the receiving antenna of a mobile station is very likely to change. The presented project involves a data measurement and detailed visual investigation of these polarisation properties in the field of GSM mobile communication at the frequency band 1800 MHz. The measuring system mounted on a special car moves along a predefined trajectory around a GSM telecommunication cell. The collected data, which are received from a dual polarisation antenna, together with the information of the location, orientation and velocity of the system, which is provided by other sensors, is subsequently processed by the standard signal analysis hardware and the digital signal processing software, so that the polarisation behaviour of the received wave can be identified and visualized. The visualisation system is based on a digitized map into which the data received from GPS is inserted specifying the actual position of the measuring system. A particular polarisation state is simultaneously assigned to the position data in the digital map. The data analysis and signal filtering is performed to estimate multi-path propagation effects and to reduce the influence of them on the quality of the link. The results of this project could be for instance used in future generations of wireless mobile communication systems, where the polarisation dependent effects may contribute to increase reliability and capacity of the transmission service. This research was performed within the AMPER project, which is supported by the EU Commission. [C1183]

"Wave propagation models Comparison of prediction results with measurements"

Models that estimate diffraction effects on the propagation of radio waves over irregular terrain in the VHF and UHF bands available for digital TV applications will be used to predict field strengths that will be compared with those from the corresponding measurements. A basis for comparison between predictions and experimental data was obtained from a special measurement series performed by BFH-TI (Berne University of Applied Sciences, Engineering and Information Technology, Bienne, Switzerland) [1] to determine the height function of the received field strength. Thousands of path profiles and measurements are incorporated also into the ITU-R DBSG5 database. All these data (BFH-TI and DBSG5) will be described; the mean value and the standard deviation of the difference between measurements and predictions will be presented as functions of their number of main obstacles. [C1184]

"Average Probability of Bit Error of MPSK in Combined Flat Ionospheric Scintillation and Flat Fading Channels"

The performance of MPSK in combined scintillation and flat multipath fading channels for satellite mobile communication system is derived in this paper. The probability density function (PDF) of combined scintillation and small-scale fading signal is first expressed in terms of instantaneous signal-to-noise ratio (SNR) per bit, then average bit error rate of MPSK is computed numerically and compared with the simulation results [C1185]

"Joint Physical-MAC Layer Design Framework for Wireless LANs"

This paper proposes a joint physical-MAC layer design framework for estimating as well as improving the capacity of wireless LANs. The framework is based on the integration of radio propagation modeling(i.e., the physical layer) and the layer-2 network protocol (i.e., the MAC layer). The concept is to gather information of wireless channel conditions and share this knowledge with the MAC protocol, so that the network can operate efficiently even in the harsh interfering environments. The proposed framework is simple and easy to implement, and can be used for applications requiring large-scale wireless networks such as a campus-wide wireless LAN. In this paper the cross-layer design framework is described and two algorithms for the implementation of the framework are presented. [C1186]

"A Generic Channel Model For MIMO Systems"

In this paper, we propose a general scattering geometry-based channel model for the analysis and design of multiple-input multiple-output (MIMO) systems in mobile fading channels, which describes the propagation environment of wireless signals. According to this model, some important effects can be explained, such as polarization properties of the antennae, large delay and angle dispersion by propagation via far clusters, and the high -rank effect. Meanwhile, a formula can be deduced on the basis of this model to determine the channel transfer matrices and simulate the capacity as well. [C1187]

"Mobile Terminal Positioning via Power Delay Profile Fingerprinting: Reproducible Validation Simulations"

Non-Line-of-Sight and multipath propagation conditions pose significant problems for most mobile terminal positioning approaches. In contrast, power delay profile fingerprinting (PDP-F) thrives on multipath propagation. This multipath extension of T(D)oA is based on matching an estimated power delay profile from one or several base stations (BSs) (or other transmitters (broadcast, ...)) with a memorized power delay profile map for a given cell. With a single BS, an absolute time reference is required as for ToA. With multiple BSs, that requirement can be dropped as in TDoA. We propose a validation of PDP-F via simulations that can easily be reproduced. The multicellular environment consists of a big box in which multipath arises by reflection off the six sides. The resulting PDP depends on the positions of BS and terminal, the attenuation mechanism and the reflection coefficients of the six sides. We also propose an extension of the PDP-F (PSDP-F) taking into account spatial information available with an multi-antenna reception. PSDP-F can be considered as a multipath extension of the combined T(D)oA and AoA methods, without explicit requirement for antenna array calibration. [C1188]

"Transmit Antenna Selection of Dual Polarized MIMO Systems Applying SCM"

This paper designs a dual polarized channel utilizing the Spatial Channel Model (SCM), and investigates the performance for a certain environment. Using the proposed channel model; it is possible to estimate the channel capacity as a function of the cross polarization discrimination (XPD) and the spatial fading correlation. Through the channel characteristics, an algorithm using Eigen Value of channels is proposed to determine a transmit antenna configuration having the optimal capacity for the time varying propagation environments. [C1189]

"Measured Diversity Gains from MIMO Antenna Selection"

We investigate the diversity gain of MIMO systems with antenna selection in measured propagation channels for wireless personal area networks. We measure both the communication from an access point to a laptop, and between two handheld devices. Both the transmitter and receiver use antenna selection for diversity transmission and reception. We consider a closed-loop system where the transmitter has full channel state information, and analyze a number of different antenna selection algorithms and signal combining methods. We find that line of sight (LOS) and non-line of sight (NLOS) situations have fairly similar behavior, and that different polarizations result in similar SNR gains. We also find that RF-preprocessing of the signals is less effective for the hand held devices scenario than for the access point and laptop scenario. Finally, we compare bulk selection (same antenna subset is used for all frequency sub-channels) to per-tone selection (different antenna subsets can be used for each frequency sub-channel) for a wideband channel. [C1190]

"A Cell Planning Approach in Non-Isotropic Transmission Medium with the Capability of Supporting Cellular Networks Downsizing"

Radio propagation model when used in cell planning is normally assumed to be isotropic over the whole area under consideration. However, in practice, making such an assumption is idealistic since the environment and terrains are unlikely to be the same in all directions. In this paper, a heuristic approach to perform cell planning with the isotropic transmission medium assumption removed is first presented. Since the deployment of 3G networks will reduce the number of 2G GSM subscribers, we next look into a simple economic model to achieve

efficient design of downsized 2G cellular networks. We show how our proposed cell planning algorithm is useful in limiting the search space to obtain the new optimal base station configuration. [C1191]

"Performance of the multi-carrier LMDS system at the 28 GHz radio frequency band"

The millimeter wavelength local multipoint distribution system (LMDS) has been proposed as a wireless access solution for high speed data service distribution to homes and small businesses. In this paper, a low cost multi-carrier LMDS system operating at the 28 GHz radio frequency band is investigated. The system uses adaptive code modulation of OFDM at PHY layer and contention based collision avoidance at MAC layer. An efficient cross layer link adaptation control scheme is proposed to increase the system's efficiency, and to mitigate the effects of fading environment. The LMDS system performance is evaluated by mathematical analysis and numeric simulations. The purpose of this study is to create a framework for designing a robust, high data rate, low cost, and reliable millimeter wavelength wireless access system. [C1192]

"Radiative Energy Transfer Based Model for Radiowave Propagation in Inhomogeneous Forests"

This paper presents a radiowave propagation model for inhomogeneous forests based on the radiative energy transfer theory (RET). This model, which is a discretised version of the RET, is able to simulate the behaviour of radiowaves inside a forest which contains various kinds of vegetation and free space gaps. To do this, the forest is divided into non-overlapping square cells, each one with different propagation characteristics. The propagation properties of each cell rely on specific propagation parameters, which are extracted from the vegetation using an appropriate practical method which is also described in this paper. The model performance is assessed through comparison with directional spectrum measurements carried out in an isolated inhomogeneous forest at 11.2 and 40 GHz. [C1193]

"Comparison of Expected Performance on B3G Spread Spectrum Mobile Radio Links at 1.9 and 5.8 GHz Based on Propagation Measurements"

For planning purposes, there is a need for the evaluation of expected performance on mobile radio links in anticipated new frequency bands and comparison of results with 2 GHz band performance estimates evaluated by the same methods. To that end, this paper reports the application of a semi-analytical technique to estimate average binary phase shift keyed direct sequence spread spectrum mobile link error rates at 1.9 and 5.8 GHz from time series of channel response estimates derived from data recorded during propagation experiments with a 5 mchps pseudo-noise channel sounder. This work is unique, as the methods used incorporate the consideration of self interference as well as random channel variations based on direct analysis of the experimentally-determined channel response estimates, rather than simplified models for either the self interference or the channel variations. [C1194]

"Performance Analysis by Measurement Results in Operating 3G Network"

In this work, measurement results obtained by means of drive test with the aid of WCDMA TEMS tool for an operating 3G-UMTS network are shown. In particular, issues in the behaviour of active set dimensioning, event handling and power control loops have been analyzed. The results reveal that continuous monitoring of the different radio propagation conditions is desirable in order to adequately parameterize each one of the cells in the network. [C1195]

"Path Loss Models for IEEE 802.11a Wireless Local Area Networks"

Wireless local area networks (WLANs) based on IEEE 802.11a standard are deployed to provide network connectivity without being tethered off of a wired network. An accurate planning of indoor radio networks and/or the setup of localization procedures based on IEEE 802.11 requires the characterization of the propagation channel. Starting from experimental data obtained in the campus area of the University of Rome Tor Vergata we evaluated the parameters for different multi-wall (MW) like path loss models. The dependence of the channel model parameters on the tilting of the access points embedded antennas is also investigated. The developed channel models were used in a computer simulator for the optimal RF coverage inside the campus' buildings. [C1196]

"On Building Modeling for Multiple Diffraction Analysis in Urban Environments considering Spherical-Wave Incidence"

A study of the influence of building modeling when predicting the signal attenuation due to over-rooftop multiple diffraction in urban environments is presented. A straightforward formulation expressed in terms of uniform theory of diffraction (UTD) coefficients is used for the above-mentioned analysis assuming a spherical-wave

incidence over the array of buildings and considering the latter modeled as series of different representations such as knife edges, double knife edges, wedges and rectangular sections. The results clearly indicate the importance of an appropriate building modeling in obtaining realistic path-loss predictions in urban environments when multiple diffraction has to be considered. [C1197]

"3-Dimensional Interference Modeling for Cellular Networks"

Planning and optimizing the radio access layer of cellular networks always requires an accurate modeling or measurement of the interference patterns in the network, for almost all technologies. Traditionally, this analysis has been performed using 2-dimensional traffic forecasts, and measurements or propagation predictions performed at ground level. While this applies quite well in a non-urban environment, such an approach is very limited in city centers with many high- rise buildings, where interference affects a very large proportion of traffic above the ground level. We propose a new approach based on 3D modeling of an entire city, for both traffic and propagation data. This new approach, which optimally models in-building traffic and interference in a large-scale network, has been applied to the generation of a 3D interference matrix in Manhattan. We show how this 3D interference matrix can lead to optimal frequency planning, hence improved network performance, of a real TDMA-FDMA network. [C1198]

"Multiobjective QoS-Oriented Planning for Indoor Wireless LANs"

This paper describes an automatic wireless LAN access points planning approach based on a multicriteria modelling and solving. A realistic and efficient wLAN planning approach can not only assess usual objectives based on radio coverage. It has to further implement a Quality of Service (QoS) constraint. In this work, a QoS criterion is defined as the mean available bandwidth per user, derived from a Markov-based performance evaluation model of the medium access control (MAC) layer behavior. Optimizing both coverage and QoS objectives results in finding the optimal trade-off between these concurrent criteria. Rather than optimizing a weighted sum of the optimization criteria that provides a single solution, it is herein proposed to develop a dedicated multicriteria search algorithm. Its main feature is to provide several solutions, each one representing a peculiar tradeoff between the objectives. The planning process estimates for each solution the optimal number of APs and their placement. The AP's coverage is estimated with a powerful multi-resolution radio propagation simulator previously described. This paper presents results for a QoS oriented planning process providing a predefined minimum per-user throughput. The example provided herein applies for 200 users distributed over a 12600 m2building floor. [C1199]

"On the Occurrence of Dead-End Nodes in Geographic Forwarding"

In geographic forwarding routing for ad hoc packet networks, if the source of a data packet cannot reach the destination directly, it transmits to the neighbor that is closest to the destination. The process then repeats, terminating when the destination is a neighbor of the last repeater. However, delivery is not guaranteed even when a route exists, because forwarding fails at repeater nodes that are closer to the destination than any of their neighbors. Algorithms to bypass such local minimum nodes have been proposed by a number of authors, but are complex and may significantly increase the hop-count of the route whenever a local minimum node is encountered. We analyze the statistical properties of this event, and its relationship to other network parameters, for an ad hoc packet network whose nodes are points of a homogeneous Poisson process, and the wireless propagation channels exhibit attenuation with distance and log-normal fading. [C1200]

"BER Performance Comparison of Low Processing Gain TDD-CDMA System with Various Spreading Sequences in Mobile Fading Channels"

The bit-error-rate (BER) performance of low processing gain (PG) time division duplex CDMA (TDD-CDMA) system with joint detection (JD) multi-user detection (MUD) algorithms and different spreading sequences in dissimilar mobile radio propagation environments is compared in this paper. The sequences considered as spreading codes are maximum-length, gold, orthogonal-gold, random and Walsh-Hadamard sequences. The zero forcing-block linear equalizer (ZF-BLE), minimum mean square error-block linear equalizer (MMSE-BLE), zero forcing block decision feedback equalizer (ZF-BDFE) and minimum mean square error block decision feedback equalizer (MMSE-BDFE) JD algorithms are adopted in simulations. The mobile radio channels are rural area (RA), typical urban (TU) and bad urban (BU) channels. The result shows that under different propagation environments, the BER performance of each spreading sequence are different. The results obtained in this paper are very useful in the selection of sequence sets for TDD-CDMA system applications [C1201]

"Multipath Channel Influence Upon Probability Characteristics of Communication Subsystems of Radio Short-Range Navigation Systems"

Investigation of error-rate performance of available radio short-range navigation systems in conditions of multipath channel and investigation of ability to increase channel capacity at the expense of using phase modulated signals with older systems compatibility are described in this paper. Multipath propagation is the most essential for quality of receiving informational signal in point-point mode. Presence of several ways of propagation brings to interference of different rays at the receiving point. [C1202]

"Monte Carlo Simulation of Light Propagation Through the Troposphere for Free Space Optical Communication"

Monte Carlo simulation is a stochastic technique used to solve a variety of physical problems. In all applications of the Monte Carlo method, a stochastic model is constructed in which the expected value of a certain random variable is equivalent to the value of a physical quantity to be determined. In this paper Monte Carlo simulations were carried out for light propagation through the atmosphere at wavelength 0.785 mum which is chosen to fall inside transmission windows within the atmospheric absorption spectra. The simulation is based on the random walks that photons make as they travel through the atmosphere, which are chosen by statistically sampling the probability distributions for step size and angular deflection per scattering event. After propagating many photons, the net distribution of all the photon paths yields an accurate approximation to reality. There are some types of weather of the atmosphere that are chosen at which the simulation is held to determine the effect on the propagation of light. Several optical thicknesses were examined between 0.1 and 5, relevant to real atmospheric conditions. Results indicate that the heavy rain or a dense fog will completely stop the passage of optical-frequency radio waves through the troposphere. Therefore optical frequency radio waves will be used only in localities where the atmospheric precipitations are a rare occurrence [C1203]

"Fast Ray Tracing Propagation Prediction Model For Indoor Environments"

A fast brute force ray tracing method employed to analyze indoor radio communication environment. To speed up the numerical calculation, several improved techniques are applied. The achieved overall enhancement, measured by verification of obtained results for three indoor case studies. Significant improvements observed in terms of calculation time and estimated field strength values have good agreement with recorded measurements. [C1204]

"The Analysis and Simulation of Planar Spiral Antenna for Microwave Hyperthermia"

A new microwave hyperthermia antenna that isn't sensitive to neither its parameters nor fluctuation of the inputting frequency is presented in this paper. The finite element method was used to simulate the distributions of the electromagnetic fields and the specific absorption rate (SAR) of the Archimedes planar spiral antenna in phantom muscle tissues. The factors that affect the antenna performance including spiral wire's diameter, space of adjacent spiral circle and circle numbers are compared. [C1205]

"The Contribution of Distributed Scattering in Radio Channels to Channel Capacity: Estimation and Modeling"

A widely used radio channel model approximates the radio channel impulse response by a superposition of a finite number of propagation paths. Using the concentrated propagation paths model only, 30-100% of the variance in the measurement data can be explained, depending on the scenario. Therefore, it has been proposed to extend the data model by an additional component describing the distributed scattering of the radio channel. The model for the DMC is parameterized by three parameters, a base delay, the coherence bandwidth or delay-spread, and the attenuation factor of the dense multipath component. It is shown in this paper that the distributed scattering contributes significantly to the capacity of the MIMO-wideband radio channel. In fact it can be observed in channel sounding measurements that the distributed scattering can contribute more to the channel capacity than the concentrated propagation paths, depending on the scenario. [C1206]

"Polarimetric Temporal Decorrelation Studies by Means of GBSAR Sensor Data"

In this paper, a study of the temporal evolution of the elements of 3 x 3 covariance matrix using an X-band polarimetric ground-based SAR sensor is proposed. Although the heterogeneity of the scenario allows to select different target typologies, the study is mainly focused on the analysis of azimuthally symmetric distributed targets. The fluctuations of the most representative elements of [C] as a function of time and the decorrelation among the polarimetric channels are investigated. A relation with atmospheric parameters like temperature, humidity and wind is considered in order to make out the weight these parameters can influence the polarimetric signature of the observed area. [C1207]

"Study of the Influence of Vessel Motions and Sea-Ship Interaction on Classification Algorithms Based on Single-Pass Polarimetric SAR Interferometry"

This paper analyzes the worsening effects the sea surface can induce on vessel classification algorithms working with SAR imagery. Two issues will be tackled, the complex motion history of ships and the polarimetric scattering mechanisms generated by the sea-hull interaction. Both can modify the information that allows to infer the geometry of ships dropping the classification capability. The current analysis will introduce a new classification approach based on polarimetric SAR interferometry that presents a low sensitivity respect the main distortions caused by the sea surface. Simulated SAR images obtained from GRECOSAR, a SAR simulator of complex targets, will show trustworthy vessel classification almost independent on the environmental conditions could be possible for incoming system configurations as Tandem TerraSAR-X. [C1208]

"Rain Retrieval Performance of a Dual-Frequency Radar Technique with Differential Attenuation Constraint"

Assessments on the performance of dual-frequency (13.6/35.5 GHz) precipitation radar (DPR) rain retrieval techniques are performed through simple vertical rain profiles synthesized with arbitrarily defined and disdrometer-measured raindrop size distribution (DSD) data. A DPR inversion technique (DPR-IT) with the estimates of differential attenuation (DA), which used to resolve the path-integrated attenuation (PIA) information instead of relying on surface reference or iterative methods, is considered mainly for the analysis. Preliminary simulation results show that the DPR-IT with DA constraint can work as an independent way to extract the DPR PIA information, hence, the DSD parameters, especially in the regions of moderate to strong rainfall rates. [C1209]

"A Radio-Link Stability-based Routing Protocol for Mobile Ad Hoc Networks"

The dynamics of mobile ad-hoc NETworks (MANET), as a consequence of mobility of mobile hosts, pose the problem in finding stable multi-hop routes for effective communication between any pair of source and destination. In this paper, a novel stability-based ad hoc routing protocol is proposed, which considers both radio link affinity and route stability in MANETs. In the proposed protocol, which is named as ad-hoc on-demand stability vector (AOSV) routing protocol, a link/route stability estimation method and a novel path finding algorithm are developed to find out and maintain stable routes for dynamically required communications services in MANETs. A stochastic mobile-to-mobile radio propagation model is constructed for the estimation of the radio link stability as well as the stability of multi-hop route. With the awareness of stabilities of radio links and eligible routes in a MANET, the path finding algorithm is designed to explore the stable route with largest route stability for a given source and destination pair. The performance of AOSV is compared with the well-known ad-hoc on-demand distance vector (AODV) routing protocol. Simulation results indicate that the AOSV routing protocol leads to significant throughput increases by 5% to 68% improvement comparing to AODV. [C1210]

"Modeling RF Signal Propagation Along On-Chip Interconnects and the Effect of Substrate Doping with the Alternating-Direction-Implicit Finite-Difference Time-Domain (ADI-FDTD) Method"

The alternating-direction-implicit finite-difference time-domain (ADI-FDTD) method is used to analyze metal-insulator-semiconductor-metal interconnects by solving Maxwell's equations in the time domain. This analysis shows that the silicon substrate losses and the metal line losses can be modeled with high resolution. Our modeling method is supported by experimental data. We find that semiconductors readily operate in the slow wave mode and skin-effect mode for selected doping densities. The ADI-FDTD method is also applied to study the effect of epitaxial layers in different propagating modes. Simulation indicates that inserting epitaxial layers in highly doped substrates should help to keep the signal integrities and reduce substrate noise [C1211]

"Improved Rain Attenuation Correction Algorithms for Radar Reflectivity and Differential Reflectivity with Adaptation to Drop Shape Model Variation"

One important goal of the Collaborated Adaptive Sensing of the Atmosphere (CASA) Engineering Research Center is to observe and monitor hazardous weather events in the low troposphere (below 1 km) by deploying networks of small, low- cost radars with small antennas. The first generation of CASA radar networks with dual-polarization capabilities is being deployed in Oklahoma. To achieve good sensitivity with small antenna size, high frequencies (X-Band) are selected. It is well known that signals transmitted at such high frequencies suffer attenuation due to rain along the propagation path. This article describes improved rain attenuation correction algorithms which correct radar reflectivity (Zh) and differential reflectivity (Zdr.) through measured differential propagation phase (Phidp). [C1212]

"The Study ofASF Prediction Method in Irregular-Terrain"

As the potential of Loran-C in land vehicle tracking, and in marine and aeronautical navigation explored, the importance of employing accurate values of additional secondary factors (ASFs) is increasingly being recognized. A computer method that used to generate ASFs for irregular terrain is developed. In order to determine the prediction accuracy of the method in irregular terrain, during the summer of 2005, a series of tests were conducted in the selected area in Jiangxi Province. Using the set of ASF values obtained by the method above, the time delay correction errors of ground-wave propagation are reduced to less than 200 ns in the land. [C1213]

"WLC11-2: Propagation Channel Characteristics for Peer-to-Peer Multiple Antenna Systems at 300 MHz"

This paper presents results from the first double-directional measurements of the multiple-input multiple-output (MIMO) peer-to-peer radio channel in the 300 MHz frequency range. The measurements were performed with vertically polarized circular antenna arrays mounted on cars driving along a route in a semi rural and sub-urban environment. We evaluate the measurements with a high resolution algorithm, thus obtaining a wideband, double-directional characterization of the propagation channel. The delay- and directional spread, as well as the small-scale fading statistics are analyzed along the measurement routes and major scatterers are identified. The measurements, performed with low antennas heights, show high angular spreads, caused by reflections from trees and buildings and by diffractions over terrain irregularities. We further observe multiple clusters in both the delay and angular domains. The large spreads in these domains indicate a high degree of available diversity, and rich multipath in the considered environment. [C1214]

"WLC31-1: On Spherical vs. Plane Wave Modeling of Line-of-Sight MIMO Channels"

In this paper we consider pure line-of-sight multiple-input multiple-output channels employing uniform linear antenna arrays. We investigate the influence of exact spherical wave propagation modeling versus approximate plane wave propagation modeling on the properties of the channel matrix. Our earlier work on 2 times 2 systems is extended to include arbitrary MIMO dimensions. As before, when transmission distance increases, the properties of the spherical wave model converge to the properties given by the simpler plane wave model. The investigation results in a new tool which gives us analytical expressions describing when spherical wave modeling is necessary and when plane wave modeling is sufficient. The parameters of interest are the transmission distance, the frequency, and the array size, and the results show that the spherical wave model should be applied e.g. in some practical WLAN scenarios where plane wave modeling is commonly applied today. [C1215]

"WLCp2-06: Modelling the Likelihood of Line-of-Sight for Air-to-Ground Radio Propagation in Urban Environments"

The likelihood of line-of-sight (LoS) is an essential component in any radio channel model. It is particularly useful for radio network planning and urban coverage prediction. Empirical LoS models are hard to derive due to a strong dependency on local topology and the need for large measurement datasets. Since buildings are the major obstructions in a dense urban environment, we propose a new theoretical model to determine the LoS probability for air-to- ground channels based on local building geometry and knife-edge diffraction theory. The model takes into account key statistical parameters such as building height, building size, building coverage, street width and street angle distribution. The theoretical model is shown to agree well with ray tracing simulation results. The statistical parameters, such as mean building height, percentage of area covered by buildings (building coverage) and building density, can all be easily obtained for a specific location. We also derive equations for the likelihood of LoS for a direct slant path. These equations can be used in the analysis of air-to-ground channels. [C1216]

"Elimination of ionospheric multipath propagation effect for over-the-horizon radar"

In this paper, the mechanism and form of ionospheric multipath effect in skywave over-the-horizon radar has been described firstly. According to its various forms, a scheme based on validating region adaptive determination and energy-weighted data association in data processing algorithm has been proposed to eliminate the multipath effect, and its performance is evaluated simply. In an integrated simulation environment, elimination scheme is tested and verified. The simulation results and analysis are also given, and finally some valuable conclusions on practical application are drawn [C1217]

"Calculation o Radar Detection Range in the Condition of Evaporation Duct"

There are all kinds of factors can affect radar electromagnetic wave when it propagating in the atmosphere. They can result radar detect singularly and there will be a duct-propagation in the condition of evaporation duct. This paper describe how to getting refractive index section using meteorologic data and then get radar detection range in the condition of evaporation duct by propagation model and modified-radar equation. In the end of the paper, validate the way discussed by the experimentation in South China Sea [C1218]

"SAT04-2: Accurate and Novel Modeling of the Land Mobile Satellite Channel using Reversible Jump Markov Chain Monte Carlo Technique"

A key issue in the design of a mobile satellite communication system is an adequate knowledge of the statistical behavior of the propagation channel. To achieve this goal, the development of very accurate models plays a very important role. In contrast to traditional multi-state Markov chain based models, the novel approach proposed in this paper makes no prior assumptions on the number of states or on the statistical distributions characterizing each state. The sequence of channel states is blindly estimated using a reversible jump Monte Carlo Markov chain algorithm. [C1219]

"Geolocation for UWB Networks in underground mines"

Ultra wideband technology is regarded by many as one of the future key technologies in communications and positioning. Even though the basic principles of UWB have been studied for decades, there is still a great demand for research, especially in the field of precise local positioning. Techniques have to be further developed to cope with for example varying line of sight (LOS)/non line of sight (NLOS) or severe multipath conditions. In this paper we give an experimental measurement and modeling of ultra wideband radio propagation in underground mines for indoor geolocation. This work has been carried out by the underground communications research laboratory LRCS and the experimental mine CANMET (Canadian Center for Minerals and Energy Technology) in Val-d'Or, Canada. [C1220]

"Impact of Building Environment on the Performance of Dynamic Indoor Localization"

Location determination of mobile users within a building is challenging due to the complexities of the indoor radio propagation characteristics. For a RF based indoor system, a common practice is to construct a signal strength map table showing the radio signal strength at different known locations in the building. A mobile user's location at an arbitrary point in the building is then determined by measuring the signal strength at the location in question and determining the location by referring to the above map table using a LMSE (least mean square error) criterion. Much work has been done lately in the indoor radio propagation in order to automatically generate the signal strength map table according to the changing environment. This research is based on the ARIADNE indoor localization system with the purpose to analyze the impact of building structures and indoor furniture on the performance of the indoor localization. We provide a simple strategy to model these indoor structures, and we verify the methodology using a complex basement building. Experimental results indicate that up to 15% improvement in location estimation is achievable from the proposed method [C1221]

"Using New Material to Analyze the Effect of Ionospheric Disturbance on Short-wave Communication"

Various of abrupt physical phenomena of earth-atmosphere can bring various of irregular changes of ionosphere, and it make different influences on short-wave communication. In this paper, we use new test material to discuss the effect of ionospheric disturbance on short-wave communication. This new method is using Doppler shift curve of standard radio wave recorded by HF-Doppler detector. And at the end we point out that use selective-frequency system is a practical way to resolve the problem of long-distance short-wave communication. [C1222]

"WLCp2-11: On the Downlink Performance of Stratospheric Platform Mobile Communications Channel"

This paper considers the downlink performance of mobile communication channel based on a novel wireless infrastructure that is called stratospheric platforms (SPF). The SPF has been recently proposed as an alternative method for delivering mobile communication services such as IMT -2000 in parallel with cellular tower-based terrestrial system or satellite. Channel performance evaluation is now becoming a matter of urgency in the designing of communication link between the platform and mobile user. We first evaluate propagation characteristic in urban area in order to obtain propagation parameters in terms of path loss model and Rice factor. Due to their unique positioning, elevation and azimuth angle are considered as main parameter in SPF environment compared with terrestrial tower-based system. The propagation parameters are then used in order to evaluate downlink performance for IMT -2000 services served by the SPF. Different applications refer to

different information bit rate that is carried by IMT -2000 system are considered in the analysis. In all scenarios, downlink performance decreases as the service bit rate increases and it becomes worse when elevation angle lower than 40deg. [C1223]

"An Algorithm for Estimation and Tracking of Distributed Diffuse Scattering in Mobile Radio Channels"

Future wireless communication systems will exploit the rich spatial and temporal dispersion of the radio propagation environment. This requires new advanced channel models, which need to be verified by real-world channel sounding measurements. In this context the reliable estimation and tracking of the model parameters from measurement data is of particular interest. In this paper, we build a state-space model, and track the parameters of the distributed diffuse scattering component of the mobile radio channel using the extended Kalman Filter. The extended Kalman Filter is applied to capture the dynamics of the channel parameters in time and to reduce the computational complexity of the estimator compared to existing estimators. The proposed estimator can be combined with existing techniques for the estimation of specular/concentrated propagation paths, which are based on the maximum likelihood approach (SAGE/RIMAX) or the Kalman Filter. The performance of the algorithm is demonstrated using both simulated and measured data [C1224]

"Parametric Characterization and Estimation of Bi-Azimuth Dispersion Path Components"

In this contribution, we derive a probability distribution suitable for characterizing bi-azimuth (azimuth of arrival and azimuth of departure) direction dispersion of individual path components in the response of the propagation channel. This distribution belongs to the family of generalized von-Mises-Fisher distributions. The elements in this family maximize the entropy under the constraint that the expectations and correlation matrix of the directions are known. The probability density function (pdf) of the proposed distribution is used to describe the bi-azimuth power spectrum of individual path components. An estimator of the parameters of the pdf is derived and applied to characterize the spreads in both azimuth of departure and azimuth of arrival, as well as the correlation between both azimuths of individual path components. Preliminary results from an experimental investigation demonstrate the applicability of the proposed characterization in real environments [C1225]

"Comparison of ANN Based Models for Path Loss Prediction in Indoor Environment"

This work presents the results of the studies concerning the application of the neural networks to the propagation path loss prediction in indoor environment. The proposed models consist of a multilayer perceptron and a generalized regression neural network trained with measurements. The results of the prediction made by the proposed neural models show a good agreement with the measurements. [C1226]

"Trellis Shaping Techniques for Satellite Telecommunication Systems"

In recent years, satellite overlay networks have shown their potential for delivering multimedia content both to rural and urban environments. In the latter case, the adoption of terrestrial intermediate module repeaters (IMRs) is in order to close the link in non-line-of-sight propagation conditions, causing a severe increase of multipath propagation and consequent linear distortion, adding to the intrinsic non linear distortion of satellite links. Whenever the propagation channel for the user receiving the data can be known with good approximation at the transmitter, the application of precoding techniques can be considered as a feasible solution to counter channel dispersion. In this paper, trellis shaping (the combination of Tomlinson-Harashima precoding and signal shaping) is used along with predistortion techniques to increase the resilience to channel dispersion and non-linear distortion. Numerical simulations allow us to assess the robustness to nonlinear distortion of trellis-shaped signals. Different optimization goals are pursued by means of different trellis shaping metrics, including several novel ones. Improvements in performance are achieved with respect to the unshaped case [C1227]

"Performance of Channel Prediction Using 3D Ray-tracing Scheme Compared to Conventional 2D Scheme"

Channel prediction tools using ray-tracing scheme can be used to get information of communication channel instead of channel measurement. Three dimensional (3D) ray-tracing technique is known for the better accuracy compared to two dimensional (2D) ray-tracing. But it requires a lot of calculations, thus 2D simulation has been generally performed. This paper shows how precious 3D ray-tracing predicts the received power indoors compared to 2D one. For this work, wave propagation phenomena are analyzed using finite difference time domain (FDTD) method and the channel measurement data also will be offered as a standard of comparison [C1228]

"A Modeling for Radiowave Propagation of M/W bands in Microcells"

The propagation models can be classified either empirical or deterministic, otherwise a combination of them. In this work, the developed model for 8 GHz band in microcell is the combination of empirical and deterministic method. The model requires the environment database in terms of the distribution rate of buildings. In LOS, the received power mainly depends on direct wave, ground-reflect wave and building-reflect wave due to both side of the road. The direct and ground-reflect wave come from deterministic method and the building-reflect wave derives from empirical method. The developed model overcomes the complexity of an explicit mathematical expression and the accuracy limitations by the measurement method [C1229]

"Short- And Mid-Term Prediction Techniques Of Propagation Conditions From Weather Radar Observations. Application to resource management in SATCOM systems"

This paper discusses possible scenarios for inclusion of forecasting of rain fields in satellite communication system for the purposes of optimizing the use of layer 1 resources (EIRP, frequencies) [C1230]

"Statistical Properties of the Propagation Losses of the Radio Waves, Calculated by Okamura-Hata Models"

A dependence of the behavior of the transmitting antenna height h 1on a path length of the radio wave propagation was investigated. Probability distributions of the transmitting antenna height h1and a dependence of the behavior of the distribution parameters on a path length of the radio wave propagation were obtained [C1231]

"Iterative Reconstruction Method of Phase Distribution for A Phased Array Antenna with A Consideration the Ground Influence"

The iteration reconstruction method of phase distribution for an antenna current of a course airport beacon of landing system with a consideration the ground influence is considered. The main idea of this method is in measurements of amplitude only data in antenna's near field at the 13lambda distance on only one cylindrical surface, also taking into account the surface influence on a radio wave propagation [C1232]

"Advanced propagation models studied within SatNEx for adaptive satcom systems at Ka and Q/V bands"

The objective of this tutorial is to describe recent activities carried out in this field especially within the network of excellence SatNEx. In a first part, the temporal behaviour of the propagation channel is addressed thanks to the use of time series synthesisers. In a second part, it is shown how space variation of propagation impairments is described with the development of generators of rain attenuation fields. Then, the hot topic of the space-time variability of the propagation channel is introduced, which is the objective of actual work carried out within SatNEx [C1233]

"Experimental Small Scale Fading Results for Mobile Channels Over the Sea"

This study focuses on small scale characterization of sea propagation environments. Conducted measurements were used to extract results on the time dispersive and on the time variant nature of the channel. As concluded, power delay profile presents a singular, "spiky" shape. The delay parameters for line-of-sight propagation conditions are low, while in the absence of line-of-sight these values increase rapidly. Finally, the envelope distributions for direct and non-direct paths were studied in comparison with the commonly used Ricean and Rayleigh distributions [C1234]

"Wideband Directional Radio Propagation Channel Analysis Inside an Arched Tunnel"

To analyze the radio propagation channel inside a tunnel, a wideband directional measurement campaign was managed inside an arched tunnel which was constructed to be used for a highway. Using a wideband channel sounder equipped with a cylindrical dual polarized array at the receiver (Rx), the spatio-temporal characteristics of the received propagation paths could be estimated by means of a super-resolution estimation algorithm. The dominant scatterers are classified into 5 classes based on the structure of the tunnel as follows: ceiling, light-frames, walls, sidewalk or ground. The power contribution and cross polarization ratio for different Rx positions along the tunnel are compared [C1235]

"Design of the Digital Block of a Hardware Simulator for MIMO Radio Channels"

The aim of the regional research project SIMPAA2, which continues the former national research SIMPAA project, is the realization of a hardware simulator of MIMO propagation channels for UMTS and WLAN applications. The simulator must reproduce the behavior of the radio propagation channel, thus making it possible to test "on table" the mobile radio equipments. The advantages are: low cost, short test duration, possibility to ensure the same test conditions in order to compare the performance of various equipments [C1236]

"Statistical Modelling of Building Scatter in Metropolitan Cells at 20 and 40 GHz for Fixed Wireless Access Links"

For fixed wireless access systems in urban areas, reflection or scattering from building surfaces can cause propagation impairments and influence system planning, deployment and quality of service. This paper presents a statistical model for fixed radio links operating at microwave/millimeter frequencies and predicts the radiowave propagation characteristics. The model considers the underlying propagation modes, where buildings give rise to multipath due to reflection or scattering. In addition, the model accounts for the antenna properties, including relative height, orientation and radiation patterns. Measurement campaigns were conducted using both 20 and 40 GHz radio links set up in the university campus. The measured and prediction results conducted at 20 and 40 GHz were compared. Agreement between the statistical properties of narrowband measurements and those from simulations using the model are demonstrated [C1237]

"ANN Prediction Models for Outdoor Environment"

This paper presents the results of our studies concerning the applications of feedforward artificial neural networks to the propagation path loss prediction in outdoor environment. An error correction model is proposed, based on the combination between a theoretical model and a neural network. The performances of the proposed artificial neural network models are compared to the measured path loss values, based on the absolute mean error, standard deviation and root mean square error. Also, the proposed neural network models are compared to each other and to the COST 231-Walfisch-Ikegami [C1238]

"Throughput Improvement Via Smart Antenna and Link Adaptation Scheme for IEEE 802.11A Systems"

Propagation delay spread and inter-symbol interference impact the transmission performance of WLAN systems. This paper presents performance enhancement using beamforming techniques operated at the access point. The performance by using omni-directional, switched beam system and phase array system in an indoor office are analyzed and compared. Based on the IEEE 802.11a physical layer specification, numerical simulations indicate that adopting directional antennae at the access point can increase diversity gain in non-line-of-sight propagations channels, while the packet error rate remains below 10-2. Besides, this paper also presents a link adaptation algorithm, based on the Ricean k-factor and signal to noise ratio, for throughput enhancement in IEEE 802.11a systems. Simulation results show that the average throughput reaches 33.7 Mbps in the signal-strength-based conventional algorithm, but rises to 43.1 Mbps when adopting the proposed scheme [C1239]

"An Interference-free MIMO-CDMA system Spread with Orthogonal Complementary Code for Multipath Fading Scenarios"

To overcome the problem that the performance of traditional MIMO-CDMA system would degrade badly in frequency-selective fading channel conditions, a novel interference-free MIMO-CDMA system spread with orthogonal complementary (OC) code is proposed in the paper. The system utilizes a novel transmitter structure, which combines OC code spreading and spatial delay multiplexing technique. Therefore, only simple correlation operation is needed at the receiver to effectively resist interferences caused by multipath propagation effect, and maximum-ratio-combination (MRC) can be employed to further resist channel fading. The proposed system provides higher BER performance and lower hardware complexity, compared with traditional MIMO-CDMA system employing single-code spreading and VBLAST scheme. Mathematical expressions and theoretical analysis of the system are presented. Simulation results validate the perfect anti-interference properties of the proposed system [C1240]

"RF Isolated Real-Time Multipath Testbed for Performance Analysis of WLANs"

Real-time performance evaluation of WLANs is an extremely challenging topic. The major drawback of real-time performance analysis in actual network installations is a lack of repeatability due to uncontrollable interference and propagation complexities, which are caused by unpredictable variations in the propagation channel. This stresses a need for an RF test system that provides isolation from interfering sources while simulating a real-

time channel, thereby creating a realistic and controllable radio propagation test environment. In this paper we introduce a novel testbed for real-time laboratory performance evaluation of WLANs utilizing an RF isolated test system (Azimuthtrade Systems 801W) for isolation from interference and a real-time multipath channel simulator (Elektrobit PROPSimtradeC8) for channel emulation. A software protocol analyzer (WildPackets Airopeek NX) is used to capture data packets in the testbed. The relationship between the throughput and received power, under controlled propagation and interference conditions, is analyzed. We present practical models describing the throughput/power relationship for multirate IEEE 802.11b/g devices in different propagation conditions. [C1241]

"Experimental Investigations of Electromagnetic Wave Propagation in Seawater"

It is often preferable to avoid using divers to undertake sub-sea activities, the alternatives being autonomous or remotely operated robotic vehicles and manipulators. This will only be achievable if robust communications can be established through seawater. Presently for such sub-sea activities it is necessary to use acoustic modems, which are only capable of operating with data rates of up to 50kbs-1. Optical sensors can also be used but these rely on clear water and in many sea conditions propagation beyond 10m is not possible. This paper presents new experimental results for electromagnetic wave propagation through seawater at MHz frequencies. These frequencies would enable the use of high speed data rates, suitable for a wide range of sub-sea activities [C1242]

"Weak NLOS Channel Sounding"

A novel approach using differential reception and nulling interferometry is devoted to weak non line of sight (NLOS) signals measurement. Performed either in the spatial domain or in the spectral domain, this method can achieve line of sight (LOS) dimming, and then NLOS emphasis. This operation, tested in the millimeter band, is very relevant for applications requiring phase carrier measurement such as accurate indoor positioning [C1243]

"Characterization for Ultra Wideband Pulses Transmitting through a Lossy Dielectric Slab"

An efficient time domain technique on the basis of numerical inversion of Laplace transform and Prony's method is extended to the transient analysis of ultra wideband pulses transmitting through a lossy dielectric slab. The results obtained using this technique agree with those obtained using the FDTD technique, and are consistent with those published in the literature. Furthermore, the corresponding results for a large incident angle are provided, which cannot be generated with the previous approaches [C1244]

"On the Fading and Shadowing Effects for Wireless Sensor Networks"

Most ad hoc and sensor network research assumes idealized radio propagation models without considering fading and shadowing effects. Experimental results have shown that many well-designed protocols will fail simply because of fading and shadowing experienced in a realistic wireless environment. While fading and shadowing for radio propagation are well understood in wireless communication community, they are rarely studied in network level research for wireless sensor networks. This paper studies the fading and shadowing effects on the performance of different MAC protocols for wireless sensor networks. We show that fading and shadowing can have a significant influence on network performance. We study and compare network performance for three different systems: 1) a multi-channel CDMA system; 2) a pure CDMA system; 3) a contention based system. Through discrete event simulation (using ns-2), we show that the multi-channel CDMA system outperforms the pure CDMA system as well as the contention based system under fading and shadowing environments [C1245]

"On the validity domain of a hybrid FDTD/UTD method for indoor channel modeling"

Classical theories such as the uniform theory of diffraction (UTD) use analytical expressions for diffraction coefficients. These methods are widely used in radio communications to predict the channel behaviour. Indeed, they are very fast and applicable as long as the objects which interact during the wave propagation are canonical (dihedral for example) and much greater than the wavelength. For more complex and smaller scattering structures, rigorous methods as the finite difference time domain method (FDTD) is more suited. In this paper, we present an original approach, combining the advantages of these two complementary methods, in order to accurately characterise the propagation channel [C1246]

"Effect of Human Body Upon Line-Of-Sight Indoor Radio Propagation"

It is of importance to study the fading effects caused by the movement of human body, since these effects become particularly significant when characterizing short-range channels. This paper proposed a deterministic model to investigate the human motion upon line-of sight (LOS) link by using ray tracing technique in a indoor environment. The experimental procedure involves a set of continuous wave (CW) measurements in a corridor,

conducted at 10 GHz. A good agreement is achieved between the results of cylinder model and the measurement scenarios. The amplitude results show that human motion affects LOS link for close distance. The distance separating the walls and the obstacle also strongly influences the received signal [C1247]

"High Resolution Spatiotemporal Characterization of Electric Field Polarization for Indoor Wireless Environments"

The effects of the electric field polarization on the received power are investigated based on high resolution measurements of the indoor wireless channel. The results presented here were obtained using a channel sounding testbed, which was specially designed to study the radio propagation in the 5-6 GHz frequency band with high resolution in terms of angle-of-arrival (AOA) and time-of-arrival (TOA). Measurements were made at different indoor locations and the influence of the receiver surroundings on polarization cross-coupling was analyzed as a function of the azimuthal and elevation AOA. Significant cross-coupling was measured in locations where multi-paths arrive with oblique AOA with respect to the horizontal plane (thetas=90deg). The cross-polarization was characterized with high resolution in azimuth and elevation, which enabled the study of the spatial distribution of depolarized multipaths. The amount of power due to cross-polarized multipaths was estimated for a vertically polarized transmitter antenna located in different indoor environments. The advantages of using multi-element antennas and polarization diversity were made evident, as well as the importance of the relative location of transmitter and receiver and the 3-D distribution of the nearest scatterers [C1248]

"The Effect of Node Density and Propagation Model on Throughput Scaling of Wireless Networks"

This paper derives a lower bound of the form ngamma-1to the per-node throughput achievable by a wireless network when n source-destination pairs are randomly distributed throughout a disk of radius ngamma, 0 < gamma < 1/2 and propagation is modeled by an attenuation of the form 1/(1 + d)alpha, alpha > 2 [C1249]

"Measurement of the Speed of Upward Lightning Discharges"

This paper presents the results from the upward lightning discharge observations. The observations were carried out using the broadband interferometry system. A total of 24 upward lightning whose leaders were negatively charged were recorded during one-month observations in wintertime on the coastal area of Japan Sea. Speeds of main leader progression varied from 0.6times105m/s to 6.7times105m/s. These values are in good agreement with previous optical measurements. Speeds of branch leader progression varied from 0.7times105m/s to 5.6times105m/s. In general the speed of branch leaders was slightly slower than that of the main leader [C1250]

"Propagation of LF-MF Radio Waves over Mountain Terrains"

A method of calculation of an attenuation function of the ground wave field by means of generalized Feinberg's equation taking into account the mountain relief is considered. It is possible to calculate the electromagnetic field in the LF-MF range over extensive inhomogeneous paths with a "bad" conductivity. Predicting maps of geoelectric sections and topographical digital maps characterizing the terrain relief and different types of forests are the basis for attenuation function calculations [C1251]

"Study on the through-the-wall Propagation Characteristics of UWB Signal Waveform Distortion"

Investigating the propagation properties of ultra-wideband (UWB) is the essential topics in UWB channel theory. Based on Fourier transform theory, the distortion of various UWB impulse waveforms with indoor refraction is studied in this paper. A comparison of Fourier transform results with time-domain accurate results shows good agreements. Finally, Properties of pulse waveform distortion is analyzed [C1252]

"A Multipath Viterbi Data Association Algorithm with uncertain ionospheric state"

The tracking system of over-the-horizon-radars (OTHR) inevitably output multiple tracks for one target in radar coordinate because of serious multiple propagation modes. At the same time, great error is usually introduced for the uncertain of the ionospheric state. In this paper, a multipath Viterbi data association (MVUI) algorithm with uncertain ionospheric state is proposed, through modeling target movement in ground coordinate and implementing data association in radar coordinate so that Viterbi data association (VDA) is extended from association between measurement and track to association among measurement, propagation mode and track. The simulation results show that MVUI improves the tracking performance at low probabilities of detection [C1253]

"Multi-Keyhole MIMO Channels: Asymptotic Analysis of Outage Capacity"

Keyhole MIMO channels were predicted theoretically and also observed experimentally. However, they are not often encountered in practice since the assumption of a single propagation eigenmode is only a rough approximation of real propagation environments. To overcome this problem, the paper extends the single-keyhole channel model by introducing a "multi-keyhole channel", which includes a number of statistically independent keyholes. Correlated full-rank and rank-deficient multi-keyhole channels are considered in detail. It is shown that under some general conditions the full-rank multi-keyhole channel is asymptotically Rayleigh fading, if the number of keyholes is large. When the number of both Tx and Rx antennas is large, the asymptotic capacity of a rank-deficient multi-keyhole channel is a sum of the capacities of the equivalent single-keyhole channels. The outage capacity distribution of both full-rank and rank-deficient multi-keyhole channels is asymptotically Gaussian. Based on the asymptotic capacity analysis, full ordering scalar measure of MIMO channel correlation and power imbalance is introduced [C1254]

"Electromagnetic Simulation of UWB Propagation in Indoor Environments"

In this paper, an efficient ray tracing model is developed for ultra wideband (UWB) indoor environments. The ray tracing model is founded and used to simulate the propagation environment of a typical office. A time domain approach is used to determine all propagation paths. The time and spatial properties of the UWB channel are presented well by using ray tracing, which include RMS, distribution of ray energy and channel impulse response. Hence, the model is suitable to rapidly evaluate UWB channel characteristics in indoor environments with different input signals [C1255]

"Parallel OFDM Signal Generation for UWB Systems"

A parallel signal generation scheme for OFDM signals is presented. Conventionally, the generation of OFDM signals is implemented by computing an inverse discrete Fourier transform (IDFT). If the bandwidth is very large, as in ultra-wide band (UWB) systems, preferably integrated solutions are used to generate the communication signals. Additionally, the output of the IDFT is protected against multipath propagation effects with either a cyclic extension or zero-padding. The system described in this paper enables the implementation of a UWB OFDM signal on low complexity and low cost hardware by generating subband OFDM signals. We show that additional errors are introduced on the subband edges, however. A performance study in terms of symbol error rate (SER) has been conducted. The results show that similar SER performance is achieved when either using a highly integrated solution or our parallel signal generation approach [C1256]

"A Method to Enhance the Accuracy of Location Systems Based on TOA-Location Algorithms"

This paper proposes an effective and simple method to enhance the accuracy of location algorithm based on time-of-arrival (TOA) estimates between the source and the receivers. Mathematical statistics and geometry theories are applied to the proposed method. The enhanced TOA location algorithms with the proposed method can lower the measurement time or avoid complex iterated algorithm (e.g., Taylor-series estimation). That is, measurement time and computation complexity can be significantly reduced. Simulation results show that the accuracy of the location estimation can be enhanced by about 15 percent in line-of-sight (LOS) propagation and about 20 percent in non-line-of-sight (NLOS) propagation at best [C1257]

"Global Optimization for Multiple Transmitter Localization"

We propose a global optimization approach to locating multiple transmitters within a geographic area. A set of sensor nodes are assumed to be present in the region and to measure total power received at their respective locations. These measurements are communicated to a processing node, which uses particle swarm optimization to find the transmitter locations that minimize the difference between the true received power and the estimated power based on the chosen propagation model. Clustering is used to generate initial estimates of the transmitter locations, thereby increasing the likelihood that the particle-based optimizer reaches the global minimum. Simulation results show that global optimization is an effective method for multiple transmitter localization and that generating "smart" initial conditions via clustering can yield an average performance improvement of over 25% compared to random initial conditions [C1258]

"An Error Propagation Aware Algorithm for Precise Cooperative Indoor Localization"

Recently, node localization for sensor networks has attracted considerable attention for military application. Despite the recent proposals, the relationship between the channel behavior and the performance analysis of cooperative algorithms has not been addressed. The assumptions about the statistics of the ranging error used in the literature are either too general or overly optimistic. Additionally when sensors collaborate to localize each other, there is no attempt to characterize the error in the position of the nodes. This lack of error propagation-awareness can degrade the performance of an algorithm and create divergence problems. In this paper we first

introduce detailed modeling of channel propagation in indoor environments in the form of novel empirical path loss (PL) and distance measurement error (DME) models developed from the results of UWB channel measurements. Then we integrate these models in developing error propagation aware (EPA) precise cooperative localization algorithm that tracks the extent of the position error in each sensor node and its overall effect on subsequent multi-laterations. Finally we compare the algorithm against the Cramer-Rao lower bound (CRLB) [C1259]

"2.5D Extensions of the Frequency Domain ParFlow Algorithm for Simulating 802.11b/g Radio Coverage in Multifloored Buildings"

We have recently proposed an original 2D multi-resolution algorithm for solving a TLM-like formulation of the Indoor propagation problem. This approach is referred to as MR-FDPF (multi-resolution frequency domain parflow). In this paper, a fast and simple extension for predicting radio coverage in multifloored building is proposed. Because a full 3D is time consuming, three 2.5D schemes are investigated and compared. The accuracy of MR-FDPF is firstly assessed in a single floor configuration. Results exhibit a RMSE of about 3.5 dB, after an automatic calibration. Then 2.5D extensions are evaluated on a multifloored building. The more sophisticated one yields a RMSE of about 4.4 dB for the inter-level prediction. The potential of this approach and the obvious limitations when compared to a true 3D approach are discussed. [C1260]

"A Model for Radio Propagation Loss Prediction in Buildings using Parabolic Equations"

This paper presents a model for propagation loss prediction in indoor mobile communications using parabolic wave equation (PE). The implicit finite differences scheme of the Crank-Nicolson type is applied in order to get the solution of the parabolic equation. The propagation is considered in 15 deg in the direction paraxial. To validate this model, a measurement campaign was accomplished at a typical five floor building of a university using a frequency of 850 MHz. The loss predicted by this model had a mean error of 4.69 dB and standard deviation of 3.85 dB in relation to the measured data [C1261]

"Physical Modeling and Template Design for UWB Channels with Per-Path Distortion"

Recent experimental and physical modeling studies demonstrate that, as opposed to systems with smaller bandwidth, the ultra-wideband (UWB) channel exhibits frequency-dependent distortion of individual multipath components. This per-path distortion is particularly significant in outdoor UWB applications, where line-of-sight (LOS) or non-distorted reflected signals might not be available at the receiver (for example, in a canyon-like street). In these cases, the dominant propagation mechanisms involve shadowing (diffraction) and reflection by small objects (e.g. signs or a lamp-posts). In this paper, a physical model is developed to investigate the position-dependent distortion of the UWB pulse. The results indicate that both the shadowed pulse and the reflected pulse (by small objects with dimensions bounded by the wavelengths present in the signal) are distorted. Design of optimal and suboptimal templates for the correlation receiver are investigated. The UWB pulses that accommodate robust template choice given by the transmit pulse shape for all propagation conditions and satisfy the FCC spectral mask for outdoor channels are identified. Finally, we analyze the frequency-dependent propagation gain of the UWB channels in various outdoor conditions. This knowledge quantifies the potential benefits of adapting the transmitted signal to the dominant propagation mechanism [C1262]

"About a Electromagnetic Solitons Propertys by using Them in the Radiolocation"

The paper is devoted to using of a electromagnetic solitons in the radiolocation. Soliton's properties (preservation of soliton's form in the time of propagation in space) giving a location quality and reliability improvement for location in the radio- or optical (laser) frequency bands [C1263]

"Throughput and Coverage Analysis of a Multi-Element Broadband Fixed Wireless Access (BFWA) System in the Presence of Co-Channel Interference"

This paper uses a detailed site-specific channel model to analyze the impact of path loss and co-channel interference (CCI) in a multi-base station broadband fixed wireless access (BFWA) network. The base stations are deployed in an urban setting and make use of sectorised multi-element arrays to suppress CCI from other cells/sectors. Customer premises equipment (CPE) is mounted at rooftop level on a number of surrounding buildings. Spatially correlated multiple input multiple output (MIMO) channels are produced for each link using channel data generated from the ray-tracing model. The tool predicts MIMO correlation based on radiowave propagation and antenna array geometries. The paper considers the use of uniform linear arrays (ULA) and Uniform circular arrays (UCA) with a number of different element spacings. The results provide a unique insight

into the deployment of multi-element WiMAX networks in an urban setting. [C1264]

"Determination of the Existence of LoS Blockage and Its Application to UWB Localization"

The presence of a line-of-sight (LoS) blockage is one of the major causes of error for ultra-wideband (UWB) localization. LoS blockage degrades the accuracy of the time of arrival (ToA) estimation of the direct path signal by making the multipath structure complex. Furthermore, propagation through the obstructing material introduces excess propagation delay, which causes ranging errors. In this paper, a hypothesis test approach to determine the existence of a LoS blockage in UWB propagation is proposed. Once the non-LoS is identified, the maximum likelihood estimation (MLE) is used for ToA-based positioning. This ML localization algorithm is applied to a set of indoor propagation measurements made in an office building [C1265]

"A Regional HF Radar Pilot Product: Serving IOOS needs in the Mid-Atlantic Bight"

Surface currents are an integral component of the Integrated Ocean Observing System (IOOS) and High Frequency (HF) radar technologies provide the means to measure these data across regional scales. A national committee on surface current mapping, supported by OCEAN.US, has outlined an organizational structure for a national HF radar system. This plan separates the national system into regional centers responsible for the operation and maintenance of the network. Recently MACOORA, the Mid-Atlantic Coastal Ocean Observing Regional Association, identified HF radar as an important component of the coastal observatory. In the context of MACOORA and the regional landscape outlined in the IOOS plan, the HF radar operators from Cape Cod to Cape Hatteras have formed a consortium for the operation and maintenance of the HF radar network, including system hardware, data management, and product delivery. Through this consortium the existing pockets of systems can be operated as part of one regional network. This network consists of 11 long-range sites providing total vector coverage across a large majority of the region. Additional sites are proposed in Moriches, NY, Block Island, RI, and Martha's Vineyard, MA to completely fill in the shelf-wide coverage from Cape Cod, MA to Cape Hatteras, NC. In addition there are three higher resolution systems made up of 13 sites in operation in the Chesapeake Bay, New York Harbor, and Long Island Sound estuaries with plans for 2 more sites in Delaware Bay. This nested network makes the Mid-Atlantic Bight the most heavily HF radar instrumented region in the world. In addition to scientific research and education applications, the data has already been ingested into United States Coast Guard Search and Rescue planning tools. An overview of the network including existing products and system infrastructure will be discussed as well as plans for the continued operation and reliable product delivery supporting the regional IOOS mission. By leve--raging off national efforts like the Radiowave Oceanography Working Group (ROWG) for operation and maintenance and ROADNET for data management, the MACOORA HF radar consortium has moved from small groups of systems to a single integrated regional system, a model that could be scaled around the nation [C1266]

"Estimation of Time Delay and Ionosphere Parameters for Wideband Signal Reception"

Joint estimation of wideband signal time delay and ionosphere integral electron concentration is considered provided that a priory information is used and multiple accumulation measurement data is realized. The possibilities of the measurement devices syntheses and adaptive compensation of signal distortions are shown [C1267]

"Sensor Networking based on Two-Dimensional Signal Transmission Technology"

This paper introduces our project of sensor networking technology called two-dimensional signal transmission (2DST). 2DST is a new form of room-size communication, in which the signal energy is confined in thin sheets. The sheet is composed of a dielectric layer sandwiched between a conductive mesh and a continuous conductive layer, typically. Signals are sent by microwaves propagating in the two-dimensional sheet. The electrical power for the device operation is also transmitted by microwaves. The prominent feature of 2DST is that it can integrate a large number of sensor chips without electrical contacts and efforts of wiring. The simplicity of the structure enables us to form the sheet on the surfaces of various materials of walls, desks, floors, and even clothing. We already developed some types of non-contact connectors to the 2DST sheet for wide band signal transmission [C1268]

"NLOS Error Mitigation in a Location Estimation of Object based on RTLS Using Kalman Filter"

The real time locating systems (RTLS) based on a set of location access points (LAP) receiving radio frequency (RF) and associated computing equipment are models which determine the position of a transmitting device relative to the placement of the aforementioned receivers that is capable of reporting that position within several minutes of the transmission used for determining the position of the transmission. The RTLS has been widely applied in various areas such as parts replenishment, vehicle management, yard management, container

management and assert management. The most challenging issues which render to reach the required accuracy for the time-based location system are non line of sight (NLOS) propagation problems. The NLOS environment prevents a LAP from receiving RF signals from an RTLS tag. Namely, RTLS which tracks location by using time difference of arrival (TDOA) cannot exactly receive RF signals from an RTLS tag attached to the object. Therefore, the estimated location of an RTLS tag is different from a tag location. Accordingly, the Kalman filtering techniques are applied to RTLS to improve its accuracy. The Kalman filter is rather a recursive estimator than a batch estimator. Because, it gradually converges estimation by using a set of the estimated data one by one. We propose an location filter designed using the Kalman filter for location mitigation in an NLOS environment. We used the linear equation and the observation equation to apply this system to the Kalman filter [C1269]

"Extracting Precise (11/2-M) Tactical Positioning Data from LF Radio Transmissions"

This paper describes a series of low-frequency (LF) time-transfer measurements performed during 2005 to support the prototyping of a frequency-agile, programmable-bandwidth radionavigation system, the theater positioning system (TPS), which is being implemented for the U.S. Army to support soldier training and combat systems testing in GPS-denied environments such as dense forests and in urban terrain. The fundamental basis for the system is a spread-spectrum signal which is launched from multiple widely-spaced, generally terrestrial transmitters. The radiolocating receiver acquires these continuous, overlapping CDMA signals, decodes them, and extracts the transmitter locations and times of transmission from data streams embedded in the respective TPS signals. The radionavigation solutions are then obtained, but with downstream corrections for spherical-earth geometry and RF propagation corrections for the groundwave signals. The TPS signal structure is also specifically designed to provide an effective back-up navigation source to GPS in difficult reception situations and afford maximal rejection of power-line noise to improve reception in urban areas. A final feature of the TPS signals permits wide-area broadcasting of low-rate data for commands, DGPS corrections, status information, and the like. The prototype timing signals described in this paper were chosen from real clocks and transmitters at LORAN-C stations operating in the western U.S. With proper clock selection and configuration, and with a new optimization technique to reduce the long-term flicker noise in the LORAN propagation paths, the equivalent system errors reduced to about 1frac12 meters. This represents the timing-error component; positioning errors can be similarly reduced with appropriate calibrations. These results demonstrate performance nearly comparable to current GPS figures and confirm that TPS can be implemented with high accuracy and stability while maintaining independence from GPS an--d its vulnerability to jamming. This paper presents our prototyping method and discusses the application of these results to future TPS developments and other military and civilian navigation systems [C1270]

"The Power Delay Profile of the Mobile Channel for Above the Sea Propagation"

This study focuses on the power delay profile (PDP) of sea propagation environments. Sounding measurements were conducted for above the sea mobile propagation channels aiming at the extraction and characterization of the channel's PDP. As concluded, PDP presents a discontinouous, and "spiky" shape. Line-of-sight propagation generally resulted in very small delay parameters values. On the contrary absence of line-of-sight indicates an extremely frequency selective channel. Finally the variation of the delay parameters vs distance, as well as the relationship between delay spread and coherence bandwidth, were also studied. [C1271]

"Seismoionospheric Variations during the Earthquake in Pakistan (September 2005) as a Precursor of Seismic Events"

The results of the monitoring of the state of the ionosphere in the area of a strong earthquake in Pakistan (magnitude of 7,6), which occurred on 2005 8th October at 3:50:35.9 UTC are presented. The monitoring was conducted on the base of the satellite navigation system GPS data using GPS receivers for registration dual-frequency signals by several ground stations. The results of the monitoring performed 3-6 days prior to the coming earthquake revealed tendency to increase of maximum in electronic concentration and 1-3 days prior to the coming earthquake revealed significant (more than twice as much) decrease of the maximum value in electronic concentration at F2 layer of the ionosphere. The analysis of heliogeophysical situation, which carried out in the period of study showed that it was quiet. That is why observed changes in electronic concentration can be provoked by the impact of seismic activities in this region and they may be used as an earthquake precursor during the online monitoring of seismic hazard territories [C1272]

"Building Corner Scattering Prediction Using a UAPO Solution for the Diffraction Contribution"

A new approach for predicting the field diffracted by a building corner is here proposed. This last is considered as a right-angle junction of penetrable lossy slabs and its geometrical optics response is attained by extending the method developed by Burnside and Burgener for lossless slabs. The diffraction coefficient is obtained by

using a physical optics approximation of the equivalent surface currents densities induced by a plane wave normally incident on the corner and by performing a uniform asymptotic evaluation of the resulting radiation integral. [C1273]

"3D Channel Simulations Including Scattering from Non-Gaussian Rough Surfaces"

An original approach to characterize radio channel in indoor environments composed of rough surfaces is presented. It is based on algorithms developed for the image rendering field that are extended to the radio wave propagation. To simulate rough surfaces scattering, these algorithms need information about roughness. A possible solution consists of quantifying roughness by using statistical distributions of surface parameters, such as heights, slopes and local normals. In this paper, different theoretical statistical laws are presented and a fitting is realized with corresponding distributions of three real samples of wall roughcasts. For these cases, the best parameter to quantify the roughness is presented. Next, two algorithms which take roughness into account are detailed and compared with first results of channel simulations in indoor environments at 60 GHz. [C1274]

"Propagation Path Loss through the Urban Foliated Semi-confined Environment Using Parabolic Equations"

A model to predict the propagation path loss through the urban foliated semi-confined environment using parabolic equations (PE) is proposed. For the solution of PE the Crank-Nicolson an implicit scheme of finite difference is used. It is considered for this case the propagation in 15 deg to the paraxial direction. The model consists of an array of rectangles (representing the buildings) and an array of cylinders (representing the trunks of the trees). A campaign of measurements taken in an urban street enclosed by buildings and high trees at 890.4 MHz was carried out to validate the model. Numerical examples demonstrate the computational efficiency of the proposed method [C1275]

"Identification of Clusters in UWB Channel Modeling"

The Saleh-Valenzuela (SV) model is used for modeling UWB propagation by the IEEE 802.15.3a and 802.15.4a standardization groups. A key step for deriving the SV model from the measured channel impulse response is the identification of clusters. In this paper, we propose a method for the non-ambiguous identification of these clusters. Using measured results, we show that the SV parameters obtained using our methodology are consistent for different sets of measurements taken in the same environment. [C1276]

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