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ТЕМАТИЧЕСКИЙ РЕФЕРАТИВНЫЙ СБОРНИК № 5-1

“Doppler Effect”
(«Доплеровский эффект»)

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"Sampling of Spectrally Correlated Processes"

The problem of sampling continuous-time spectrally correlated (SC) processes is addressed. SC processes have Loeve bifrequency spectrum with spectral masses concentrated on a countable set of support curves in the bifrequency plane. This class of nonstationary processes extends that of the almost-cyclostationary processes and occurs in wideband mobile communications and spectral analysis with nonuniform spectral resolution. The class of the discrete-time SC processes is introduced and characterized. It is shown that such processes can be obtained by uniformly sampling the continuous-time SC processes. Sampling theorems are presented and sufficient conditions to avoid aliasing are provided. Applications are illustrated with reference to the problem of cross spectral analysis with nonuniform frequency resolution and the propagation of communications signals through MIMO multipath Doppler channels. [J1]

"Scattering and Doppler Spectral Analysis for Two-Dimensional Linear and Nonlinear Sea Surfaces"

Two-dimensional linear and second-order Creamer [Creamer (2)] nonlinear sea-surface models are combined with the second-order small-slope approximation method to comparatively study the electromagnetic scattering and the Doppler spectral characteristics from sea surfaces. Due to nonlinear hydrodynamics, the bistatic normalized radar cross section (NRCS) calculated from Creamer (2) surfaces is slightly larger than its linear surface counterpart for scattering angles departing from the specular direction, and the Creamer (2) surface backscattering coefficient increases as well for wind direction angles around upwind and downwind, whereas, for the crosswind direction, it is interesting to note that the observations are contrary. However, as was pointed out by Toporkov in a 1-D surface case, the effect of the nonlinear surface model on the average NRCS is minute. In particular, the Doppler spectra of the backscattered echoes are compared for the linear and Creamer (2) surfaces at various incident angles. It is seen, as expected, that the Doppler shifts and spectral widths of 2-D Creamer (2) surfaces exhibit different features compared with those of the linear surfaces, agreeing with the 1-D cases. However, for larger incident angles, the Doppler spectral broadening for Creamer (2) surfaces is not as severe as was reported in previous 1-D studies that used full Creamer model. The reason for this discrepancy appears to be the reduced nature of the Creamer (2) approximation. Moreover, studies of the Doppler characteristics for different wind directions demonstrate that nonlinear effects become weaker as the wind direction varies from upwind to crosswind. [J2]

"Maximum Likelihood Based Channel Estimation for Macrocellular OFDM Uplinks in Dispersive Time-Varying Channels"

Coherent modulation is more effective than differential modulation for orthogonal frequency division multiplexing (OFDM) systems requiring high data rate and spectral efficiency. Channel estimation is therefore an integral part of the receiver design. Two iterative maximum likelihood (ML) based channel estimation algorithms are proposed for OFDM uplinks in dispersive time-varying channels. The uplink multipath fading channel is modeled such that the channel state can be determined by estimating the unknown channel parameters. A second-order Taylor series expansion is adopted to simplify the channel estimation problem. Based on the system model, an iterative ML-based algorithm is first proposed to estimate the discrete-time channel parameters. The mean square error performance of the proposed algorithm is analyzed using a small perturbation technique. Based on a convergence rate analysis, an improved iterative ML channel estimation algorithm is presented using a successive overrelaxation method. Numerical experiments are performed to confirm the theoretical analyses and show the improvement in convergence rate of the improved algorithm. [J3]

"On High Performance MIMO Communications with Imperfect Channel Knowledge"

This paper compares the performance of a MIMO system applying a Mismatched Maximum Likelihood Detector (MMLD) with that applying a Generalized Likelihood Ratio Detector (GLRD) in the presence of channel

estimation errors. Two sources of error are considered: errors due to noise and errors due to time variations induced by Doppler effects. The MMLD relies on the available channel estimate whereas the GLRD combines the channel estimate with a block of received data and uses a joint channel-symbol estimation approach to solve for the transmitted symbols. The GLRD is shown to outperform the MMLD whenever errors in channel estimation are incurred and the performance gap depends on the amount of error. Furthermore, the GLRD provides a unified receiver structure which can also be applied to differentially encoded MIMO systems and to situation where no channel estimate is available as in blind MIMO. The improved performance of the GLRD comes with increased computational complexity. This problem is addressed through search efficient algorithms based on the branch-estimate-bound optimization framework. We analyze the performance of the GLRD and provide a tight upper bound on the BER of the system at high SNR. Simulation results are shown for a 2 Ч 2 MIMO system. [J4]

"Numerical Analysis of Effects of Measurement Errors on Ultrasonic-Measurement-Integrated Simulation"

Ultrasonic-measurement-integrated (UMI) simulation, in which feedback signals are applied to the governing equations based on errors between ultrasonic measurement and numerical simulation, has been investigated for reproduction of the blood flow field. However, ultrasonic measurement data inherently include some errors. In this study, the effects of four major measurement errors, namely, errors due to Gaussian noise, aliasing, wall filter, and lack of data, on UMI simulation were examined by a numerical experiment dealing with the blood flow field in the descending aorta with an aneurysm, the same as in our previous study. While solving the governing equations in UMI simulation, Gaussian noise did not prevent the UMI simulation from effectively reproducing the blood flow field. In contrast, aliasing caused significant errors in UMI simulation. Effects of wall filter and lack of data appeared in diastole and in the whole period, respectively. By detecting significantly large feedback signals as a sign of aliasing and by not adding feedback signals where measured Doppler velocities were aliasing or zero, the computational accuracy substantially improved, alleviating the effects of measurement errors. Through these considerations, UMI simulation can provide accurate and detailed information on hemodynamics with suppression of four major measurement errors. [J5]

"Bias Correction and Doppler Measurement for Polarimetric Phased-Array Radar"

This paper discusses ways to avoid and/or mitigate biases in polarimetric variables inherent to agile-beam planar phased-array radars. Two bias-avoiding schemes produce unbiased estimates of the polarimetric backscattering covariance matrix which are then combined into bias-free polarimetric variables. One concerns full polarimetric measurements and calls for adjusting the amplitudes and phases of the array elements so that the transmitted field equals that generated by a mechanically steered polarimetric weather radar antenna; this is followed by an additional adjustment of the received fields. The second scheme is also applicable to full polarimetric measurements but involves adjustments only of the received fields. Crucial to both schemes is decoupling of the Doppler effects from the terms of the covariance matrix. It is a significant part of the bias issue that had not been previously addressed. A scheme to reduce bias applicable to nondepolarizing media (i.e., diagonal backscattering matrix) is also addressed; it calls for multiplication of the fields received by each dipole as opposed to a combination of multiplication and addition required for full correction. The schemes are applied to the alternate transmission and simultaneous reception polarimetric mode and the simultaneous transmission and simultaneous reception mode. [J6]

"DOMUS: DOppler MUltiple-Scattering Simulator"

Multiple scattering (MS) strongly affects CloudSat's W-band cloud-profiling radar (CPR) reflectivity when the satellite is overpassing moderate and heavy precipitation systems. With the upcoming deployment of W-band Doppler radars in space-Earth Clouds, Aerosols, and Radiation Explorer's CPR in primis-and the goal of retrieving vertical motions within convective systems, there is an urgent need to assess the impact of MS onto the Doppler signatures. A Monte Carlo code capable of simulating the reflectivity enhancement due to higher orders of scattering has been extended to include the Doppler effects. This paper presents the main guidelines for the inclusion of the Doppler analysis into the Monte Carlo scheme. To our knowledge, this simulator is the first one capable of simulating realistic Doppler signals in the presence of MS. The case studies are first presented in uniform beam-filling conditions for the profiles extracted from a cloud-resolving model simulation of deep convection (i.e., 1-D profiles are used to characterize a stratified atmosphere). The simulations demonstrate that, at ranges where MS contributions affect the overall radar signal, two main features appear as the following: 1) The Doppler spectrum tends to broaden with increasing MS enhancement, adding up to the single-scattering (SS) Doppler fading due to the satellite motion; and 2) the mean Doppler of the backscattered signal departs from the mean Doppler determined by the combined effect of the vertical-wind and hydrometeor-terminal velocities at all range bins below the altitude where the MS contribution significantly overcomes the SS.

The simulator can be run in nonuniform-beam-filling conditions as well (i.e., a 3-D field is used to characterize the atmosphere at scales smaller than the radar resolution). With its cutting-edge capabilities, it provides a unique tool for the evaluation of the performances of the upcoming high-frequency spaceborne Doppler radars. [J7]

"Using Doppler Spectra to Separate Hydrometeor Populations and Analyze Ice Precipitation in Multilayered Mixed-Phase Clouds"

Multimodality of cloud radar Doppler spectra is used to partition cloud particle phases and separate distinct ice populations in the radar sample volume, thereby facilitating the analysis of individual ice showers in multilayered mixed-phase clouds. A 35-GHz cloud radar located at Barrow, Alaska, during the Mixed-Phase Arctic Cloud Experiment collected the Doppler spectra. Data from a pair of collocated depolarization lidars confirmed the presence of two liquid cloud layers reported in this letter. Both of these cloud layers were embedded in ice precipitation yet maintained their liquid. The spectral separation of the ice precipitation yielded two distinct ice populations: the ice initiated within the two liquid cloud layers and the ice precipitation formed in the higher cloud layers. The comparisons of ice fall velocity-versus-radar reflectivity relationships derived for distinct showers reveal that a single relationship does not properly represent the ice showers during this period. [J8]

"Focusing of Medium-Earth-Orbit SAR With Advanced Nonlinear Chirp Scaling Algorithm"

The signal processing of the medium-Earth-orbit synthetic aperture radar (SAR) is more challenging than that of the current low-Earth-orbit SAR because the imaging geometry is more complicated, and the range and azimuth variances are more severe. This paper deals with these imaging problems in three aspects. First, an advanced hyperbolic range equation (AHRE) is proposed for the first time, which is more precise for a spaceborne SAR than the conventional hyperbolic range equation (CHRE). Second, the point target spectrum based on the AHRE is analytically derived, which is useful for developing efficient SAR processing algorithms. Third, the well-known nonlinear chirp scaling (NLCS) algorithm is modified according to this new spectrum, and the so-called AHRE-based advanced NLCS (A-NLCS) algorithm is established. The simulation results validate the correctness of our method for L-band SAR systems at altitudes from 1000 to 10000 km with an azimuth resolution around 3 m. It is also shown that the A-NLCS algorithm has better performance than the CHRE-based algorithms in longer integration time cases. Therefore, we recommend the A-NLCS algorithm for a spaceborne SAR with a lower frequency, finer resolution, and higher satellite altitude. [J9]

"Laser Doppler Velocimetry for Two-Dimensional Directional Discrimination by Monitoring Scattered Beams in Different Directions"

2-D laser Doppler velocimetry without polarization discrimination, wavelength discrimination or frequency-shift discrimination is proposed. In the proposed velocimetry, scattered beams in different directions are monitored with two detection blocks in order to discriminate the direction of velocity. The principle of the proposed velocimetry is described and the discrimination of velocity direction is theoretically analyzed by simulation. The simulation result indicates that the direction of velocity can be discriminated by using the proposed velocimetry as well as the magnitude of velocity. [J10]

"Application of a Simple Adaptive Estimator for an Atmospheric Doppler Radar"

A simple method for estimating parameters of the Doppler spectrum of atmospheric signals is described. The method is based on an adaptive filter processing that has been widely used in telecommunications but rarely applied in measurements using atmospheric radars. The method has been tested using both synthetic and real data obtained by the radar profiler-Transportable Atmospheric Radar (TARA)-and the weather radar-International Research Centre for Telecommunications and Radar (IRCTR) Drizzle Radar (IDRA)-both developed by IRCTR. The method is compared with the traditional pulse-pair method and fast Fourier transform (FFT)-based methods, as well as with the IRCTR FFT-based method implemented in the TARA and IDRA processing including an additional noise clipping stage. The tests have demonstrated high efficiency of the adaptive filtering estimator under low signal-to-noise ratio conditions. The applicability of adaptive estimations in radar meteorology and the limitations associated with a sample length are discussed. [J11]

"Ground Moving Targets Imaging Algorithm for Synthetic Aperture Radar"

It is well known that the motion of a target induces range migration, especially for high-resolution synthetic aperture radar (SAR) systems. Ground moving target imaging necessitates the correction of the unknown range migration. To finely refocus a moving target, one must accurately obtain the motion parameters for compensating the target trajectory. However, in practice, these parameters usually cannot be precisely estimated. This paper

proposes a new imaging approach for ground moving targets without a priori knowledge of their motion parameters. In the devised method, the azimuth compression function is constructed in range frequency domain, which can eliminate the coupling effect between range and azimuth. Theoretical analysis confirms that the methodology can precisely focus targets without interpolation procedure. The effectiveness of the proposed imaging technique is demonstrated by both simulated and real airborne SAR data. [J12]

"Enhanced resonant magnetoelectric coupling in frequency-tunable composite multiferroic bimorph structures"

We report on a giant tunable enhanced resonant magnetoelectric (ME) coupling in multiferroic magnetostrictive/piezoelectric composite bimorph structures. The approach uses a magnetic/electric field assisted stress-reconfigurable resonance to produce frequency tuning of up to 100%. The studies were performed by laser Doppler spectroscopy. We also show that this principle of a continuously tuned resonance might be used to improve sensitivity for ME magnetic sensors. [J13]

"Ultrafast compound doppler imaging: providing full blood flow characterization"

Doppler-based flow analysis methods require acquisition of ultrasound data at high spatio-temporal sampling rates. These rates represent a major technical challenge for ultrasound systems because a compromise between spatial and temporal resolution must be made in conventional approaches. Consequently, ultrasound scanners can either provide full quantitative Doppler information on a limited sample volume (spectral Doppler), or averaged Doppler velocity and/or power estimation on a large region of interest (Doppler flow imaging). In this work, we investigate a different strategy for acquiring Doppler information that can overcome the limitations of the existing Doppler modes by significantly reducing the required acquisition time. This technique is called ultrafast compound Doppler imaging and is based on the following concept: instead of successively insonifying the medium with focused beams, several tilted plane waves are sent into the medium and the backscattered signals are coherently summed to produce high-resolution ultrasound images. We demonstrate that this strategy allows reduction of the acquisition time by a factor of up to of 16 while keeping the same Doppler performance. Depending on the application, different directions to increase performance of Doppler analysis are proposed and the improvement is quantified: the ultrafast compound Doppler method allows faster acquisition frame rates for high-velocity flow imaging, or very high sensitivity for low-flow applications. Full quantitative Doppler flow analysis can be performed on a large region of interest, leading to much more information and improved functionality for the physician. By leveraging the recent emergence of ultrafast parallel beamforming systems, this paper demonstrates that breakthrough performances in flow analysis can be reached using this concept of ultrafast compound Doppler. [J14]

"Effect of Phase Pattern of Antennas Onboard Flying Spin Satellites on Doppler Measurements"

The effect of the phase patterns of antennas onboard flying spin satellites on the Doppler measurements is reported. Phase patterns mean that there are deviations in wave fronts from perfect sphericity, expressed as a function of the angular position around the antenna. We analyzed what effect the phase patterns of dipole and patch antennas onboard two flying spin satellites, Rstar and Vstar, used in the Japanese lunar mission, SELENE (KAGUYA), had on 2-way and 4-way Doppler measurements, and detected higher harmonics in the spin frequency up to an order of 26 in the Doppler frequency. We developed a low-pass filter (LPF) using a Kaiser window, with the optimal parameters empirically determined, to remove the influence of phase patterns and to precisely conserve information on the lunar gravity field. We processed the 2-way and 4-way Doppler data of SELENE by using LPF. After using LPF, a high degree of accuracy of about 0.001 Hz was achieved for the 2-way Doppler measurements, and signals that reflected the gravity field on the far side of the Moon were first detected from the 4-way Doppler data. We also suggested a method for estimating the phase response of satellite antennas using the Doppler frequency variations. In order to estimate the Doppler frequency variation, a filtering technique was adopted to extract the harmonics of interest in the residual signal, from which the antenna phase pattern was derived. [J15]

"Effect of window reflections on photonic Doppler velocimetry measurements"

Photonic Doppler velocimetry (PDV) has rapidly become a standard diagnostic for measuring velocities in dynamic compression research. While free surface velocity measurements are fairly straightforward, complications occur when PDV is used to measure a dynamically loaded sample through a window. Fresnel reflections can severely affect the velocity and time resolution of PDV measurements, especially for low-velocity transients. Shock experiments of quartz compressed between two sapphire plates demonstrate how optical window reflections cause ringing in the extracted PDV velocity profile. Velocity ringing is significantly reduced by using either a wedge window or an antireflective coating. [J16]

"Analysis of photonic Doppler velocimetry data based on the continuous wavelet transform"

The short time Fourier transform (STFT) cannot resolve rapid velocity changes in most photonic Doppler velocimetry (PDV) data. A practical analysis method based on the continuous wavelet transform (CWT) was presented to overcome this difficulty. The adaptability of the wavelet family predicates that the continuous wavelet transform uses an adaptive time window to estimate the instantaneous frequency of signals. The local frequencies of signal are accurately determined by finding the ridge in the spectrogram of the CWT and then are converted to target velocity according to the Doppler effects. A performance comparison between the CWT and STFT is demonstrated by a plate-impact experiment data. The results illustrate that the new method is automatic and adequate for analysis of PDV data. [J17]

"Performance Bounds and Angular Resolution Limit for the Moving Colocated MIMO Radar"

To identify a target, the moving noncoherent colocated multiple-input multiple-output (MIMO) radar system takes advantage of multiple antennas in transmission and reception which are close in space. In this paper, we study the estimation performance and the resolution limit for this scheme in which each array geometry is described by the sample-variance of the sensor distribution. So, our analysis encompasses any sensor distributions, including varying intersensors distances or/and lacunar (missing sensors) configuration. As in the space-time MIMO model considered here the radar is moving, the target Doppler frequency cannot be assumed invariant to the target position/angle. The first part of this paper derives and analyzes closed form (nonmatrix) expressions of the deterministic Cramer-Rao lower bound (CRB) for the direction and the velocity of a moving target contaminated by a structured noise (clutter echoes) and a background noise, including the cases of the clutter-free environment and the high signal-to-noise ratio (SNR) regime. The analysis of the proposed expressions of the CRB allows to better understand the characterization of the target. In particular, we prove the coupling between the direction parameter and the velocity of the target is linear with the radar velocity. In the second part, we focus our study on the analytical (closed form) derivation and the analysis of the angular resolution limit (ARL). Based on the resolution of an equation involving the CRB, the ARL can be interpreted as the minimal separation to resolve two closely spaced targets. Consequently, the ARL is a key quantity to evaluate the performance of a radar system. We show that the ARL is in fact quasi-invariant to the movement of the MIMO radar. [J18]

"Track-before-detect procedures for low pulse repetition frequency surveillance radars"

In this study, the authors present a dynamic programming (DP)-based tracking-before-detect (DP TBD) procedure with reference to a low pulse repetition frequency (PRF) surveillance radar framework. In order to avoid non-linear transformation and meanwhile exploit the ambiguous Doppler information, which is eliminated in most of the literature, the authors model the target dynamics in the measurement coordinates defined by range and apparent Doppler. The target state evolutions in the range-apparent Doppler domain are considered as a hybrid system with the ambiguous number deemed as mode variable. Ambiguity number (or mode) transitions are modelled as state dependent. The authors present a DP TBD method for joint maximum a posteriori(MAP) estimation of the target trajectory in the range-apparent Doppler maps and the corresponding ambiguity sequence, both assumptions of known and unknown nuisance parameters (target power and noise variance) are considered. The detection and tracking performance of the proposed procedure are investigated under several system settings. The effect of the prior uncertainty of the nuisance parameters on the performance is also studied. [J19]

"Analysing and compensating the effects of range and Doppler frequency migrations in linear frequency modulation pulse compression radar"

The pulse compression and Doppler processing (PCDP) method has been extensively used to detect low-speed and uniform-speed targets in linear frequency modulation (LFM) pulse compression radar. However, the PCDP method is affected by range migration (RM) and Doppler frequency migration (DFM) when detecting high-speed and accelerating targets. In this paper, the authors analyse and quantify these effects, and obtain the relationships of the optimal number of pulses and the threshold number of pulses with RM and DFM. It shows that when the number of pulses equals its optimal value, the maximum output signal-to-noise ratio can be obtained; when the number of pulses is greater than its threshold value, the migrations should be compensated. Then the authors propose a method based on the scaling processing and the fractional Fourier transform to remove the two migrations. In the end, the authors give a target detection experiment to show that the proposed method can effectively compensate these migrations. [J20]

"Comparison of pulse subtraction doppler and pulse inversion doppler"

In this paper, a new Doppler technique based on pulse subtraction imaging (PSD) is described and compared with pulse inversion Doppler (PID). Combining a nonlinear contrast agent imaging technique with a Doppler process provides a tool for detecting motion of both contrast agents and tissues. This has potential in targeted imaging in which attached microbubbles need to be separated from moving ones and surrounding tissues. The results from both simulation and experiment show that PSD is able to differentiate bubble motion from tissue motion. For Doppler processing conducted at the fundamental frequency, the contrast-to-tissue ratio (CTR) in PSD was 3.3 (±0.4) times higher on average than PID at a mechanical index (MI) of 0.1. At the harmonic frequency, PID was shown to have a 3.1 (±0.4) times higher CTR than PSD. Overall, taken in their optimum processing conditions, PID has a CTR up to 1.9 (±0.4) times higher than PSD. The CTRs for both techniques have also been shown to increase with increasing MI. However, for the same axial Doppler resolution. PSD also allows less energy to be transmitted into the medium, which makes it less disruptive. The relative performances of PSD and PID in terms of the bandwidth of the imaging system are also discussed. [J21]

"Time resolved metal line profile by near-ultraviolet tunable diode laser absorption spectroscopy"

Pulsed systems are extensively used to produce active species such as atoms, radicals, excited states, etc. The tunable diode laser absorption spectroscopy (TD-LAS) is successfully used to quantify the density of absorbing species, but especially for stationary or slow changing systems. The time resolved-direct absorption profile (TR-DAP) measurement method by TD-LAS, with time resolution of mu s is proposed here as an extension of the regular use of diode laser absorption spectroscopy. The spectral narrowness of laser diodes, especially in the blue range (0.01 pm), combined with the nanosecond fast trigger of the magnetron pulsed plasma and long trace recording on the oscilloscope (period of second scale) permit the detection of the sputtered titanium metal evolution in the afterglow (ms). TR-DAP method can follow the time-dependence of the temperature (Doppler profile) and the density (deduced from the absorbance) of any medium and heavy species in a pulsed system. [J22]

"DataWare: Sea Clutter and Small Boat Radar Reflectivity Databases [JBest of the Web]"

In this issue, "Best of the Web" presents online radar reflectivity databases, which are free of charge to the international research community. Databases such as these are used for the characterization of interference (including noise, sea clutter and land clutter, among others) in radar systems, and the development of signal processing techniques that reduce the detrimental effects of this unwanted interference. The data can also be used for the development and evaluation of signal processing techniques aimed at detecting and tracking man-made objects by separating targets from interference based on Doppler and amplitude characteristics. These signal processing techniques include moving target indication (MTI), pulse-Doppler, space-time adaptive processing, track-before-detect (TkBD), and constant false alarm rate (CFAR) processing. [J23]

"Theory and Technology for Standard WiMAX Over Fiber in High Speed Train Systems"

In this investigation, we propose and investigate the standard WiMAX access in high speed railway (HSR) using radio over fiber (RoF) link. We also discuss the theory of mobile WiMAX at a target speed of 300 km/hr in simulation. We also analyze the effect of the Doppler frequency shift over HSR. The effective transmission fiber length in the WiMAX-RoF system was limited due to the time-division-duplex (TDD) protocol in the practical WiMAX. Thus, we also demonstrate the transmission limitation and performance of the standard WiMAX access in RoF link. The performances of throughput and packet loss at different fiber lengths are also investigated and discussed. Furthermore, a WiMAX-RoF field trial is also demonstrated based on a simple two RAUs RoF architecture. It was tested and measured in the SongShan tunnel of the Taiwan high speed railway (THSR). [J24]

"Integrated Laser Doppler Blood Flowmeter Designed to Enable Wafer-Level Packaging"

The authors propose a new sensor structure for an integrated laser Doppler blood flowmeter that consists of two silicon cavities with a PD and laser diode inside each cavity. A silicon lid formed with a converging microlens completes the package. This structure, which was achieved using micromachining techniques, features reduced optical power loss in the sensor, resulting in its small size and significantly low power consumption. Measurements using a model tissue blood flow system confirmed that the new sensor had high linearity and a wide dynamic range for measuring tissue blood flow. [J25]

"Electromagnetic scattering from wind blown waves and ripples modulated by longer waves under laboratory conditions"

Laboratory radar measurements at low grazing angle of long waves of different steepness in the presence of wind waves were examined. The radar cross-section (RCS) variation was found to agree closely with the

composite model. The effect of the orbital velocity of the long waves was observable in the Doppler spectra and could be used to determine the wave height; however, other aspects of the Doppler spectra could not be satisfactorily explained by the composite model. Electromagnetic (EM) scattering results were also generated using the Forward-backward code in conjunction with a two-dimensional hydrodynamic code that produced time-dependent wave profiles of long waves with wind blown ripples. The numerical results showed close agreement with the normalised RCS calculated from Bragg scattering theory, Г‚Вї0==В|2, but not with the composite model. [J26]

"Clutter modelling for space-time adaptive processing in airborne radar"

The presence of clutter can be highly detrimental to detection of targets in airborne radar systems. Space-time adaptive processing (STAP) attempts to alleviate the problem by exploiting angle-Doppler inter-relationships to suppress clutter. The requirements for modelling of clutter data that are suitable for the application of STAP are considered in this study. Examples of clutter generated using the ELMBAARC program in bistatic and monostatic applications are provided. Modelling of internal clutter motion is considered, together with its effect on the clutter domain in angle-Doppler space. Modelling of non-homogeneous clutter is also considered. [J27]

"Analysis of interpolated channel estimation for mobile OFDM systems"

In an OFDM system using pilots for channel estimation, time interpolation among pilots of different OFDM symbols is commonly used to improve the estimate. The estimated channel impulse response may be also windowed to further reduce noise and disturbances. However, for a transmission over a time-varying channel, suboptimal time interpolation, implemented with a filter having only a few taps not matched to the maximum Doppler frequency, degrades channel estimation. In this paper we provide an analysis of the effects of pilot time interpolation over time-varying channels. We show in particular that suboptimal time interpolation yields aliases in the estimated channel impulse response and we derive a closed-form expression of the aliasesГ‚Вї variance. As aliases can lead to an erroneous estimate of channel length and consequent errors in windowing, we propose a technique to detect aliases and correct the channel length estimate. Parameters of the detection techniques are optimized by an analysis that provides closed-form expressions of the false alarm and miss detection probabilities. Numerical results show the merits of the proposed techniques in a mobile transmission of the terrestrial digital video broadcasting standard (DVB-T). [J28]

"An Array Error Estimation Method for Constellation SAR Systems"

In practice, unavoidable array errors, consisting of phase and position errors, significantly degrade the performance of constellation synthetic aperture radar (SAR) systems. Therefore, methods are required to estimate these errors. In constellation SAR systems, the clutter spectrum components within a Doppler bin can be used as calibration sources with known directions. In this letter, it is observed that the steering vectors of the spectrum components in one Doppler bin are conjugate with those of the spectrum components in its contrary Doppler bin on condition that each SAR operates in side-looking mode and its nominal left coordinate is zero, which is easy to realize. We obtain a new phase error estimation method based on this observation. An array error estimation method, which estimates phase and position errors simultaneously, is proposed via combining the new phase error estimation method with the least squares method for estimating position errors. The advantages of the proposed method include its capability to directly estimate phase and position errors without joint iteration between the estimations of phase and position errors; thus, it performs well, while the conventional method behaves unstably because it may converge to a local optimal solution, when position errors are large. Furthermore, mathematical analysis indicates that the proposed method has less computational load. In addition, computer simulations show that it performs better than the conventional method. The only cost is that it employs twice as many Doppler bins as the conventional method does, which is endurable because there are numerous Doppler bins. [J29]

"Maximum Likelihood Angle-Doppler Estimator using Importance Sampling"

A new joint angle-Doppler maximum likelihood estimator (MLE) based on importance sampling (IS) is proposed. The IS method allows one to compute the maximum likelihood estimator in a computationally efficient manner. It is based upon generating random variates using an importance function which approximates the compressed likelihood function. The performance is very close to the Cramer-Rao lower bound (CRLB). The choice of the algorithm parameters, which will affect the estimation performance, is also addressed. With a reasonable parameter choice, even the angles/Dopplers for closely spaced sources can be accurately estimated, whereas conventional subspace methods fail. Comparison with some suboptimal methods demonstrates that the IS method produces better performance at low signal-to-noise (SNR) and/or a small number of snapshots. [J30]

"Multiuser MIMO Achievable Rates With Downlink Training and Channel State Feedback"

In this paper, we consider a multiple-input-multiple-output (MIMO) fading broadcast channel and compute achievable ergodic rates when channel state information (CSI) is acquired at the receivers via downlink training and it is provided to the transmitter by channel state feedback. Unquantized (analog) and quantized (digital) channel state feedback schemes are analyzed and compared under various assumptions. Digital feedback is shown to be potentially superior when the feedback channel uses per channel state coefficient is larger than 1. Also, we show that by proper design of the digital feedback link, errors in the feedback have a minor effect even if simple uncoded modulation is used on the feedback channel. We discuss first the case of an unfaded additive white Gaussian noise (AWGN) feedback channel with orthogonal access and then the case of fading MIMO multiple access (MIMO-MAC). We show that by exploiting the MIMO-MAC nature of the uplink channel, a much better scaling of the feedback channel resource with the number of base station (BS) antennas can be achieved. Finally, for the case of delayed feedback, we show that in the realistic case where the fading process has (normalized) maximum Doppler frequency shift 0 Г‚Вї F < 1/2, a fraction 1-2F of the optimal multiplexing gain is achievable. The general conclusion of this work is that very significant downlink throughput is achievable with simple and efficient channel state feedback, provided that the feedback link is properly designed. [J31]

"Investigation of Doppler Features From Wind Turbine Scattering"

We examine the Doppler features from wind turbine scattering through a series of model measurements. Both backscattered and forward-scattered data are collected in the laboratory at Ku-band from various wind turbine models undergoing rotation. The tested models include a 1:160 scale model turbine, a three-arm wire model, and a small wind turbine from Bergey Windpower with 2' blades. The findings from the wire turbine model are corroborated by simulations performed using the Numerical Electromagnetics Code (NEC). Detailed accounts of the physics behind the observed Doppler features due to multiple scattering, near-field effects, and blade-shape effects are reported. [J32]

"HFSW Radar Model: Simulation and Measurement"

High-frequency surface-wave (HFSW) radars are usually used to remotely measure oceanographic parameters. These systems can also potentially detect targets beyond the conventional microwave radar coverage. In this paper, the backscattered Doppler spectrum made up of the sea clutter, ship echoes, and the background noise has been modeled. Taking into account the propagation and the signal-processing effects, a range-Doppler image has been generated. This model can be used for different purposes like the (theoretical) evaluation of detection performance. This paper gives an overview of the theoretical elements for modeling the backscatter signal. The processing effects on the range-Doppler image and the time-evolving target signature are also introduced. Some of the simulated elements and the obtained range-Doppler images are compared with real data. Finally, from this model, the detection capabilities of HFSW radars are evaluated. [J33]

"Dual-frequency ultrasound imaging and therapeutic bilaminar array using frequency selective isolation layer"

A new ultrasound array transducer with two different optimal frequencies designed for diagnosis and therapy integration in Doppler imaging-based transcranial sonothrombolysis is described. Previous studies have shown that respective frequencies around 0.5 and 2 MHz are suitable for sonothrombolysis and Doppler imaging. Because of the small acoustic window available for transcranial ultrasound exposure, it is highly desirable that both therapeutic and diagnostic ultrasounds pass through the same aperture with high efficiency. To achieve such a dual-frequency array transducer, we propose a bilaminar array, having an array for imaging and another for therapy, with a frequency selective isolation layer between the two arrays. The function of this layer is to isolate the imaging array from the therapy array at 2 MHz without disturbing the 0.5-MHz ultrasound transmission. In this study, we first used a 1-D model including two lead zirconate titanate (PZT) layers separated by an isolation layer for intuitive understanding of the phenomena. After that, we optimized the acoustic impedance and thickness of the isolation layer by analyzing pulse propagation in a 2-D model by conducting a numerical simulation with commercially available software. The optimal acoustic impedance and thickness are 3 to 4 MRayl and Г‚Вї/10, respectively. On the basis of the optimization, a prototype array transducer was fabricated, and the spatial resolutions of the Doppler images it obtained were found to be practically the same as those obtained through conventional imaging array transducers. [J34]

"Saturation throughput analysis of WAVE networks in Doppler spread scenarios"

IEEE 802.11p, also known as wireless access in vehicular environment (WAVE), extends the applications of IEEE 802.11 to a fast fading vehicular communication environment. In WAVE systems, Doppler effect should not be ignored because of the high velocity of vehicles. Hence, in this paper the authors study the characteristics of

physical layer WAVE system in the presence of the Doppler spectrum, such as symbol error rate performance and inter-subcarrier interference power. The throughput performance expression of a WAVE system is derived theoretically, which is the function of the frame size, number of the nodes, transmission probability, frame error rate and Doppler spread. Based on the obtained expressions, the optimal frame size, transmission probability and the number of nodes supportable in the WAVE system are derived to evaluate the maximum throughput performance. Finally, to validate the analytical results, simulations have been conducted to show the effectiveness of the proposed scheme. [J35]

"Spectral Properties of Modulated Signal in the Doppler Domain in Urban Radio Channels With Fading"

We examine propagation of frequency modulated (FM) radio signals in the urban environments for different elevations of base station (BS) and mobile subscriber (MS) antennas, below and above the rooftops, based on the stochastic multi-parametric approach. We concentrate our attention on the spectral properties of signal power variations in the frequency domain and describe them based on the Doppler-spread spectrum of bandpass signal power. In the framework of the stochastic approach, the total signal power, the correlation function, the Ricean K-parameter of fading, and the scale of correlation of different spectral components of the modulated signal are analyzed. A practical aspect of relationship between the correlation scale of any two components of the FM signal and the coherent bandwidth of the urban channel with fading is examined via prism of special experiment. New effects of buildings' density and the elevation of BS antenna on above characteristics of the FM signal are examined numerically. It is found that, depending on various scenarios occurring in the urban scene, the buildings' density and the elevation of BS antenna can significantly distort the modulated signal within radio link with fading. [J36]

"Simulating the Multipath Channel With a Reverberation Chamber: Application to Bit Error Rate Measurements"

We illustrate the use of the reverberation chamber to simulate fixed wireless propagation environments including effects such as narrowband fading and Doppler spread. These effects have a strong impact on the quality of the wireless channel and the ability of a receiver to decode a digitally modulated signal. Different channel characteristics such as power delay profile and RMS delay spread are varied inside the chamber by incorporating various amounts of absorbing material. In order to illustrate the impact of the chamber configuration on the quality of a wireless communication channel, bit error rate measurements are performed inside the reverberation chamber for different loadings, symbol rates, and paddle speeds; the results are discussed. Measured results acquired inside a chamber are compared with those obtained both in an actual industrial environment and in an office. [J37]

"Eigen-based clutter filter design for ultrasound color flow imaging: a review"

Proper suppression of tissue clutter is a prerequisite for visualizing flow accurately in ultrasound color flow imaging. Among various clutter suppression methods, the eigen- based filter has shown potential because it can theoretically adapt its stopband to the actual clutter characteristics even when tissue motion is present. This paper presents a formative review on how eigen-based filters should be designed to improve their practical efficacy in adaptively suppressing clutter without affecting the blood flow echoes. Our review is centered around a comparative assessment of two eigen-filter design considerations: 1) eigen-component estimation approach (single-ensemble vs. multi-ensemble formulations), and 2) filter order selection mechanism (eigenvalue-based vs. frequencybased algorithms). To evaluate the practical efficacy of existing eigen-filter designs, we analyzed their clutter suppression level in two in vivo scenarios with substantial tissue motion (intra-operative coronary imaging and thyroid imaging). Our analysis shows that, as compared with polynomial regression filters (with or without instantaneous clutter downmixing), eigen-filters that use a frequency-based algorithm for filter order selection generally give Doppler power images with better contrast between blood and tissue regions. Results also suggest that both multi-ensemble and single-ensemble eigen-estimation approaches have their own advantages and weaknesses in different imaging scenarios. It may be beneficial to develop an algorithmic way of defining the eigen-filter formulation so that its performance advantages can be better realized. [J38]

"Characterizing the Impact of Moving Mode-Stirrers on the Doppler Spread Spectrum in a Reverberation Chamber"

A moving mode-stirrer in a reverberation chamber (RC) not only changes the field distributions within the reverberation chamber, but also causes a Doppler effect. In this letter, the Doppler spread spectrum of a received signal in a reverberation chamber is characterized according to the radius and rotational velocity of the mode-stirrers and TX antenna positions. [J39]

"Experimental Determination of the Sea Correlation Time Using GNSS-R Coherent Data"

The feasibility of the Global Navigation Satellite Signal Reflectometry (GNSS-R) techniques has been proven for remote determination of sea state. When using GNSS-R techniques, coherent integration time is limited by the correlation time of the surface under observation which, in the case of the ocean, depends on sea state. In this letter, a new technique to retrieve the sea correlation time at L-band using GNSS-R coherent data is presented along with experimental results. [J40]

"A new trapped ion atomic clock based on 201 Hg+"

High-resolution spectroscopy has been performed on the ground-state hyperfine transitions in trapped 201Hg+ions as part of a program to investigate the viability of 201Hg+for clock applications. Part of the spectroscopy work was directed at magnetic-field-sensitive hyperfine lines with Г‚ВїmF=0, which allow accurate Doppler-free measurement of the magnetic field experienced by the trapped ions. Although it is possible to measure Doppler-free magnetic-field-sensitive transitions in the commonly used clock isotope, 199Hg+, it is more difficult. In this paper, we discuss how this 201Hg+feature may be exploited to produce a more stable clock or one requiring less magnetic shielding in environments with magnetic field fluctuations far in excess of what is normally found in the laboratory. We have also determined that in discharge-lamp-based trapped mercury ion clocks, the optical pumping time for 201Hg+is about 3 times shorter than that of 199Hg+This can be used to reduce dead time in the interrogation cycle for these types of clocks, thereby reducing the impact of local oscillator noise aliasing effects. [J41]

"Micro-Doppler Effect Analysis and Feature Extraction in ISAR Imaging With Stepped-Frequency Chirp Signals"

The micro-Doppler (m-D) effect induced by the rotating parts or vibrations of the target provides a new approach for target recognition. To obtain high range resolution for the extraction of the fine m-D signatures of an inverse synthetic aperture radar target, the stepped-frequency chirp signal (SFCS) is used to synthesize the ultrabroad bandwidth and reduce the requirement of sample rates. In this paper, the m-D effect in SFCS is analyzed. The analytical expressions of the m-D signatures, which are extracted by an improved Hough transform method associated with time-frequency analysis, are deduced on the range-slow-time plane. The implementation of the algorithm is presented, particularly in those extreme cases of rotating (vibrating) frequencies and radii. The simulations validate the theoretical formulation and robustness of the proposed m-D extraction method. [J42]

"On-Body Diversity Channel Characterization"

Statistical analysis of the on-body diversity combined and branch signals are presented. The distribution of short-term fading envelopes of the branch and combined signals show that the fading environment for the on-body channels is Rician. The long-term fading best fits the log-normal distribution. The average best fit parameters are presented for short-term and long-term fading envelopes of the branch and combined signals. The Doppler spectra are also presented. Three different types of antennas were used and two on-body channels were characterized at 2.45, 5.8, and 10 GHz. [J43]

"Sparse Channel Estimation for Multicarrier Underwater Acoustic Communication: From Subspace Methods to Compressed Sensing"

In this paper, we investigate various channel estimators that exploit channel sparsity in the time and/or Doppler domain for a multicarrier underwater acoustic system. We use a path-based channel model, where the channel is described by a limited number of paths, each characterized by a delay, Doppler scale, and attenuation factor, and derive the exact inter-carrier-interference (ICI) pattern. For channels that have limited Doppler spread we show that subspace algorithms from the array processing literature, namely Root-MUSIC and ESPRIT, can be applied for channel estimation. For channels with Doppler spread, we adopt a compressed sensing approach, in form of Orthogonal Matching Pursuit (OMP) and Basis Pursuit (BP) algorithms, and utilize overcomplete dictionaries with an increased path delay resolution. Numerical simulation and experimental data of an OFDM block-by-block receiver are used to evaluate the proposed algorithms in comparison to the conventional least-squares (LS) channel estimator. We observe that subspace methods can tolerate small to moderate Doppler effects, and outperform the LS approach when the channel is indeed sparse. On the other hand, compressed sensing algorithms uniformly outperform the LS and subspace methods. Coupled with a channel equalizer mitigating ICI, the compressed sensing algorithms can effectively handle channels with significant Doppler spread. [J44]

"Assessment of arterial distension based on continuous wave Doppler ultrasound with an improved Hilbert-Huang processing"

A novel approach based on continuous wave (CW) Doppler ultrasound and the Hilbert-Huang transform with end-effect restraint by mirror extending is proposed to assess arterial distension. In the approach, bidirectional Doppler signals were first separated using the phasing-filter technique from the mixed quadrature Doppler signals, which were produced by bidirectional blood and vessel wall movements. Each separated unidirectional signal was decomposed into intrinsic mode functions (IMFs) using the empirical mode decomposition with end effect restraint by mirror extending algorithm, and then the relevant IMFs that contribute to the vessel wall components were identified. Finally, the displacement waveforms of the vessel wall were calculated by integrating its moving velocity waveforms, which were extracted from the bidirectional Hilbert spectrum estimated from the identified wall IMFs. This approach was applied to simulated and clinical Doppler signals from normal common carotid arteries (CCAs). In the simulation study, the estimated wall moving velocity and displacement waveforms were compared with the theoretical ones, respectively. The mean and standard deviation of the root-mean-square errors between the estimated and theoretical wall distension of the 30 realizations was 4.2 ? 0.4 ? m. In the clinical study, peak-to-peak distension was extracted in a subject and then averaged over 15 cardiac cycles, resulting in 603 ? 22 ?m. The mean and standard deviation of the CCA distension averaged over the experimental measurements of 12 healthy subjects gave the result of 620 ? 154 ?m. The clinical results were in agreement with those measured by using the multigate Doppler ultrasound and echo tracking systems. The results show that based on the CW Doppler ultrasound, the proposed approach is practical for extracting arterial wall peak-to-peak distension correctly and could be an alternative method for the vessel wall distension estimation. [J45]

"Noncoherent Capacity of Underspread Fading Channels"

We derive bounds on the noncoherent capacity of wide-sense stationary uncorrelated scattering (WSSUS) channels that are selective both in time and frequency, and are underspread, i.e., the product of the channel's delay spread and Doppler spread is small. The underspread assumption is satisfied by virtually all wireless communication channels. For input signals that are peak constrained in time and frequency, we obtain upper and lower bounds on capacity that are explicit in the channel's scattering function, are accurate for a large range of bandwidth, and allow to coarsely identify the capacity-optimal bandwidth as a function of the peak power and the channel's scattering function. We also obtain a closed-form expression for the first-order Taylor series expansion of capacity in the infinite-bandwidth limit, and show that our bounds are tight in the wideband regime. For input signals that are peak constrained in time only (and, hence, allowed to be peaky in frequency), we provide upper and lower bounds on the infinite-bandwidth capacity. Our lower bound is closely related to a result by Viterbi (1967). We find cases where the bounds coincide and, hence, the infinite-bandwidth capacity is characterized exactly. The analysis in this paper is based on a discrete-time discrete-frequency approximation of WSSUS time- and frequency-selective channels. This discretization takes the underspread property of the channel explicitly into account. [J46]

"Carrier Frequency Offset Estimation for OFDM Systems Over Mobile Radio Channels"

In this paper, a new technique is proposed for blind estimation of carrier frequency offset (CFO) in wireless orthogonal frequency-division multiplexing (OFDM) systems with constant-modulus constellations. The proposed scheme is based on the assumption that the channel slowly changes in the time domain with respect to the OFDM symbol duration. As a consequence, the channel effect on a given subcarrier in two consecutive OFDM symbols is approximately the same. Based on this assumption, a cost function is derived such that the power difference between all subcarriers in two consecutive OFDM symbols is minimized. Using Monte Carlo simulation, we demonstrate that the proposed scheme has superior performance in both static and time-varying frequency-selective fading channels. The proposed system can rapidly and accurately estimate the CFO using only three trial values, given that the CFO is less than half of the subcarriers' frequency spacing. [J47]

"ISAR Imaging for Avian Species Identification With Frequency-Stepped Chirp Signals"

Imaging an avian target by inverse synthesis aperture radar (ISAR) is a novel and important technological approach of solving the problem of avian detection. However, the ISAR images of birds obtained with the conventional range-Doppler algorithm could be contaminated due to serious micro-Doppler effects, which are generated by the birds' flapping wings. In this letter, a novel imaging method of birds is proposed, which is simple to comprehend and operate, and avoids lots of complications and computation burdens. In the method, the moving status of bird is identified first via finding the variety of moving average values of the cross-correlation coefficient of the adjacent high-resolution range profiles. The usage of moving average values is attributed to the characters of the bird's flapping. The parts of respective flapping spectrogram can then be eliminated, and the parts of the residual spectrogram, i.e., the respective gliding spectrogram, can be connected

to prepare for the cross-compression. In this letter, the minimum waveform entropy criterion and genetic algorithm are employed in the spectrogram connection to compensate the phase error. Finally, the feasibility and effectiveness of the methods are verified by simulation results. [J48]

"ISAR Imaging of Maneuvering Targets Based on the Range Centroid Doppler Technique"

A new inverse synthetic aperture radar (ISAR) imaging approach is presented for application in situations where the maneuverability of noncooperative target is not too severe and the Doppler variation of subechoes from scatterers can be approximated as a first-order polynomial. The proposed algorithm is referred to as the range centroid Doppler (RCD) ISAR imaging technique and is based on the stretch Keystone-Wigner transform (SKWT). The SKWT introduces a stretch weight factor containing a range of chirp rate into the autocorrelation function of each cross-range profile and uses a 1-D interpolation of the phase history which we call stretch keystone formatting. The processing simultaneously eliminates the effects of linear frequency migration for all signal components regardless of their unknown chirp rate in time-frequency plane, but not for the noise or for the cross terms. By utilizing this novel technique, clear ISAR imaging can be achieved for maneuvering targets without an exhaustive search procedure for the motion parameters. Performance comparison is carried out to evaluate the improvement of the RCD technique versus other methods such as the conventional range Doppler (RD) technique, the range instantaneous Doppler (RID) technique, and adaptive joint time-frequency (AJTF) technique. Examples provided demonstrate the effectiveness of the RCD technique with both simulated and experimental ISAR data. [J49]

"Equivalence Analysis of Accuracy of Geolocation Models for Spaceborne InSAR"

There are two main geolocation models for spaceborne synthetic aperture radar (SAR) interferometry (InSAR): range Doppler (RD) and direct geocoding (DG) models. The RD model gets the target position by combining and solving the Doppler equation, slant-range equation, and the modified Earth model equation. The DG location model gets the target position through its 3-D coordinates by the Doppler equation and two slant-range equations. Usually, the geolocation accuracy analyses of these two models are discussed separately. It is confused which one is more precise and we should use during InSAR system designing. This paper deduced and compared the geolocation accuracies of these two models in the same frame-matrix. According to the matrix theory, the explicit expressions of the geolocation uncertainty of RD and DG models were deduced through the use of parameters in matrix form. After defining a new slant-range plane coordinate system, the precision of RD geolocation model and that of geocoding location model were compared quantificationally. It was presented that the geolocation uncertainty formulas between RD and DG models were the same. Then, the conclusion that these two models would lead to the same precision in geolocation measurement was obtained. At last, computer simulation results were employed to confirm the mathematical analysis. [J50]

"On the Doppler Spreading Effect for the Range-Instantaneous-Doppler Technique in Inverse Synthetic Aperture Radar Imagery"

Inverse synthetic aperture radar (ISAR) is an all-weather radar technique which may generate high-resolution images of noncooperative targets. The standard range-Doppler algorithm (RDA) is usually employed for image generation. However, the images obtained with RDA are usually blurred because of the relative motion between radar and target. As a consequence, motion compensation techniques should be used to improve the imagery quality. The range-instantaneous-Doppler (RID) technique based on time-frequency transforms has been proposed for obtaining a sequence of focused ISAR images without the need of using motion compensation techniques. However, in this letter, it is clearly shown that the migration of the target scatterers in slant range indirectly induces Doppler spreading of the scatterers' point spread function in each of the ISAR images obtained by the RID technique. This Doppler spreading means blurring. It is important to highlight that the migration in slant range may be caused not only by the radial component of the translational motion but also by the rotational motion. The application of motion compensation techniques prior to the use of the RID technique allows us to mitigate the Doppler spreading, as shown here both for simulated and live data acquired by a high-resolution coherent radar. [J51]

"A New Slant-Range Velocity Ambiguity Resolving Approach of Fast Moving Targets for SAR System"

This paper describes an ambiguity resolving approach for slant-range velocity estimation which utilizes the wideband characteristic of the transmitted signal (multiple wavelengths). Based on the wavelength dual-wavelength radar data. Then, two effective approaches are introduced to focus the moving target no matter the Doppler ambiguity exists or not. The slant-range velocity is estimated by the number of azimuth cell displacements between the two focused images. Both imaging methods have different properties and

advantages. A performance analysis is made, and deleterious factors in practice are analyzed in detail. The effectiveness of the unambiguous slant-range velocity estimation approach is demonstrated with the use of simulated and real data. [J52]

"Response: The Case of Absence of Transverse Doppler Effect"

Measurements that were done have yielded a gamma factor due to the quantum-mechanical absorption of photons in the detectors, thereby transferring the mass of photons into the detectors. It is said that if reflectors were used instead of detectors, then no gamma factor would have been obtained. Hence, it has not been demonstrated in the comment that the equations of the relativistic Doppler effect had been misapplied. In fact, it seems that those equations may have been improperly applied in the comment. [J53]

"Cross-layer distributed joint power control and scheduling for delay-constrained applications over CDMA-based wireless ad-hoc networks"

In this paper, we propose a cross-layer distributed power control and scheduling protocol for delay-constrained applications over mobile CDMA-based ad hoc wireless networks. Herein, we propose a novel scheme where power control is employed to combat delay occurring on multi-hop wireless ad hoc networks via cross-layer information exchange. Based on that, a distributed power control and scheduling protocol is proposed to control the incurred delay as well as the multiple access interference (MAI). Unlike other previous work on power control and scheduling, we also investigate the impact of Doppler spread upon the system performance, and provide a robust system which employs a combination of power control, and coding/interleaving to combat the effects of Doppler spread by exploiting the time diversity when the Doppler spread gets large. Hence, our proposed approach can function appropriately over a wide range of channel conditions. [J54]

"Spectral efficient transmit diversity techniques without cyclic prefix for fading relay channels"

This paper proposes spectral efficient relay-assisted transmit diversity techniques, i.e., space-time and space-frequency block codes (STBC/SFBC), for single carrier frequency-domain equalization (SC-FDE). The proposed systems achieve spatial diversity over frequency selective channels in a distributed fashion without cyclic prefix (CP), which increases spectral efficiency of conventional relay-assisted systems. In practical mobile applications, the CP-less distributed STBC (D-STBC) SC-FDE suffers from the time selectivity of wireless fading channels, resulting in a deviation from the basic assumption of Alamouti codeword. In order to obtain a reliable performance over doubly selective channels, the CP-less D-SFBC SC-FDE and its efficient implementation are presented. Further, the performance of these two distributed SC transmissions is analytically compared over fast fading (i.e., time selective) environments. For evaluation of mean square error over fast fading channels, we present a channel model that captures the time-varying nature of wireless channels. It is shown through analysis that the CP-less DSFBC SC-FDE outperforms the CP-less D-STBC SC-FDE when there exists a severe Doppler spread. Timing synchronization and highly accurate channel estimation of the proposed systems are also addressed for practical implementations. Simulation results show that the proposed systems approach the lower bound of full-CP systems, thus increasing the spectral efficiency. [J55]

"On eigenmodes, stiffness, and sensitivity of atomic force microscope cantilevers in air versus liquids"

The effect of hydrodynamic loading on the eigenmode shapes, modal stiffnesses, and optical lever sensitivities of atomic force microscope (AFM) microcantilevers is investigated by measuring the vibrations of such microcantilevers in air and water using a scanning laser Doppler vibrometer. It is found that for rectangular tipless microcantilevers, the measured fundamental and higher eigenmodes and their equivalent stiffnesses are nearly identical in air and in water. However, for microcantilevers with a tip mass or for picket shaped cantilevers, there is a marked difference in the second (and higher) eigenmode shapes between air and water that leads to a large decrease in their modal stiffness in water as compared to air as well as a decrease in their optical lever sensitivity. These results are explained in terms of hydrodynamic interactions of microcantilevers with nonuniform mass distribution. The results clearly demonstrate that tip mass and hydrodynamic loading must be taken into account in stiffness calibration and optical lever sensitivity calibration while using higher-order eigenmodes in dynamic AFM. [J56]

"Size distributions of nanoscopic holes in Ti /h-BN and Ti/B nanocomposites"

Positron annihilation spectroscopy was employed for defect studies of "Ti"-based nanocomposites prepared by high-energy ball milling and consisting of Ti nanoparticles separated by hexagonal boron nitride (h-BN)or boron (B) additive. The size distribution of nanoscopic holes in nanocomposites was determined directly from

measurement of ortho-positronium (Ps) lifetimes. Chemical environment of defects was characterized using coincidence Doppler broadening. It was found that size of nanoscopic holes is reduced with increasing milling time in H2/Heatmosphere and also probability of Ps formation in holes decreases. At the same time the Ti content in the vicinity of holes increases. This can be explained by (i) increased intermixing of Ti particles with h-BNor B additive and by (ii) filling the nanoscopic holes with absorbed hydrogen. Analysis of obtained results showed that both these processes take place during milling of nanocomposites. In addition, it was found that the effect of filling the nanoscopic pores with hydrogen is enhanced in TiH2milled with h-BNor B in He atmosphere. Comparison of nanocomposites with h-BNand B additive showed that sufficiently long milling time leads to a similar size distribution of nanoscopic holes in Ti/h-BNand Ti/B, despite the fact that it differs substantially in the initial powders. However, density of nanoscopic holes in Ti/B is significantly lower than in Ti/h-BNnanocomposites. [J57]

"Compressive Estimation of Doubly Selective Channels in Multicarrier Systems: Leakage Effects and Sparsity-Enhancing Processing"

We consider the application of compressed sensing(CS) to the estimation of doubly selective channels within pulse-shaping multicarrier systems (which include orthogonal frequency-division multiplexing (OFDM) systems as a special case). By exploiting sparsity in the delay-Doppler domain, CS-based channel estimation allows for an increase in spectral efficiency through a reduction of the number of pilot symbols. For combating leakage effects that limit the delay-Doppler sparsity, we propose a sparsity-enhancing basis expansion and a method for optimizing the basis with or without prior statistical information about the channel. We also present an alternative CS-based channel estimator for (potentially) strongly time-frequency dispersive channels, which is capable of estimating the ??off-diagonal?? channel coefficients characterizing intersymbol and intercarrier interference (ISI/ICI). For this estimator, we propose a basis construction combining Fourier (exponential) and prolate spheroidal sequences. Simulation results assess the performance gains achieved by the proposed sparsity-enhancing processing techniques and by explicit estimation of ISI/ICI channel coefficients. [J58]

"Simulation and Analysis of Human Micro-Dopplers in Through-Wall Environments"

We present a simulation methodology for generating micro-Doppler radar signatures of humans moving behind walls. The method combines primitive-based modeling of humans with finite-difference time-domain (FDTD) simulation of walls. Realistic motions of humans are generated from computer animation data. The time-varying human radar cross section is simulated using the primitive-based prediction technique. The scattered returns of humans behind walls are then simulated by a hybrid of the human simulation model with the through-wall propagation data generated from FDTD. The resulting simulator is used to investigate the effects of walls of both homogeneous and inhomogeneous types on human micro-Dopplers. It is found that while through-wall propagation affects the magnitude response of the Doppler spectrogram in the form of attenuation and fading, it only introduces very minor distortions on the actual Doppler frequencies from the body parts. This is corroborated by measurement data collected using a Doppler radar, as well as by a point-scatterer analysis of refraction and multipath introduced by walls. [J59]

"MIMO Radar Using Compressive Sampling"

A multiple-input multiple-output (MIMO) radar system is proposed for obtaining angle and Doppler information on potential targets. Transmitters and receivers are nodes of a small scale wireless network and are assumed to be randomly scattered on a disk. The transmit nodes transmit uncorrelated waveforms. Each receive node applies compressive sampling to the received signal to obtain a small number of samples, which the node subsequently forwards to a fusion center. Assuming that the targets are sparsely located in the angle-Doppler space, based on the samples forwarded by the receive nodes the fusion center formulates an l1-optimization problem, the solution of which yields target angle and Doppler information. The proposed approach achieves the superior resolution of MIMO radar with far fewer samples than required by other approaches. This implies power savings during the communication phase between the receive nodes and the fusion center. Performance in the presence of a jammer is analyzed for the case of slowly moving targets. Issues related to forming the basis matrix that spans the angle-Doppler space, and for selecting a grid for that space are discussed. Extensive simulation results are provided to demonstrate the performance of the proposed approach at difference jammer and noise levels. [J60]

"Comment on "The Case of Absence of Transverse Doppler Effect""

In the above paper, an extraordinary claim of experimental absence of the transverse Doppler effect is made. As stated in the abstract, "An experiment... showing that a 33-GHz microwave signal received by rotating antennas is not exhibiting the frequency shift ("transverse Doppler effect") predicted by the relativistic Doppler formula." In

this comment, we will reanalyze the experiment and show that the correct application of special relativity predicts exactly a zero effect, in perfect coincidence with the observed result. [J61]

"Joint data QR-detection and Kalman estimation for OFDM time-varying Rayleigh channel complex gains"

This paper deals with the case of a high speed mobile receiver operating in an orthogonal-frequency-division-multiplexing (OFDM) communication system. Assuming the knowledge of delay-related information, we propose an iterative algorithm for joint multi-path Rayleigh channel complex gains estimation and data recovery in fast fading environments. Each complex gain time-variation, within one OFDM symbol, is approximated by a polynomial representation. Based on the Jakes process, an auto-regressive (AR) model of the polynomial coefficients dynamics is built, making it possible to employ the Kalman filter estimator for the polynomial coefficients. Hence, the channel matrix is easily computed, and the data symbol is estimated with free inter-sub-carrier-interference (ICI) thanks to the use of a QR-decomposition of the channel matrix. Our claims are supported by theoretical analysis and simulation results, which are obtained considering Jakes' channels with high Doppler spreads. [J62]

"Outage rates and outage durations of opportunistic relaying systems"

Opportunistic relaying is a simple yet efficient cooperation scheme that achieves full diversity and preserves the spectral efficiency among the spatially distributed stations. However, the stations' mobility causes temporal correlation of the system's capacity outage events, which gives rise to its important second-order outage statistical parameters, such as the average outage rate (AOR) and the average outage duration (AOD). This letter presents exact analytical expressions for the AOR and the AOD of an opportunistic relaying system, which employs a mobile source and a mobile destination (without a direct path), and an arbitrary number of (fixed-gain amplify-and-forward or decode-and-forward) mobile relays in Rayleigh fading environment. [J63]

"Shock Hugoniot of single crystal copper"

The shock Hugoniot of single crystal copper is reported for stresses below 66 GPa. Symmetric impact experiments were used to measure the Hugoniots of three different crystal orientations of copper, [100], [110], and [111]. The photonic doppler velocimetry (PDV) diagnostic was adapted into a very high precision time of arrival detector for these experiments. The measured Hugoniots along all three crystal directions were nearly identical to the experimental Hugoniot for polycrystalline Cu. The predicted orientation dependence of the Hugoniot from molecular dynamics calculations was not observed. At the lowest stresses, the sound speed in Cu was extracted from the PDV data. The measured sound speeds are in agreement with values calculated from the elastic constants for Cu. [J64]

"Impurity temperature correction factors for the transmission grating spectrometer in the TJ-II stellarator"

Impurity ion temperature and velocity profiles are obtained across plasmas in the TJ-II stellarator by performing charge-exchange recombination spectroscopy with a diagnostic neutral beam injector. For this, a tridirectional (toroidal plus two poloidal opposing views) multichannel spectroscopic diagnostic, incorporating 12-way fiber arrays, a compact f/1.8 spectrograph, and a back-illuminated CCD, permits Doppler line shifts and widths (of the C VI line at 529.05 nm) to be determined with 1-2 cm spatial resolution. For good photon counting statistics under Li-coated wall conditions, 600mcmdiameter fibers collect and transmit light to curved 100mcmwide input slits. When calibrated with a neon pencil lamp this entrance slit width results in a non-Gaussian instrumental function that, if not handled correctly, can result in systematically underestimated impurity temperatures. Here we develop and present correction factors for this effect for a range of conditions. [J65]

"LatinCon13-Planning a Mobile DVB-T Network for Colombia"

The TV evolution and the need of better quality and new services for the users have accelerated the migration from analogue to digital TV, forcing a renovation process in all fields of this communication system. Most of the DVB-T networks deployed in the world have been designed for fixed rooftop reception. The countries where it has not yet deployed the DTT network can introduce technological advances to planning DVB-T network for fixed and mobile reception and use the MPEG-4 video compression to provide high definition TV. This paper describes the technical solutions proposed in order to provide mobile DVB-T services to public transportation systems: antenna diversity, hierarchical modulation, and Application Layer Forward Error Correction (AL-FEC). These solutions compensate the negative effects caused by the mobility of the receivers, such as fading in the signal due to Doppler shift and the poor coverage at ground level. Furthermore, this paper describes the

methodology carried out to evaluate the improvements in mobile reception of the DVB-T network in Colombia by using these techniques. [J66]

"GMTI Tracking via the Gaussian Mixture Cardinalized Probability Hypothesis Density Filter"

The cardinalized probability hypothesis density (CPHD) filter is a recursive Bayesian algorithm for estimating multiple target states with a varying target number in clutter. In particular the Gaussian mixture variant (GMCPHD), which provides closed-form prediction and update equations for the filter in the case of linear Gaussian systems, is a candidate for real time multi-target tracking. The following three issues are addressed. First we show the equivalence between the GMCPHD filter and the standard multi hypothesis tracker (MHT) in the case of a single target. Second by using a Gaussian sum approach, we extend the GMCPHD filter to incorporate digital road maps for road constrained targets. The use of such external information leads to more precise tracks and faster and more reliable target number estimates. Third we model the effect of Doppler blindness by a target state-dependent detection probability, which leads to a more stable target-number estimation in the case of low-Doppler targets. [J67]

"Ship-Suspended Acoustical Transmitter Position Estimation and Motion Compensation"

An acoustical transmitter was suspended at multiple depths to 800 m from the research vessel R/V Melville at several stations in the North Pacific in 2004. The 3-D position of the transmitter varied with time due to ship motion and subsurface currents. The transmitter 3-D position and velocity were subsequently estimated using a cable dynamics model forced by ship position, as measured by high-precision global positioning system (GPS), and subsurface currents, as measured by the onboard acoustical Doppler current profiler. These estimated positions and velocities varied in the horizontal up to 10 m from the station "center" position, and 0.5 m/s from zero, respectively. Auxiliary measurements indicate that these estimates were accurate along either horizontal coordinate to better than 2 m and 0.05 m/s, respectively. Transmitter motion dilates the apparent time base of the radiated signal, producing time-varying Doppler effects. Simulation and analysis are used to determine when the induced Doppler effect is significant, and a technique is presented that "de-dopplerizes" a received signal for arbitrary interplatform motion. One example, involving the transmitter motion solutions determined here, shows that the transmitter motion induces a root mean square (RMS) variability of roughly for a 75-Hz ranging signal on time scales of several minutes: a 41-point de-dopplerizing filter reduced this to . [J68]

"Micro-Doppler Signature Extraction from Ballistic Target with Micro-Motions"

Precession and nutation of the warhead and the wobble of decoys are the typical micro-motions of ballistic targets, and micro-Doppler analysis is a new way to investigate micro-motions. Based on the difference of micro-motions between the warhead and decoys, micro-Doppler signatures might be extracted for radar target identification, which is seen as a good method and a technique of great potential. We build micro-motion models of a ballistic missile target, including precession, nutation, and wobble; develop a novel model of micro-Doppler modulations based on the proposed concept of the micro-motion matrix; derive the formulas of micro-Doppler induced by the three micro-motions; and verify them by simulation studies. In order to further approach the actual case, the effective point scatterer model and the occlusion effect are considered in micro-Doppler, and the simulated results are shown compared with ones under the fixed point scatterer model and without the occlusion effect. In addition the precession experiment is performed in a microwave chamber, and the measured result is in accordance with the simulated result and the computed result. [J69]

"A Unified Treatment of Optimum Pilot Overhead in Multipath Fading Channels"

The optimization of the pilot overhead in single-user wireless fading channels is investigated, and the dependence of this overhead on various system parameters of interest (e.g., fading rate, signal-to-noise ratio) is quantified. The achievable pilot-based spectral efficiency is expanded with respect to the fading rate about the no-fading point, which leads to an accurate order expansion for the pilot overhead. This expansion identifies that the pilot overhead, as well as the spectral efficiency penalty with respect to a reference system with genie-aided CSI (channel state information) at the receiver, depend on the square root of the normalized Doppler frequency. It is also shown that the widely-used block fading model is a special case of more accurate continuous fading models in terms of the achievable pilot-based spectral efficiency. Furthermore, it is established that the overhead optimization for multiantenna systems is effectively the same as for single-antenna systems with the normalized Doppler frequency multiplied by the number of transmit antennas. [J70]

"Triaxial Acceleration Measurement for Oblique Penetration Into Concrete Target"

To obtain accurate data of the motion parameters of a rigid projectile during the oblique penetration event, a triaxial acceleration measurement device (TAMD) was developed, and a method for the calibration of a high-g

accelerometer was presented by using a Hopkinson bar and a grating laser Doppler interferometer. The buffer structure was designed, and the cushioning capacity of it was studied to improve the survivability of the multichannel data recorder. A set of penetration experiments with concrete targets that had average compressive strengths of 35 and 45 MPa was conducted to characterize the response of monolithic concrete targets to projectile impact. The 96-mm-diameter 630-mm-long ogive-nose projectiles were machined from 35CrMnSiA steel and designed to contain a TAMD in the tail of the cavity. The projectiles were launched by a 100-mm-diameter smooth-bore powder gun to striking velocities between 300 and 600 m/s, and impacted the concrete target at an oblique angle of 0°-30°. The acceleration during the launch and the triaxial deceleration during the penetration were successfully recorded by the TAMD. The measured penetration data and deceleration-time data were analyzed. [J71]

"Concise Derivation of Scattering Function from Channel Entropy Maximization"

In order to provide a concise time-varying SISO channel model, the principle of maximum entropy is applied to scattering function derivation. The resulting model is driven by few parameters that are expressed as moments such as the channel average power or the Doppler spread. Physical interpretations of the model outputs are discussed. In particular, it is shown that common Doppler spectra such as the flat or the Jakes spectrum fit well into the maximum entropy framework. The Matlab code corresponding to the proposed model is available at http://perso.telecom-bretagne.eu/fxsocheleau/software. [J72]

"Low Earth Orbit nanosatellite communications using Iridium's network"

Nanosatellite communication in Low Earth Orbit (LEO) is limited by line-of-sight twice a day transmissions that last a total average of 15 minutes. Using Iridium's satellite network as a gateway, satellites in LEO may achieve near continuous communications with Earth. This discusses the use of the Iridium network for nanosatellite satellite communications by NASA's Florida Space Grant Consortium funded researchers at Florida International University (FIU). Specifically, this focuses on FIU's Florida University SA Tellite (FUNSAT) IV competition award winning payload submissions, named PicoPanther, orbiting in a sun synchronous polar orbit. An introduction to the network and hardware is presented as well as simulation results. An analysis of cost, Doppler Effect shifts, and possible uses are also performed. [J73]

"ICI Mitigation for OFDM Using PEKF"

Orthogonal frequency division multiplexing (OFDM) is widely known as the promising broadband wireless communication technology due to the high spectral efficiency and robustness to the multi-path interference. However, the inter-carrier interference (ICI) caused by Doppler frequency offset is an important issue for OFDM in high mobility. In this paper, the method to mitigate ICI for OFDM system is investigated, and a novel ICI mitigation method using planar extended Kalman filter (PEKF) is proposed to reduce the ICI effects. Simulation results demonstrate that the proposed ICI mitigation method in this letter outperforms traditional ICI mitigation methods. [J74]

"Ortho-Rectification and Slope Correction of SAR Data Using DEM and Its Accuracy Evaluation"

This paper proposes an accurate ortho-rectification and slope correction method for Synthetic Aperture Radar (SAR) images using a digital elevation model (DEM). Since SAR observation is performed in the squint condition, the image is distorted both geometrically and radiometrically (e.g., through foreshortening, range and azimuth shift, layover, radiometric modulation associated with slope, and shadowing). Furthermore, the pixel height cannot be retrieved directly even when orbital data are accurate. The proposed method calculates the geometric and radiometric distortion components from a comparative process between the DEM-based Simulated SAR Image (DSSI) and the SAR slant range image. When applied to Advanced Land Observing Satellite (ALOS) Phased Array Type L-band SAR (PALSAR) data, the geometric accuracy of the ortho-rectified SAR image at the off-nadir angle of 34.3° was high, with a Root Mean Square Error (RMSE) of 11.9 m when evaluated against Ground Control Points (GCPs) deployed globally. The slope correction effectively reduced the radiometric variation caused by the terrain height variation. The proposed method can be applied to a range of SAR data to support a diversity of applications. [J75]

"Special Relativistic Visualization by Local Ray Tracing"

Special relativistic visualization offers the possibility of experiencing the optical effects of traveling near the speed of light, including apparent geometric distortions as well as Doppler and searchlight effects. Early high-quality computer graphics images of relativistic scenes were created using offline, computationally expensive CPU-side 4D ray tracing. Alternate approaches such as image-based rendering and polygon-distortion methods are able to achieve interactivity, but exhibit inferior visual quality due to sampling artifacts. In this paper, we

introduce a hybrid rendering technique based on polygon distortion and local ray tracing that facilitates interactive high-quality visualization of multiple objects moving at relativistic speeds in arbitrary directions. The method starts by calculating tight image-space footprints for the apparent triangles of the 3D scene objects. The final image is generated using a single image-space ray tracing step incorporating Doppler and searchlight effects. Our implementation uses GPU shader programming and hardware texture filtering to achieve high rendering speed. [J76]

"Available information in 2D motional Stark effect imaging"

Recent advances in imaging techniques have allowed the extension of the standard polarimetric 1D motional Stark effect (MSE) diagnostic to 2D imaging of the internal magnetic field of fusion devices [J. Howard, Plasma Phys. Controlled Fusion 50, 125003 (2008)]. This development is met with the challenge of identifying and extracting the new information, which can then be used to increase the accuracy of plasma equilibrium and current density profile determinations. This paper develops a 2D analysis of the projected MSE polarization orientation and Doppler phase shift. It is found that, for a standard viewing position, the 2D MSE imaging system captures sufficient information to allow imaging of the internal vertical magnetic field component BZ(r,z)in a tokamak. [J77]

"Experimental characterisation of flow effects on marine current turbine behaviour and on its wake properties"

Experimental results of tests carried out to investigate the hydrodynamics of marine current turbines are presented. The objective is to build an experimental database in order to validate the numerical developments conducted to characterise the flow perturbations induced by marine current turbines. For that purpose, we used a tri-bladed horizontal axis turbine. The work is dedicated to measuring the behaviour of the system and to characterising the wake generated by the turbine. The efficiency of the device is quantified by the measurement of the thrust and the amount of power generated by the rotor for various inflow conditions, whereas the wake is characterised by Laser Doppler Velocimetry. Particular attention is paid to the flow characteristic effects on the performance of a 0.70 m diameter turbine. The load predictions on the structure and the measured performance of the turbine over its working range of currents and rotational speeds are presented. The results showed that this kind of turbine is sensitive to the quality of the incoming flow. The turbulence intensity effects on turbine behaviour and on its wake are also characterised in order to study how the far wake decays downstream and to estimate the effect produced in downstream turbines. [J78]

"Performance analysis of orthogonal signaling over fast fading channels"

This paper analyzes the performance of a system consisting of a central base transmitter transmitting to a group of mobiles with on-off orthogonal modulation over a fast fading channel. Because the channel is changing across the symbol interval, inter-code interference appears at the output of each user's matched filter. The cumulative distribution function at one user's matched filter output is derived. From this distribution, a metric is introduced to evaluate which pairs of codes lead to the most severe inter-code interference for a particular fading spectrum. [J79]

"L-band array for ground-based remote sensing of volcanic eruptions"

In this study, an L-band array for ground-based remote sensing of volcanic eruptions will be presented. The proposed array configuration was created using a particular class of microstrip elements, namely shorted rectangular patch (SRP) antennas, with improved directivity arranged in a 6Ч6 array with high inter-element spacing. This solution allowed high directivity, while grating lobe effects were mitigated by the element factor. The array was developed for use with volcano Doppler radar (Voldorad), a volcanological Doppler radar used to remotely sense summit eruptions of Mt. Etna in Sicily, where the prototype Voldorad is now located. The main features of the SRP and the design principles of the array will be presented, along with simulated and measured results. [J80]

"Generating Large-Scale High-Quality SAR Mosaic Datasets: Application to PALSAR Data for Global Monitoring"

This paper proposes a mosaicking algorithm to produce large-scale radiometrically and geometrically calibrated Synthetic Aperture Radar (SAR) datasets as a base for environmental monitoring of terrestrial biospheric and cryospheric changes. Features of the proposed method are thematic inclusion of a) long-strip processing of the SAR data, b) ortho-rectification and slope correction using a digital elevation model, c) suppression of differences in intensity between neighboring strips, and d) preparation of metadata (e.g., dates from launch, local

incidence angle, radar shadow, layover, and valid/invalid data) to support dataset interpretation. The performance of the proposed method is evaluated using Advanced Land Observing Satellite (ALOS) Phased Array type L-band SAR (PALSAR) mosaics for Southeast Asia, Australia, and Africa. [J81]

"Channels estimation in OFDM system over rician fading channel based on comb-type pilots arrangement"

Orthogonal frequency-division multiplexing (OFDM) is a transmission technique that is based on many orthogonal carriers that are transmitted simultaneously. Channel estimation techniques for OFDM systems, based on comb-type pilot arrangement, over frequency-selective Rician and time-varying fading channel are investigated. The advantage of comb-type pilot arrangement, in channel estimation, is the ability to track the variation in the channel, which is the main reason for inter-carrier interference modelled as an additive white Gaussian noise, leading to an increase in the noise level. The estimation of the channel at the pilot frequencies is based on least-square (LS) method. Several interpolation methods have been used to estimate the channel response at the data frequency. In this study, simulation results for Rician channel model were examined and bit error rate/signal-to-noise ratio performance, for various conditions, were considered, and the pilot arrangement was used with the LS estimation and low-pass interpolation techniques, leading to a reduction in the effect of Doppler frequency. [J82]

"Resolving Velocity Ambiguity in Multifrequency, Pulse-to-Pulse Coherent Doppler Sonar"

Coherent Doppler sonar allows noninvasive velocity measurements and is suitable for both laboratory and field applications. The approach is particularly attractive in those environments where optical techniques are not suitable either because of power requirements or more critically, water turbidity. Notably, the technique has been employed successfully in oceanic and river boundary layer studies. However, the occurrence of range and velocity ambiguities limit the more general application of the technique. This paper introduces a method to overcome speed ambiguities by acquiring acoustic backscatter at two (or more) frequencies simultaneously with a broadband transmit pulse. The different frequencies have distinct velocity ambiguities allowing disambiguation of the velocity measurements. The approach is conceptually similar to the use of multiple transmit pulse rates but has the advantage that the data can be acquired simultaneously and so there is no loss in data rate. In addition, system geometry often restricts the allowed pulse repetition rate so that disambiguation using frequency is more flexible and more generally applicable. Theoretically, the effective ambiguity velocity of a dual-frequency system can be extended arbitrarily but phase noise in a practical system restricts the method to about a fivefold increase in ambiguity velocity. [J83]

"An Experimental Study of WiMAX-Based Passive Radar"

Passive radars using illuminators of opportunity have attracted much attention in recent years. The worldwide inter-operability for microwave access (WiMAX) signal is a new illumination source for passive radar. This paper presents a study to understand and to demonstrate the feasibility of using WiMAX signals for passive radar. The study includes WiMAX signal analysis, the design and implementation of a WiMAX-based passive radar demonstrator, the associated radar signal processing scheme, and the field measurements. Results based on field measurements for various moving targets provide some useful references about the performance and potential capability of using WiMAX signals for passive radar applications. [J84]

"Grating spectrometer system for beam emission spectroscopy diagnostics using high-energy negative-ion-based neutral beam injection on LHD"

A beam emission spectroscopy (BES) system was developed for density gradient and fluctuation diagnostics in the Large Helical Device (LHD). In order to cover the large Doppler shift of the Halpha beam emission because of the high-energy negative-ion-based neutral beam atom (acceleration voltage Vacc=90-170kV) and the large motional Stark splitting due to the large vЧBfield (magnetic field B=3.0T), a grating spectrometer was used instead of a conventional interference filter system. The reciprocal linear dispersion is about 2 nm/mm, which is sufficient to cover the motional Stark effect spectra using an optical fiber with a diameter of 1 mm. [J85]

"Limited Feedback for Temporally Correlated MIMO Channels With Other Cell Interference"

Limited feedback improves link reliability with a small amount of feedback from the receiver to the transmitter. In cellular systems, the performance of limited feedback will be degraded in the presence of other cell interference, when the base stations have limited or no coordination. This paper establishes the degradation in sum rate of users in a cellular system, due to uncoordinated other cell interference and feedback delay. A goodput metric is defined as the rate when the bits are successfully received at the mobile station, and used to derive an upper

bound on the performance of limited feedback systems with delay. This paper shows that the goodput gained from having delayed limited feedback decreases doubly exponentially as the delay increases. The analysis is extended to precoded spatial multiplexing systems where it is shown that the same upper bound can be used to evaluate the decay in the achievable sum rate. To reduce the effects of interference, zero forcing interference nulling is applied at the receiver, where it is shown that the effect of the interference on the achievable sum rate can be suppressed by nulling out the interferer. Numerical results show that the decay rate of the goodput decreases when the codebook quantization size increases and when the Doppler shift in the channel decreases. [J86]

"Multistatic micro-Doppler radar signatures of personnel targets"

This study extends the theory of the micro-Doppler effect into the multistatic domain, and considers how the multistatic micro-Doppler signature (μ-DS) will affect radar automatic target recognition (ATR). Real multistatic μ-DS of personnel targets are examined and their nature compared with theory and simulated results. It is demonstrated that the use of multistatic μ-DSs would increase the robustness of radar ATR systems to the problem of self-occlusion, where the target obscures itself. Redundancy in the multistatic μ-DS is identified, and how this may reduce the data fusion demands of multi-aspect classifiers is discussed. Also, information theory is used to demonstrate that the multistatic μ-DS contains more target information than the monostatic case. This result leads to the prediction that multi-aspect μ-DS-based radar ATR would have improved performance compared to single-aspect solutions. [J87]

"Effect of collisional quenching on the measurement of ion species mix in neutral beam injectors"

A corona model is used in analyzing the Doppler shifted spectroscopy (DSS) data for estimating the ion species mix and beam species fractions in positive ion based neutral beam injectors. In this model the excited neutral atom is assumed to decay solely by a spontaneous radiative process. However, at the beam energies of 20-60 keV/amu, collisional quenching of the excited neutrals affects these estimations when background pressure exceeds 1 mTorr. We present here a modified corona model that takes into account the effects of collisional quenching. We also describe the results of application of the present model to a typical DSS data obtained in the first phase of operation of the SST-1 neutral beam injector. [J88]

"Analysis of Wind Turbines Blockage on Doppler Weather Radar Beams"

The split-step solution to the parabolic wave equation describing beam propagation permits examination of the signal degradation in a Doppler weather radar caused by wind turbines blockage under general atmospheric conditions and at arbitrary transmitter and receiver configurations. At radar wavelengths, an understanding of turbine and terrain obscuration effects is essential for deciding the reliability of radar measurements affected by blockage. [J89]

"Development and characterisation of freeze-dried liposomes containing two anti-asthma drugs"

Stable liposomes that offer a potential for pulmonary delivery have been developed and characterised. Freeze-dried soya phosphatidylcholine: cholesterol (1:1) small unilamellar liposome vesicles were prepared with salbutamol sulphate (SS) and beclometasone dipropionate (BDP), being included within separate or same formulations, and in presence or absence of a cryoprotectant. The cryoprotectants used were sucrose and trehalose in 5:1 or 10:1 (w/w) cryoprotectant to lipid ratio. Size analysis was performed using photon correlation spectroscopy and surface charge (zeta potential) was measured using laser Doppler velocimetry. Inclusion of a cryoprotectant prior to freeze-drying minimised the increase in the measured size on rehydration, with sucrose being superior to trehalose. When both SS and BDP were included, the rehydrated liposomes had the smallest size, being below 100 nm using sucrose and below 136 nm using trehalose. The zeta potential of the liposomes was slightly increased after freeze-drying and was highly independent on formulation. This study has demonstrated the possibility of producing stable freeze-dried liposomes that included two anti-asthma drugs and also demonstrated a potential for application in pulmonary delivery. [J90]

"Shear modulus estimation with vibrating needle stimulation"

An ultrasonic shear wave imaging technique is being developed for estimating the complex shear modulus of biphasic hydropolymers including soft biological tissues. A needle placed in the medium is vibrated along its axis to generate harmonic shear waves. Doppler pulses synchronously track particle motion to estimate shear wave propagation speed. Velocity estimation is improved by implementing a k-lag phase estimator. Fitting shear-wave speed estimates to the predicted dispersion relation curves obtained from two rheological models, we estimate the elastic and viscous components of the complex shear modulus. The dispersion equation estimated using the standard linear solid-body (Zener) model is compared with that from the Kelvin-Voigt model to estimate moduli in

gelatin gels in the 50 to 450 Hz shear wave frequency bandwidth. Both models give comparable estimates that agree with independent shear rheometer measurements obtained at lower strain rates. [J91]

"Investigation of contact acoustic nonlinearity in delaminations by shearographic imaging, laser doppler vibrometric scanning and finite difference modeling"

Full-field dynamic shearography and laser Doppler vibrometric scanning are used to investigate the local contact acoustic nonlinear generation of delamination-induced effects on the vibration of a harmonically excited composite plate containing an artificial defect. Nonlinear elastic behavior caused by the stress-dependent boundary conditions at the delamination interfaces of a circular defect is also simulated by a 3-D second-order, finite-difference, staggered-grid model (displacement-stress formulation). Both the experimental and simulated data reveal an asymmetric motion of the layer above the delamination, which acts as a membrane vibrating with enhanced displacement amplitude around a finite offset displacement. The spectrum of the membrane motion is enriched with clapping-induced harmonics of the excitation frequency. In case of a sufficiently thin and soft membrane, the simulations reveal clear modal behavior at sub-harmonic frequencies caused by inelastic clapping. [J92]

"Link adaptation based on repetition coding for mobile worldwide interoperability for microwave access systems"

Worldwide interoperability for microwave access (WiMAX) suffers from inter-carrier interference (ICI) since it adopts orthogonal frequency division multiplexing in physical layer. This study applies a repetition coding scheme, which encodes the same data on a subcarrier pair, to the hierarchical modulation to suppress the ICI and thus the inter-layer interference. Consequently, the proposed method mitigates the effects of fading and interference and provides a finer granularity of modulation order for link adaptation. Besides, the repetition coding scheme is also applied to a hybrid automatic repeat request (HARQ) protocol to recover error packets because of poor channel conditions. The proposed method incorporates the ICI cancellation into the conventional incremental redundancy HARQ and automatically activates the cancellation of ICI without Doppler shift/mobility estimation. Simulations show that the proposed algorithms outperform the conventional schemes in time-varying Rayleigh fading channels, especially in high-mobility environments. [J93]

"The First-Order High Frequency Radar Ocean Surface Cross Section for an Antenna on a Floating Platform"

The first-order high frequency surface wave radar (HFSWR) cross section of the ocean surface is derived for the case of the transmitting and receiving antenna being mounted on a floating, but otherwise fixed, ocean platform. It is assumed that the sway component of the platform or barge motion is responsible for observed differences in the cross section compared to that for the fixed antenna case. Based on earlier work, a general expression for the bistatically received first-order electric field, which consists of a two-dimensional spatial convolution, is presented and reduced to integral form. Then, it is assumed that the surface can be described by a Fourier series whose coefficients are zero-mean Gaussian random variables, and from there the analysis proceeds for the backscatter case. The integrals are taken to the time domain, with the source field being that of a barge-mounted omnidirectional vertically polarized pulsed dipole antenna. Subsequently, the first-order monostatic radar cross section is developed and found to consist of Bessel functions. Simulation results for the new cross section are also provided to show the effects of barge motion under different sea states and operating frequencies. It is seen that the results have important implications in the application of HFSWR technology to ocean remote sensing. [J94]

"An interference self-cancellation technique for SC-FDMA systems"

A new interference self-cancellation (ISC) method for Single Carrier-FDMA (SC-FDMA) systems is proposed to mitigate the inter-user interference caused by frequency offset or Doppler effect. By transmitting a compensation symbol at the first symbol location in each resource block, the energy leakage can be significantly suppressed. With little bandwidth and power sacrifice, the proposed method can greatly improve the system robustness against frequency offset. Simulation results show that the signal-to-interference ratio (SIR) can be improved by 7 dB on average for the entire system band, and up to 11.7 dB for an individual user. [J95]

"Fast Algorithms in Slow and High Doppler Mobile Environments"

High Doppler effects resulting from fast time varying dispersive channels give rise to the so-called intercarrier interference, whose accurate modeling for data recovery is paramount. We present a novel turbo estimation scheme based on a known linearized model of the time varying channel via its derivatives. The derivatives

estimation is adaptive, in the sense that at each turbo estimation it incorporates information on previously estimated parameters. This is combined with a decision-directed scheme implemented at bit level with soft decision. We show that any pilot based scheme that is able to induce a Toeplitz structure in the channel correlation matrix, can make use of an existing class of so-called superfast algorithms for minimum mean-square error (MMSE) channel estimation. Given a structure for the vector of pilots and an upper bound for the channel delay spread, say N, we show that it is only necessary to store 2N coefficients per pilot structure in order to recover the entire channel parameters. We bring attention to the fact that either for static or slowly varying channels, any Toeplitz-like model can yield a superfast equalization method as well, and show how fast order recursive algorithms can be combined to a superfast receiver structure, in order to yield both efficient equalizer computation and equalization. [J96]

"Formulation of Doppler and cross-ambiguity processes based on delay only"

The author addresses the problem of estimating the time varying delay of a signal observed by two or more receivers, and develop accurate and computationally efficient methods for processing these signals. The effectiveness of these methods is demonstrated on signals whose parameters are consistent with airborne receivers and a stationary ground emitter. The author proposes a solution to the time varying delay problem that is based on the phase of the short time cross-correlation function. This model is based on the exact signal model in which received signal differs from the transmitted signal by a time varying delay function. The process presented is based on previous work and provides enough accuracy in the estimated delay function that accurate Doppler velocity may be estimated from the estimated delay function. Moreover, the process is computationally efficient since it is based on the conventional correlation function and does not require estimation of a cross-ambiguity function or scale cross-ambiguity function surfaces on a fine Doppler lattice. [J97]

"An Improved SoS Method for Generating Multiple Uncorrelated Rayleigh Fading Waveforms"

This paper introduces an improved method to generate multiple uncorrelated Rayleigh fading waveforms. Correlated waveforms occur occasionally when Generalized Method of Exact Doppler Spread is used. Detailed study shows how this error occurs and how to avoid it with the introduced parameter computation method. Moreover, a design concept of Set Partition is used to reduce the number of sinusoids needed in Sum-of-Sinusoids (SoS) method. Finally, performance analysis and comparisons are done to demonstrate the accuracy and efficiency of the improved method. [J98]

"A Numerical Study of Forward- and Backscattering Signatures on Doppler-Reflectometry Signals"

In Doppler reflectometry, two scattering processes may be involved, Bragg backscattering and forward scattering. In this paper, a numerical study of both processes is undertaken using a finite-difference time-domain full-wave code with plasma parameters compatible with Tore Supra or Asdex Upgrade Doppler reflectometers. The spectra modeling the plasma turbulence were chosen to isolate forward- and backscattering events, allowing the segregation of the two different signatures and bring forth the different mechanisms intervening in each of the cases. Some numerical precautions needed for this type of simulations are presented. The results obtained are compared with the theoretical models. [J99]

"A Rao-Blackwellized Particle Filter for Joint Channel/Symbol Estimation in MC-DS-CDMA Systems"

This paper deals with the joint estimation of Rayleigh fading channels and symbols in a MC-DS-CDMA system. Formerly, particle filtering has been introduced as a set of promising methods to solve communication problems. PF consists in simulating possible values of the unkwnown parameters and selecting the most likely candidates with regard to the received signal. Here, the Rao-Blackwellized particle filter (RBPF) is used to significantly decrease the variance of the channel/symbol estimates. Our contribution is twofold. Firstly, sinusoidal stochastic models have been shown to better represent the statistical properties of Rayleigh channels than classical autoregressive models. Therefore, the proposed RBPF estimator is based on these models which are expressed as the sum of two sinusoids in quadrature at the maximum Doppler frequency with autoregressive processes as amplitudes. The model parameters are unknown and need to be estimated. Since PFs are not well-suited to recover non-varying parameters, we propose to cross-couple the RBPF with a Kalman filter which makes use of the RBPF ouputs to sequentially update the parameters. Secondly, the choice of an efficient proposal distribution to simulate the particles is crucial for PF performance. We suggest using a suboptimal distribution which simulates likely values of the symbols at a reasonable computational cost. [J100]

"Joint Data Detection and Channel Estimation for Fading Unknown Time-Varying Doppler

Environments"

This work considers a joint channel estimation and data detection technique for Multiple Space-Time Trellis Codes (MSTTCs) operating over unknown time-varying channels with large Doppler spread. We propose an algorithm, called Doppler Adaptive Smoothed Data Detection and Kalman Estimation (DA-SDD-KE), that jointly detects data and estimates the channel as well as the time-varying Doppler. In this scheme, an Adaptive Kalman Predictor (AKP) consisting of a KP and a covariance-based Doppler estimator is incorporated into a Per-Survivor Processing (PSP)-based algorithm that utilizes the past, present and future received symbols for smoothed data detection. For comparison purposes, we also develop a Doppler Adaptive version of the Delayed Mixture Kalman Filtering (DMKF) technique, referred to as DA-DMKF, where the adaptive estimations of the channel and the Doppler shift are based on sequences of importance samples. Moreover, we propose a model for generating a Rayleigh fading process with time-varying Doppler using the sum of sinusoids method. The performance of the DA-SDD-KE and DA-DMKF algorithms over channels with constant, linear and quadratic Doppler functions is evaluated using computer simulations, revealing that the DA-SDD-KE algorithm performs well for all considered Doppler functions, and provides a considerably gain over the DA-DMKF algorithm. [J101]

"Accuracy and precision in photonic Doppler velocimetry"

While photonic Doppler velocimetry (PDV) is becoming a common diagnostic in dynamic compression research, its limiting accuracy and precision are not well understood. Velocity resolution is known to be inversely proportional to the time resolution, but resolution estimates differ by one to two orders of magnitude. Furthermore, resolution varies with the number of recorded signals and how these signals are analyzed. Numerical simulations reveal factors that affect accuracy and precision in PDV, and the results may be extended to a broad class of measurements. After systematic effects are eliminated, the limiting velocity uncertainty in a PDV measurement is governed by the sampling rate, the signal noise fraction, and the analysis time duration. [J102]

"Inter-subcarrier interference compensation in the frequency-hopped single-carrier frequency division multiple access communication system"

Single-carrier frequency division multiple access (SC-FDMA) system having very good characteristic on peak-to-average power ratio is promising in communication area. But the performance of SC-FDMA system is very sensitive to inter-subcarrier interference (ICI), and existing phase noise suppression algorithm has reduced just phase noise only. Therefore the authors propose effective method, phase noise and frequency offset suppression (PNFS) algorithm, using comb-type pilot. PNFS algorithm can suppress phase noise, carrier frequency offset and even Doppler effect simultaneously in frequency domain. Through PNFS algorithm, SC-FDMA system has robust characteristic against ICI of performance degradation. Moreover, in these days, most electronic communication systems are weak to jamming. So, frequency-hopped (FH) scheme, which is one kind of spread spectrum techniques as a means of making performance better to supplement a disadvantage of SC-FDMA system on jamming attack, is considered. The authors would like to analyse ICI and jamming in SC-FDMA system and employ FH technique in SC-FDMA system because existing studies have not considered the situation regarding ICI and jamming exist simultaneously in mobile channel. So, the authors analyse degradation factors in FH-SC-FDMA system about ICI and jamming signal categorised as partial band jamming and multi-tone jamming. Then, the proposed FH-SC-FDMA system using PNFS algorithm has strong performances about ICI and jamming. [J103]

"Direct measurement of micromotion speed in a linear quadrupole trap"

We demonstrate a simple method to directly measure the micromotion speed and amplitude of ions far away from the nodal line of the linear quadrupole trap using the cross-correlation technique. For the ions very close to the trap nodal line, the micromotion speed and amplitude of ions can also be deduced through linear fitting. This work gives us a direct picture to the ions' micromotion modes at different displacements in the linear trap. With this work, an absolute measurement of the second-order Doppler effect in the research of atomic clocks based on large number of ions becomes possible. [J104]

"ICI Analysis for FRFT-OFDM Systems to Frequency Offset in Time-Frequency Selective Fading Channels"

This letter presents the effects of frequency offset to orthogonal frequency division multiplexing systems based on fractional Fourier transform (FRFT-OFDM) in time-frequency selective fading channels. FRFT-OFDM systems generalize the OFDM systems based on discrete Fourier transform by the deployment of FRFT. The expressions of signal-to-interference ratio (SIR) due to ICI are derived in different fading channels. In a flat channel, the performances of both systems are the same. In a frequency selective channel, the FRFT-OFDM systems have

superior SIR performances by choosing the optimal fractional factor, when Doppler spread is comparable to the inverse of the symbol duration or carrier offset exists in the system. [J105]

"Adaptive Channel Estimation and Data Detection for Underwater Acoustic MIMO-OFDM Systems"

In this paper, frequency and time correlation of the underwater channel are exploited to obtain a low-complexity adaptive channel estimation algorithm for multiple-input-multiple-output (MIMO) spatial multiplexing of independent data streams. The algorithm is coupled with nonuniform Doppler prediction and tracking, which enable decision-directed operation and reduces the overhead. Performance is demonstrated on experimental data recorded in several shallow-water channels over distances on the order of 1 km. Nearly error-free performance is observed for two and four transmitters with BCH(64,10) encoded quadrature phase-shift keying (QPSK) signals. With a 24-kHz bandwidth, overall data rates of up to 23 kb/s after coding were achieved with 2048 carriers. Good results have also been observed in two other experiments with varying MIMO-OFDM (orthogonal frequency-division multiplexing) configurations. [J106]

"Adaptive spectral doppler estimation"

In this paper, 2 adaptive spectral estimation techniques are analyzed for spectral Doppler ultrasound. The purpose is to minimize the observation window needed to estimate the spectrogram to provide a better temporal resolution and gain more flexibility when designing the data acquisition sequence. The methods can also provide better quality of the estimated power spectral density (PSD) of the blood signal. Adaptive spectral estimation techniques are known to provide good spectral resolution and contrast even when the observation window is very short. The 2 adaptive techniques are tested and compared with the averaged periodogram (Welch's method). The blood power spectral capon (BPC) method is based on a standard minimum variance technique adapted to account for both averaging over slow-time and depth. The blood amplitude and phase estimation technique (BAPES) is based on finding a set of matched filters (one for each velocity component of interest) and filtering the blood process over slow-time and averaging over depth to find the PSD. The methods are tested using various experiments and simulations. First, controlled flow-rig experiments with steady laminar flow are carried out. Simulations in Field II for pulsating flow resembling the femoral artery are also analyzed. The simulations are followed by in vivo measurement on the common carotid artery. In all simulations and experiments it was concluded that the adaptive methods display superior performance for short observation windows compared with the averaged periodogram. Computational costs and implementation details are also discussed. [J107]

"Motion-Compensation Improvement for Widebeam, Multiple-Receiver SAS Systems"

The effect that uncompensated motion errors have on synthetic aperture sonar (SAS) imagery can be severe. Time-domain beamforming SAS reconstruction is able to compensate arbitrary track errors, but the more efficient frequency-domain reconstruction algorithms, such as the range-Doppler, chirp-scaling, and wave number (akarange migration or Stolt-mapping) algorithms do not allow for simple compensation, especially for widebeam sonars. Data processed via these block algorithms is usually compensated before azimuth compression in a computationally inexpensive preprocessing step. Unfortunately, this compensation assumes a narrowbeam geometry, causing blurring in high-resolution images collected with widebeam sonars. In this paper, we demonstrate a new technique for compensation of large, but known, motion errors in data collected with widebeam geometry sonars. The technique relies on obtaining angle-of-arrival information from the multiple-receiver array configuration typical in high-resolution SAS systems. The new method of compensating for motion errors was found to significantly outperform the previous techniques in a simulation of point-reflector imagery. [J108]

"Phase-Coded Interrupted CW Signals and Processors"

High resolution radars require signals with large time-bandwidth product such as CW signal and coherent pulse train (CPT). We discuss a phase-coded interrupted CW (ICW) signal which is the combination of CW signal and CPT. Phase codes used here are with perfect periodic autocorrelation. The periodic ambiguity function of ICW signals is studied including single-carrier signal and multi-carrier signal. It is interesting that the gate function has different effects on two signals and contributes to a multi-carrier ICW signal which yields nearly perfect autocorrelation. Meanwhile we also suggest an efficient receiver approach to ICW signals, which can reduce the computational burden of the processor and utilize the good properties of P3 and P4 codes. [J109]

"Noninvasive Biosignal Detection Radar System Using Circular Polarization"

This paper proposes an integrated hypersensitive Doppler radar system through a circular polarization characteristic. Through the idea of a reverse sense of rotation when the reflecting surface is perfectly

conducting, it is shown that the detecting property of the system can be effectively improved by using antennas that have a reverse polarization. This bistatic radar system can be used in noninvasively sensing biosignals such as respiration and heart rates with the periodic movement of skin and muscle near the heart. The operating frequency of the system is in the X-band and the radar size is 95 times 50 times 13 mm3. [J110]

"Cyclostationarity-based doppler spread estimation in mobile fading channels"

The Doppler spread, or equivalently, the mobile speed, is a measure of the spectral dispersion of mobile fading channel. Accurate estimation of the mobile speed is of importance in wireless mobile applications which require the knowledge of the rate of channel variations. This paper exploits the inherent cyclostationarity of linearly modulated signals, transmitted through fading channels, to design robust blind and data-aided mobile speed estimators. Two categories of cyclic-correlation and cyclic-spectrum-based methods are developed. Extension to space-time speed estimation at the base station in macrocells is also provided. In comparison with the existing methods, the new estimators can be used without any need for pilot tones, and are robust to additive stationary noise or interference of any color or distribution. Unlike the conventional multi-antenna based method, the proposed space-time speed estimator does not assume the receiver noise to be spatially white. We also devised a suboptimal training sequence for pilot-symbol assisted methods, to reduce the estimation error. The performances of the proposed estimators are illustrated via extensive Monte Carlo simulations. [J111]

"Through-Wall Human Tracking With Multiple Doppler Sensors Using an Artificial Neural Network"

An artificial neural network is proposed to track a human using the Doppler information measured by a set of spatially distributed sensors. The neural network estimates the target position and velocity given the observed Doppler data from multiple sensors. It is trained using data from a simple point scatterer model in free space. The minimum required number of sensors is investigated for the robust target tracking. The effect of sensor position on the estimation error is studied. For the verification of the proposed method, a toy car and a human moving in a circular track are measured in line-of-sight and through-wall environments. The resulting normalized estimation errors on the target parameters are less than 5%. [J112]

"Propagation Issues for Cognitive Radio"

Cognitive radios are expected to work in bands below about 3.5 GHz and may be used for a variety of applications, e.g., broadband fixed wireless access, mobile and nomadic access, etc. Cognitive radio system designers must have access to a wide range of channel models covering a wide span of operating frequencies, carrier bandwidths, deployment conditions, and environments. This paper provides a comprehensive overview of the propagation channel models that will be used for the design of cognitive radio systems. We start with classical models for signal loss versus distance and discuss their dependence on the physical properties of the environment and operating frequency. Here we also introduce the concept of log-normal shadowing resulting from signal blockage by man-made and natural features. Next, we discuss the time-varying nature of the wireless channel, introduced as a result of the motion of objects in the channel. This is followed by a discussion on the dispersion of the signal caused by various effects of propagation, especially in the time and frequency domains. Angular dispersion, which is discussed next, is important because cognitive radios may be based on modems that exploit the spatial domain. Lastly, we summarize channel models that have been standardized for fixed and mobile systems. [J113]

"Robust Doppler Spread Estimation in the Presence of a Residual Carrier Frequency Offset"

In high data-rate transmission systems, accurate Doppler spread estimation is a critical task for not only mobile velocity estimation, but also for optimal adaptive processing. It is known that the residual carrier frequency offset (CFO) which is inherent to the asynchrony between the communicating ends in a wireless link has a detrimental effect on the Doppler spread estimation. In this correspondence, we propose a new simple and accurate approach that copes with this issue by explicitly taking the CFO into account when estimating the Doppler spread. This new approach stems from the fact that the cross-correlation of the channel is a weighted summation of monochromatic plane waves (or an inverse Fourier transform of its power spectral density). It turns out that these plane waves are locally (as compared to the sampling rate) distributed around a main frequency which is nothing but the CFO. Using this property, we base our analysis on Taylor series expansions in addition to an observation temporal aperture to develop a two-ray spectrum approximate model for the Doppler spread estimation. We find that the Doppler spread is half of the frequency spacing between both rays which are located symmetrically around the CFO. Finally, we deduce new closed-form estimators for the Doppler spread and also for the CFO. These estimators are accurate and practical in environments with isotropic scattering where the channel power spectrum density (PSD) is symmetric. Simulations are provided to illustrate the advantages of the proposed method and its robustness to the CFO. [J114]

"Analysis of the Effects of Flicker on the Blood-Flow Variation in the Human Eye"

Flicker annoyance measurement, regardless if it is performed by processing the supplying voltage or by evaluating the light emitted by the lamp, relies on the assumption of a proper model of the behavior of the complex eye-brain system in the presence of fluctuating light. The only experimental data available are the ones obtained, for a certain incandescent lamp, by asking several people to report their perception about the flicker to which they were subjected. In this paper, the possibility of achieving an ldquoobjectiverdquo evaluation of the flicker effects on a human subject is investigated. In particular, the increment of the blood flow in a vessel at the optic nerve is considered and taken as a possible index of annoyance due to flicker. [J115]

"Numerical Study of Doppler Dynamics in Self-Mixing Semiconductor Lasers"

We present a new approach for performing numerical simulations of optical feedback semiconductor lasers for moving targets. The derived rate equation for the complex electric field is suitable for the numerical analysis of the dynamics in a self-mixing semiconductor laser with a Doppler frequency shift. We present numerical examples calculated using the rate equations. [J116]

"Adaptive Polarization Contrast Techniques for Through-Wall Microwave Imaging Applications"

In this paper, we describe and utilize polarization contrast techniques of the adaptive polarization difference imaging algorithm and its transient modification for through-wall microwave imaging (TWMI) applications. Originally developed for optical imaging and sensing of polarization information in nature, this algorithm is modified to serve for target detection purposes in a through-wall environment. The proposed techniques exploit the polarization statistics of the observed scene for the detection and identification of changes within the scene and are not only capable of mitigating and substantially removing the wall effects but also useful in detecting motion, when conventional Doppler techniques are not applicable. Applications of the techniques to several TWMI scenarios including both homogeneous and periodic wall cases are presented. [J117]

"Three-dimensional reconstruction of the "bright ring" echogenicity from porcine blood upstream in a stenosed tube"

To investigate the echogenicity variation due to blood flow disturbance near a stenosis under pulsatile flow, a series of in vitro experiments were performed in a rigid tube with an eccentric stenosis of 70% area reduction in a mock flow loop. An ultrasonic B-mode with a Doppler spectrogram was used to correlate echogenicity with flow speed and stroke rate. This paper reports echogenicity variation upstream of a stenosis under pulsatile flow. The experimental results showed that blood flow disturbed by the stenosis affects echogenicity and red blood cell rouleaux upstream. A hypoechoic ldquoblack holerdquo was shown at the center of the stream at systole. During diastole, the ldquobright ringrdquo in cross-sectional images was observed as eddy-like or parabolic profiles in longitudinal images. These images could be reconstructed into a 3-dimensional animation, providing a better understanding of dynamic changes of the rouleaux distribution upstream of a stenosis under pulsatile flow. [J118]

"Magnetoelastic/piezoelectric laminated structures for tunable remote contactless magnetic sensing and energy harvesting"

In this letter, we report a method for a tunable magnetic field sensor based on the magnetoelastic coupling properties of a magnetoelastic/piezoelectric laminated composite structure. The magnetically and elastically tunable, flexural resonant mode in the bimorph FeNi36% (invar)/polyvinylidene fluoride clamped bilayer has been investigated by Doppler laser spectroscopy. Here we demonstrate that this bimorph structure can be used for low-frequency contactless detection of magnetic field fluctuation and magnetic field monitoring. [J119]

"Injection Heights of Biomass Burning Debris Estimated From WSR-88D Radar Observations"

Understanding the vertical distribution of aerosols is critical to accurately determining their effects on air quality. Since current tools for obtaining this information have limited spatial and temporal coverage, we explore the use of Doppler radar data for obtaining the injection heights of biomass burning debris (BBD) produced from large fires in southern Georgia during Spring 2007. Due to their submicrometer sizes, the smoke aerosols are not detected by the radar. Therefore, we use BBD as a possible surrogate for aerosol height since smoke aerosols are often collocated with the debris. Using 32 h of Weather Surveillance Radar-1988 Doppler (WSR-88D) radar data from Jacksonville, FL, between May 23 and 25, 2007, the injection heights of BBD (D ~ 1mm) are calculated. Our analysis indicates that the maximum injection height is ~5 km for the strongest fire, with a mean injection height of 3 plusmn 1.0 km. Maximum injection heights are present between 1800 and 0000 UTC, during the late afternoon periods when both the intensity of the fire (based on radar information) and the convective

mixing are greatest. The injection heights estimated from this approach represent the first step at providing inputs for future air-quality forecasting applications within numerical simulations, particularly ones that require diurnal information. [J120]

"Doppler frequency up conversion of electromagnetic waves in a slotline on an optically excited silicon substrate"

The Doppler frequency up conversion of microwaves in a slotline on an optically excited silicon substrate was experimentally observed. An array of 24 optical fibers with different lengths was used to effectively tilt the wave front of a 532 nm neodymium-doped yttrium aluminum garnet laser beam with a pulse duration of 33 ps. The tilted laser beam produced electron-hole surface plasma whose boundary moved at a relativistic velocity of about c/3.4(cis the speed of light) along the slotline. The experiments showed that microwaves reflected at the moving boundary of the plasma in the slotline are converted to millimeter waves with a frequency up conversion ratio of 3.82. [J121]

"Prolog to On the Complexity of the Verification of the Costas Property"

This is an introduction to the above titled paper. [J122]

"Improvement of high-frequency surface waves radar performances by use of multiple-input multiple-output configurations"

A multiple-input multiple-output (MIMO) configuration has been studied for communication applications, offering a lot of advantages to mitigate propagation effects because of multipath and fading environments. More recently, MIMO techniques in radar have been proposed. MIMO is discussed in the context of high-frequency surface waves radar (HFSWR). After a short introduction to the MIMO radar technique (a technique which is not new; the RIAS developed by ONERA was probably the first MIMO radar), explores two different applications are explored. The first application aims at improving the resolution and accuracy of a coastal radar, proposed here in a bistatic configuration. Such a radar operates with a wide sparse frequency band and with an equivalent wide aperture, taking advantage of the MIMO configuration. Simulation over a congested area of targets demonstrates the benefit of MIMO over the conventional HFSWR radar, especially in terms of separation of targets. The second application consists in a more practical ship-borne HFWSR configuration compatible with space time adaptive processing (STAP) to improve the detection of slow targets. In this case, a limited number of receiving channels is considered whereas STAP uses the degrees of freedom offered by the transmitting array. The MIMO-STAP is compared with a conventional STAP, showing that theoretical performances should not be affected by the MIMO configuration even if the signals are no longer perfectly orthogonal, because of Doppler shift, once scattered by moving targets. [J123]

"In-band interference reduction in FMCW channel data using Prony modelling"

He is shown that Prony modelling can be used to reduce the effect of in-band interference in frequency modulated continuous-wave (FMCW) channel data. Results of the modelling are examined by comparing average power delay profiles and Doppler spectra with those obtained from FFT processing. [J124]

"Effect of Die-Bonding Process on MEMS Device Performance: System-Level Modeling and Experimental Verification"

This paper presents a distributed nodal method (DNM) for compact modeling of the package-device interaction of microelectromechanical systems (MEMS). MEMS devices have movable structures that are sensitive to structural stresses and easily influenced by package structures and environmental parameters. Hence, it is necessary to include the packaged behavior of MEMS into a compact simulation tool with acceptable precision. The conventional nodal method is therefore modified to achieve this purpose. A node with distributed nodal quantities is defined to describe the distributed interactions among the device, package, and environmental temperature. Based on the definition, the related processes of element partition, nodal matrix formation, and element assembly have been demonstrated. The case of a die-bonded microbridge has been used as an example, since the microbridge is not only a typical MEMS structure but also is influenced easily by structural stresses. The DNM model is validated first by a finite-element method (FEM) simulation, then by two individual experiments, including the measurement of die warpage using a digital image correlation system and the detection of shifted natural frequencies of surface-micromachined bridges using a laser Doppler vibrometer system, both after die bonding. The FEM and test results agree with those evaluated by the model with a relative error of less than 10%. Stress alleviation of the test structure has been unintentionally achieved by die bonding, leading to relative shifts of 12%-26% and 19%-26% of the first and third natural frequencies of the

microbridges. The packaged behavior also exhibits an evident distributed feature along the die surface as expected. Although, at current stage, the application of the DNM is still limited to static domain, it shows potential in developing hierarchical models of MEMS devices including the package. [J125]

"Optimizing Pilot Locations Using Feedback in OFDM Systems"

Pilot-aided orthogonal frequency-division multiplexing (OFDM) channel estimation has, so far, been optimized only for open-loop systems for which the uniform spacing of pilots is optimal. In this paper, we examine closed-loop OFDM systems and show how uniform pilots may no longer be optimal. In doing so, we propose a feedback technique in which the pilot allocation mechanism is adapted to the mobile channel. After deriving a general expression for the symbol error rate as a function of pilot allocation, we optimize the pilot locations and propose two practical solutions using bounds on the objective function. We proceed to formulate pilot allocation based on the maximal average OFDM channel capacity. We examine the feedback overhead that is associated with our method and make comparisons with the conventional uniform framework. Finally, we suggest the use of vector quantization in the context of the generalized Lloyd algorithm to reduce feedback and extend our method to a multiple-input-multiple-output (MIMO)-OFDM system based on the Alamouti space-time block code. Monte-Carlo simulations illustrate the error-rate/capacity performance gains via nonuniform pilots and illustrate the effects of Doppler frequency and carrier frequency offset. [J126]

"Cross-Layer Performance Study of Cooperative Diversity System With ARQ"

In this paper, a cross-layer design of a wireless communication system is proposed by considering a quadrature signaling (QS)-based cooperative diversity (CD) system employing truncated stop-and-wait automatic repeat request (ARQ) for error control. The proposed CD-ARQ scheme employs selection relaying at the partner, and all the transmission channels are assumed to exhibit Nakagami-m fading. To analyze the cross-layer performance of the proposed scheme, a Markov model is developed by capturing the effects of correlated transmission errors of the Nakagami-m fading cooperative channels. Based on the analysis, the effective cooperative channel of QS-CD-ARQ is uncorrelated when the normalized Doppler shift of at least one of the user-to-destination channels is higher than 0.2. Performance metrics (e.g., channel efficiency, packet loss rate, throughput, average delay, and jitter) are taken into account in the study. Our numerical results show that the QS-CD-ARQ scheme outperforms both an incremental-relaying-based CD system and a non-cooperative system if the average of the received signal is higher than the receiver sensitivity and if the channel between users is better than the direct transmission channel. In addition, QS-CD-ARQ provides the lowest packet loss rate with the lowest delay among all the schemes for any number of maximum retry limits. Moreover, compared with a scheme that employs incremental relaying, the proposed QS-CD-ARQ scheme is less complex to implement. [J127]

"An Analysis of Probability Distribution of Doppler Shift in Three-Dimensional Mobile Radio Environments"

The Doppler shift (DS) distribution of the signal that is received by a mobile station in 3D mobile radio environments is closely related to the signal's power spectral density (PSD). From the relationship between the arriving angles and the DS, general equations are derived, bridging the probability density function (pdf) of the elevation angle with the pdf of the DS, its variance, and the characteristic function. These equations are then used to analyze the statistic distribution of the DS based on the semispheroid model, which has been recently proposed by Janaswamy. For this particular model, analytical expressions for the pdf and the variance of the DS have been derived, and a definite-integral expression is provided for the characteristic function. When the average strengths of the waves that are distributed on different equal-Doppler-shift surfaces are assumed to be equal, the derived pdf of the DS is equivalent to the signal's PSD, and the derived characteristic function of the DS is equivalent to the signal's autocorrelation function. [J128]

"A Novel SFBC-OFDM Scheme for Doubly Selective Channels"

Effective intercarrier interference (ICI) mitigation for multiple-input-multiple-output orthogonal frequency-division multiplexing (MIMO-OFDM) requires accurate channel estimation, which is very challenging due to the large number and fast time-varying nature of the channel parameters to be estimated using scattered pilots. We present a novel space-frequency block coding OFDM (SFBC-OFDM) scheme for doubly selective channels and a reduced-complexity channel-estimation algorithm, which exploits the banded and sparse structure of the channel in the frequency and time domains, respectively. Furthermore, we design a finite-impulse-response minimum-mean-square-error (FIR-MMSE) ICI cancellation algorithm for mobile SFBC-OFDM and demonstrate its effectiveness for digital video broadcasting-handheld (DVB-H) systems. [J129]

"The Effect Effect"

Scientists and technologists have long used the word effect-as in the Doppler effect, the butterfly effect, and the greenhouse effect-to good effect. In fact, effect has been so, uh, effective at naming things that it has branched out into the mainstream. [J130]

"The Influence of Emitter and Receiver Motion on Acoustic Coherence in Shallow Water"

This paper is aimed at studying the source and receiver motion effects on the energy and correlation characteristics of the acoustic field in shallow water. The statistical analysis is based on the radiation transport equation for the mutual coherence function (MCF) of the multimodal Doppler-shifted field. A general computer program has been elaborated to implement this theory for rough surface scattering by fully developed wind seas. Calculations of the expected total average acoustic intensity and two-point coherence function are presented. [J131]

"Optimized training and basis expansion model parameters for doubly-selective channel estimation"

We address the problem of estimating doubly-selective channels using pilot clusters that are time-division multiplexed with the data. The pilot clusters consist of zero-padded pilot symbols in order to decouple channel estimation from data detection. Channel estimation is carried out using the basis expansion model (BEM-)based method, where different BEMs are investigated, and the exact MMSE method which requires full knowledge of the channel statistics. For a fixed number of pilot symbols, we attempt to optimize the power and placement of the pilot symbols at the transmitter side used in transmission, and the number of BEM coefficients used in channel estimation, in the sense of minimizing the total mean-square estimation error (MSE) that includes modelling error. Simulation results confirm that for a wide range of SNR and Doppler spread values, this optimization greatly reduces the MSE and the bit-error rate, and that modelling error, which was ignored in existing work on training design, should be taken into account. The effects of uncertainty in the channel statistics are also studied. [J132]

"Diversity Gains of Power Control With Noisy CSIT in MIMO Channels"

A multi antenna channel with partial channel state information at the transmitter (CSIT) is studied. The partial CSIT takes the form of the channel matrix corrupted by additive white Gaussian noise (AWGN) with a variance that is assumed to decay as a power of the signal-to-noise ratio (SNR). It is shown that under a long-term power constraint and in the regime of asymptotically high SNR, a large diversity gain over the channel can be achieved by using rarely a high power at the transmitter that compensates for bad channel realizations. Examples relating the diversity gain of the systems with the channel Doppler bandwidth are discussed. [J133]

"Application of the radon transform to detect small-targets in sea clutter"

The authors present a novel and heuristic approach for the detection of low radar cross-section targets in high-resolution sea clutter. The proposed technique is based on the application of the Radon transform to range-time matrices formed by column-wise storage of consecutive range profiles. The objective of this paper is 2-fold: to analyse the effect of the transform on real high-resolution sea clutter and to describe a detection scheme based on the insight obtained. The proposed technique emulates the behaviour of traditional motion target detection algorithms without the need for reliable Doppler information. It also constitutes a powerful non-coherent integration strategy of the target-s energy along its specific path on the range-time plot. The performance of the detection technique has been tested against real high-resolution sea clutter data, acquired at the south coast of Spain with an in-house developed continuous wave linear frequency modulated millimetre-wave radar system. Monte Carlo simulations show a significant improvement over the conventional cell averaging constant false alarm rate schemes. [J134]

"Limited Feedback Beamforming Over Temporally-Correlated Channels"

Feedback of quantized channel state information (CSI), called limited feedback, enables transmit beamforming in multiple-input-multiple-output (MIMO) wireless systems with a small amount of overhead. Due to its efficiency, beamforming with limited feedback has been adopted in several wireless communication standards. Prior work on limited feedback commonly adopts the block fading channel model where temporal correlation in wireless channels is neglected. In this paper, we consider temporally correlated channels and design single-user transmit beamforming with limited feedback. Analytical results concerning CSI feedback are derived by modeling quantized CSI as a first-order finite-state Markov chain. These results include the information rate of the CSI quantizer output, the bit rate a CSI feedback channel is required to support, and the effect of feedback delay on

throughput. In particular, based on the theory of Markov chain convergence rate, feedback delay is proved to reduce the throughput gain due to CSI feedback at least exponentially. Furthermore, an algorithm is proposed for CSI feedback compression in time. Combining the results in this work leads to a new method for designing limited feedback beamforming as demonstrated by a design example. [J135]

"In vivo validation of a blood vector velocity estimator with MR angiography"

Conventional Doppler methods for blood velocity estimation only estimate the velocity component along the ultrasound beam direction. This implies that a Doppler angle under examination close to 90deg results in unreliable information about the true blood direction and blood velocity. The novel method transverse oscillation (TO), which combines estimates of the axial and the transverse velocity components in the scan plane, makes it possible to estimate the vector velocity of the blood regardless of the Doppler angle. The present study evaluates the TO method with magnetic resonance phase contrast angiography (MRA) by comparing in vivo measurements of stroke volume. Eleven healthy volunteers were included in this prospective study. From the obtained data sets recorded with the 2 modalities, vector velocity sequences were constructed and stroke volume calculated. Angle of insonation was approximately 90deg for TO measurements. The correlation between the stroke volume estimated by TO and MRA was 0.91 ($p<0.01$) with the equation for the line of regression: MRA=1.1ldrTO-0.4. A Bland-Altman plot was additionally constructed where the mean difference was 0.2 ml with limits of agreement at -1.4 ml and 1.9 ml. The results indicate that reliable vector velocity estimates can be obtained in vivo using the presented angle-independent 2-D vector velocity method. The TO method can be a useful alternative to conventional Doppler systems by avoiding the angle artifact, thus giving quantitative velocity information. [J136]

"Phase-Coded Waveforms and Their Design"

The design of radar waveforms has received considerable attention since the 1950s. In 1953, P.M. Woodward (1953; 1953) defined the narrowband radar ambiguity function or, simply, ambiguity function. It is a device formulated to describe the effects of range and Doppler on matched filter receivers. Woodward acknowledged the influence that Shannon's communication theory from 1948 had on his ideas; and he explained the relevance of ambiguity in radar signal processing, perhaps best conceived in terms of a form of the uncertainty principle (see the sections "Motivation" and "Ambiguity Functions"). However, in the 50 or so years since Woodward's book was published, radar signal processing has used the ambiguity function as an intricate and flexible tool in the design of waveforms to solve diverse problems in radar. In the process, substantial connections were established in mathematics, physics, and other areas of signal processing. As such, we are introducing two new methods, discussed in sections "CAZAC Sequences" and "Aperiodic Simulations". [J137]

"A multichannel, frequency-modulated, tunable Doppler backscattering and reflectometry system"

A novel multichannel Doppler backscattering system has been designed and tested for application on the DIII-D [J. L. Luxon, Fusion Sci. Technol. 48, 828 (2005)] and National Spherical Torus Experiment (NSTX) [M. Ono etal, Nucl. Fusion 40, 557 (2000)] fusion plasma devices. Doppler backscattering measures localized intermediate wavenumber (k rho i 1-4,k 2-15cm-1)density fluctuations and the propagation velocity of turbulent structures. Microwave radiation is launched at a frequency that approaches a cutoff layer in the plasma and at an angle that is oblique to the cutoff layer. Bragg backscattering occurs near the cutoff layer for fluctuations with k ≈-2ki, where kiis the incident probe wave vector at the scattering location. The turbulence propagation velocity can be determined from the Doppler shift in the return signal together with knowledge of the scattering wavenumber. Ray tracing simulations are used to determine k and the scattering location. Frequency modulation of a voltage-controlled solid state microwave source followed by frequency multiplication is used to create an array of finely spaced (Delta f=350MHz)frequencies spanning 1.4 GHz. The center of the array bandwidth is tunable within the range of 53-78GHz. This article details the system design, laboratory tests, and presents initial data from DIII-D plasmas. [J138]

"Adaptive ground clutter suppression for conformal array radar systems"

Conformal arrays (CFAs) possess certain desirable characteristics for deployment on unmanned aerial vehicles and other payload-limited platforms. However, the CFA non-planar geometry induces clutter non-stationarity, resulting in elevated signal-to-interference-plus-noise ratio (SINR) loss when applying conventional space-time adaptive processing (STAP) algorithms. Non-stationary clutter leads to covariance matrix estimation error and, consequently, an erroneous STAP frequency response. In this study, the authors examine two practical conformal antenna configurations: a belly-mounted canoe and a nose-mounted, chined shape. Using high-fidelity signal models, the authors show traditional STAP losses in excess of 10-dB because of the effects of clutter non-stationarity. The authors then investigate a number of ameliorating techniques compatible with standard

STAP implementation, including localised processing, localised processing with time-varying weights, equivalent uniform linear array transformation, angle-Doppler warping and higher-order angle-Doppler warping. The authors demonstrate very good performance for the higher-order angle-Doppler warping method applied to the chined radome shape, with peak adaptive SINR losses reduced from nearly 16-dB for the uncompensated case to 3-dB of loss consistent with performance attainable in a homogeneous clutter environment. The authors also find good performance for three-dimensional angle-Doppler warping over azimuth, elevation and Doppler when applied to the tapered canoe shape, with uncompensated losses of roughly 14-dB reduced to 3-dB, again a level compatible with STAP applied in a homogeneous clutter environment. The authors thus show that CFA STAP can yield performance similar to that of a conventional planar array when using appropriate compensation methods. [J139]

"Small single-crystal silicon cantilevers formed by crystal facets for atomic force microscopy"

We have developed a batch fabrication method of small cantilevers formed by crystal facets of single-crystal silicon for improving the sensitivity of atomic force microscopy. In order to realize a small cantilever with a very sharp tip, we have employed KOH anisotropic etching and local oxidation of silicon. We have made two types of small cantilevers, the V-shaped triangular type and the bulk triangular type. The length of each cantilever is 20mcm. The tip of the V-shaped type is bridged by two wires with thickness of 0.6mcm. The bulk triangular type has a thickness of 1.5mcm. The frequency characteristics of the cantilevers vibrated using photothermal excitation were measured by laser Doppler velocimetry. The resonance frequency of the V-shaped type and the bulk triangular type were 687 kHz and 8.42 MHz, and their spring constants are estimated to be 0.7 N/m and 370 N/m, respectively. [J140]

"Radar Signature of a Helicopter Illuminated by a Long LFM Signal"

Helicopters exhibit a very particular Doppler radar signature caused by the movement of rotor blades. This signature can easily be derived using a short-time approximation: the blades are assumed to be static during each pulse. In wideband linear frequency modulated (LFM) radars, however, this assumption cannot be made. The work presented here describes the echo of rotary blades illuminated by LFM radars without the short-time assumption and provides useful information for detection and recognition purposes. [J141]

"Performance of Feedback Cancellers for T-DMB On-Channel Repeaters"

This paper presents a feedback canceller (FC) for T-DMB repeaters. Though the conventional FC of T-DMB repeaters has a good feedback cancellation performance, it distorts the recovered signal's out-band spectrum. This spectrum distortion problem is very crucial for commercializing T-DMB repeaters. The feedback canceller with pre-whitening filters (PWFs), which estimates the feedback channel using whitened input signals, can compensate this spectrum problem. However the feedback canceling performance degradation occurs when the feedback channel varies with Doppler effects. To compensate the out-band spectrum distortion and cope with the variation of feedback channel, we propose a novel FC based on the convex combination algorithm. Simulation results show that the proposed FC can remove clearly the out-band spectrum distortion of the recovered signal with improved the feedback canceling performance in both time-invariant and time-varying feedback channels. [J142]

"Channel Coding for Progressive Images in a 2-D Time-Frequency OFDM Block With Channel Estimation Errors"

Coding and diversity are very effective techniques for improving transmission reliability in a mobile wireless environment. The use of diversity is particularly important for multimedia communications over fading channels. In this work, we study the transmission of progressive image bitstreams using channel coding in a 2D time-frequency resource block in an OFDM network, employing time and frequency diversities simultaneously. In particular, in the frequency domain, based on the order of diversity and the correlation of individual subcarriers, we construct symmetric n-channel FEC-based multiple descriptions using channel erasure codes combined with embedded image coding. In the time domain, a concatenation of RCPC codes and CRC codes is employed to protect individual descriptions. We consider the physical channel conditions arising from various coherence bandwidths and coherence times, leading to a range of orders of diversities available in the time and frequency domains. We investigate the effects of different error patterns on the delivered image quality due to various fade rates. We also study the tradeoffs and compare the relative effectiveness associated with the use of erasure codes in the frequency domain and convolutional codes in the time domain under different physical environments. Both the effects of intercarrier interference and channel estimation errors are included in our study. Specifically, the effects of channel estimation errors, frequency selectivity and the rate of the channel variations are taken into consideration for the construction of the 2D time-frequency block. We provide results

showing the gain that the proposed model achieves compared to a system without temporal coding. In one example, for a system experiencing flat fading, low Doppler, and imperfect CSI, we find that the increase in PSNR compared to a system without time diversity is as much as 9.4 dB. [J143]

"Use of IR pyrometry to measure free-surface temperatures of partially melted tin as a function of shock pressure"

Equilibrium equation of state theory predicts that the free-surface release temperature of shock-loaded tin will show a plateau at 505 K in the stress range from 19.5 to 33.0 GPa, corresponding to the solid-liquid, mixed-phase region of tin. In this paper we report free-surface temperature measurements on shock-loaded tin from 15 to 31 GPa using multiwavelength optical pyrometry. The shock waves were generated by direct contact of detonating high explosive with a tin sample, and the stress in the sample was determined by free-surface velocity measurements using photon Doppler velocimetry. We measured the emitted thermal radiance in the near IR region at four wavelengths from 1.5 to 5.0mcm. Above 25 GPa the measured free-surface temperatures were higher than the predicted 505 K, and they increased with increasing stress. This deviation may be explained by hot spots and/or variations in surface emissivity, and it may indicate a weakness in the use of a simple analysis of multiwavelength pyrometry data for conditions, such as above the melt threshold, where hot spots or emissivity variations may be significant. We are continuing to study the discrepancy to determine its cause. [J144]

"Approximate ML Doppler Spread Estimation Over Flat Rayleigh Fading Channels"

The maximum likelihood (ML) Doppler spread estimator provides an accurate estimation performance; however, it results in a much higher computation cost. In this work, we propose a time-domain approximate-ML estimator that significantly reduces the computational complexity of the ML estimator over a flat Rayleigh fading channel. Simulation results show that the proposed method nearly achieves the exact ML performance. Moreover, by using a small number of observation samples, our proposed method gives almost unbiased Doppler spread estimation for low to medium user mobility. [J145]

"Characterization of time variation on 1.9 GHz fixed wireless channels in suburban macrocell environments"

We observed temporal fading on 1.9 GHz fixed wireless channels during short-term measurements at 107 different locations in a suburban macrocell environment characterized by flat terrain and heavy foliage in order to determine how the rate of fading varies with average wind speed and distance. For each location, we estimated: (1) the Ricean K-factor using a moment-based estimator and (2) an equivalent Doppler frequency which is related to the maximum Doppler frequency by a factor that depends upon the shape of the Doppler spectrum. We did so by fitting the measured level crossing rate (LCR) and average fade duration (AFD) distributions to expressions normally justified for mobile wireless links using a method recently proposed by Feick, Valenzuela and Ahumada (2007). As has been observed at other sites, the Ricean K-factor decreased with both average wind speed and distance. However, we found that the equivalent Doppler frequency was effectively uncorrelated with wind speed and noticeably increased with distance. Similar measurements at other sites will be required to determine the extent to which these trends are affected by foliage density and tower height. [J146]

"Orbit Accuracy Requirement for ABYSS: The Space Station Radar Altimeter to Map Global Bathymetry"

The Altimetric Bathymetry from Surface Slopes (ABYSS), which is the proposed science payload on the International Space Station (ISS), is a Johns Hopkins University Applied Physics Laboratory-developed flight-proved delay-Doppler phase-monopulse radar altimeter capable of measuring ocean surface slope in the 6-200-km half-wavelength frequency band range with an accuracy of 0.5 mu rad, with autonomous gimbal control to compensate for the ISS structural motions. This measurement allows an improved mapping of the global bathymetry, enabling a wide range of scientific research works and applications. The nonrepeat ISS orbital ground track is ideal for ABYSS. This letter describes a simulation study on the effects of the Earth's gravity field and other errors, including thermal bending of the ISS, on the orbit determination of the altimeter instrument antenna phase center location, fulfilling the science objectives of ABYSS. Our study concluded that the error due to mean gravity field is no longer limiting due primarily to the recent Gravity Recovery and Climate Experiment gravity modeling and that the ABYSS/ISS radial orbit slope error budget in the presence of various force and measurement model errors is estimated at the 0.2-mu rad root-sum-squared (RSS) level, which satisfies the ABYSS orbit accuracy science requirement to provide an improved mapping of global bathymetry. [J147]

"Time-varying carrier offsets in mobile OFDM"

A carrier offset in OFDM system simulation is generally considered to be slowly time-varying, so that, over short simulation periods, it may be considered to be a constant quantity. However, depending on system mobility, carrier frequency, and communication duration, time-varying carrier offsets caused by Doppler effects can be significant in a real physical environment. Few researchers have addressed this in their works. Of those who have addressed this, many present simplified, vague, or inaccurate time-varying carrier offset models. In this paper, we present a more realistic time-varying carrier offset model and present expressions for carrier offset correction that maximize the signal-to-interference ratio (SIR). We also provide guidelines for when the application of the time-varying carrier offset model is crucial for correct OFDM system evaluation. [J148]

"A survey on vehicle-to-vehicle propagation channels"

Traffic telematics applications are currently under intense research and development for making transportation safer, more efficient, and more environmentally friendly. Reliable traffic telematics applications and services require vehicle-to-vehicle wireless communications that can provide robust connectivity, typically at data rates between 1 and 10 Mb/s. The development of such VTV communications systems and standards require, in turn, accurate models for the VTV propagation channel. A key characteristic of VTV channels is their temporal variability and inherent non-stationarity, which has major impact on data packet transmission reliability and latency. This article provides an overview of existing VTV channel measurement campaigns in a variety of important environments, and the channel characteristics (such as delay spreads and Doppler spreads) therein. We also describe the most commonly used channel modeling approaches for VTV channels: statistical as well as geometry-based channel models have been developed based on measurements and intuitive insights. Extensive references are provided. [J149]

"Functional changes in arteries induced by pulsed high-intensity focused ultrasound"

Continuous high-intensity focused ultrasound (HIFU) at various intensities has been shown to induce functional changes in arteries. The objective of the current study was to investigate the functional changes in arteries when pulsed HIFU is used at various acoustic power levels. Sonication was applied at an ultrasound frequency of 1 MHz with a burst length of 50 ms and a repetition frequency of 1 Hz. The duration of the whole sonication was 6 s. The femoral arteries and abdominal aortas of Sprague-Dawley rats were surgically exposed and sonicated with pulsed HIFU; the pulsed-HIFU beam was aimed using color images of the blood flow. The peak systolic velocity (PSV) of the blood flow, as measured by Doppler velocimetry, increased in the arteries to which pulsed HIFU had been applied at acoustic powers of 15, 30, and 45 W. The increase in PSV was correlated with the acoustic power of the pulsed HIFU. The temperatures recorded by the thermocouples placed above and below the aorta surfaces did not change significantly during the sonication. Furthermore, no histological changes were found and the vessel wall showed no obvious temperature rise. Therefore, our results indicate that the functional changes induced by pulsed-HIFU exposure are mainly due to mechanical effects. [J150]

"Analysis of Stepped-Frequency Pulse Train Design"

For uniform frequency stepped pulse trains, there can be undesirable peaks of the autocorrelation function, known as "grating lobes." In this paper we address this issue, using an approach which allows us to suppress grating lobes in the case of appropriately chosen stepped-frequency waveforms, i.e., sequences of narrowband pulses that span the desired bandwidth. We introduce a multiparametric generalization of a stepped-frequency train, and by exploiting a factorization of the autocorrelation function, will be able to effect a useful tradeoff between competing properties of the factors by careful choices of relevant parameters. We provide a detailed description of the method applied to a representative data set. [J151]

"A Phase-Domain All-Digital Phase-Locked Loop Architecture Without Reference Clock Retiming"

State-of-the-art phase-domain all-digital phase-locked loops (ADPLLs) require a retimed reference clock to synchronize the digitally controlled oscillator (DCO) output frequency and the reference clock frequency. Therefore, the entire digital logic is operated with a periodically nonuniform clock. Due to on-chip coupling effects, the DCO output frequency is pulled with the edges of the retimed reference clock, producing undesired spurs in the phase noise power spectrum. In this brief, we analyze and classify the spur generation from a signal processing point of view and propose an alternative ADPLL implementation that abandons the retiming mechanism. Thus, the entire ADPLL can be clocked with a uniform reference clock, and consequently, side spurs are avoided. Behavioral simulations verify the spur analysis and emphasize the improved behavior of the proposed synchronous reference architecture. [J152]

"Nanoscale CMOS Transceiver Design in the 90-170-GHz Range"

This paper reviews recent research conducted at the University of Toronto on the development of CMOS transceivers aimed at operation in the 90-170-GHz range. Unique nanoscale CMOS issues related to millimeter-wave circuit design in the 65-nm node and beyond are addressed with an emphasis on transistor and top-level layout issues, low-voltage circuit topologies, and design flow. A Doppler transceiver and two receivers fabricated in a 65-nm GPLP CMOS technology are described, along with a single pole, double throw antenna switch with better than 5-dB insertion loss and 25-dB isolation in the entire 110-170-GHz band. The first receiver has an IQ architecture with a fundamental frequency voltage-controlled oscillator, and is intended for wideband passive imaging applications at 100 GHz. The measured noise figure and downconversion gain are 7-8 and 10.5 dB, respectively, while the 3-dB bandwidth extends from 85 to 100 GHz. The second receiver has double-sideband architecture, operates in the 135-145-GHz range (the highest for CMOS receivers), and features an 8-dB gain LNA, a double-balanced Gilbert cell mixer, and a dipole antenna. The 90-94-GHz Doppler transceiver, the highest frequency reported to date in CMOS, is intended for the remote monitoring of respiratory functions. A Doppler shift of 30 Hz, produced by a slow-moving (4.8 cm/s) target located at a distance of 1 m, was measured with a transmitter output power of approximately + 2 dBm and a phase noise of -90 dBc/Hz at 1 MHz offset. The range correlation effect is demonstrated for the first time in CMOS by measuring the phase noise of the received baseband signal at 10-Hz offset, clearly indicating that 1/fnoise has been canceled and it does not pose a problem in short-range applications, where neither a phase-locked loop nor a frequency divider are needed. [J153]

"Modulation of propagation characteristics of spin waves induced by perpendicular electric currents"

We have theoretically and numerically investigated the effect of perpendicular currents on the propagation characteristics of spin waves on a wire composing the free layer of a spin valve. Our theory shows that the single Slonczewski's spin-transfer torque can cause the spin-wave Doppler effect and modify the spin-wave attenuation and that the fieldlike torque makes negligible contribution due to its relatively small magnitude. Micromagnetic simulations confirm these theoretical predictions and further reveal that spin waves at suprathreshold currents are instable and become chaotic with increased time. Finally, selective tuning of the spin-wave attenuation is demonstrated by using local, individual currents. [J154]

"OFDMA uplink frequency offset estimation via cooperative relaying"

Frequency offset estimation for an orthogonal frequency-division multiple access (OFDMA) uplink for amplify-and-forward (AF) relays and a new type of relay (R) called decode-and-compensate-and-forward (DcF) relays are studied. Multiple relays are considered, and the relay with the best S rarr R channel is chosen to perform re-transmission, where S and R represent the source and relay nodes, respectively. Frequency offsets due to the mismatches between the transmitter and receiver oscillators are considered, and without considering the effect of Doppler shift, both S rarr D and S rarr R rarr D links have the same frequency offset, where D represents the destination. Thus, by using these two transmissions, D generates two frequency offset estimates, which are combined to minimize the mean square error (MSE). Power allocation between S and R can be adaptively adjusted to optimize the cooperative scheme in terms of frequency offset error variance. When channel state information (CSI) is available at each mobile node, a scheme where the relays adaptively switch between the cooperative and conventional (no relaying) transmissions is proposed to optimize the frequency offset estimation. Although the frequency offset estimation accuracy in the DcF mode is somewhat worse than the AF mode, both modes outperform the conventional transmission. However, DcF (or decode-and-forward (DF)) relays outperform AF relays in terms of channel capacity and bit error rate (BER). [J155]

"MIMO-OFDM for High-Rate Underwater Acoustic Communications"

Multiple-input-multiple-output (MIMO) techniques have been actively pursued recently in underwater acoustic communications to increase the data rate over the bandwidth-limited channels. In this communication, we present a MIMO system design, where spatial multiplexing is applied with orthogonal-frequency-division-multiplexing (OFDM) signals. The proposed receiver works on a block-by-block basis, where null subcarriers are used for Doppler compensation, pilot subcarriers are used for channel estimation, and a MIMO detector consisting of a hybrid use of successive interference cancellation and soft minimum mean square error (MMSE) equalization is coupled with low-density parity-check (LDPC) channel decoding for iterative detection on each subcarrier. The proposed design has been tested using data recorded from three different experiments. A spectral efficiency of 3.5 b/s/Hz was approached in one experiment, while a data rate of 125.7 kb/s over a bandwidth of 62.5 kHz was achieved in another. These results suggest that MIMO-OFDM is an appealing solution for high-data-rate transmissions over underwater acoustic channels. [J156]

"Modeling and performance analysis of SAW reader systems for delay-line sensors"

In this contribution, we present a comprehensive modeling approach for delay line-based surface acoustic wave (SAW) sensor reader systems, which provides valuable insight into the interaction of the individual system parameters. A parametric analysis of signal strength, noise, and quantization effects and consideration of important signal processing parameters, such as data windows and averaging, allows prediction of the achievable statistical measurement accuracy by closed-form solutions. The performance and capabilities of the derived model are verified on system design examples as well as multiple practical measurement scenarios, using a prototype 2.45-GHz frequency-stepped continuous-wave SAW reader system. [J157]

"Radial modulation of single microbubbles"

Radial modulation imaging is a new promising technique to improve contrast-enhanced ultrasound images. The method is based on dual-frequency insonation of contrast agent microbubbles. A low-frequency (LF) pulse is used to modulate the responses of the microbubbles to a high-frequency (HF) imaging pulse. Inverting the LF pulse induces amplitude and phase differences in the HF response of contrast agent microbubbles, which can be detected using Doppler techniques. Although the technique has been successfully implemented, no consensus persists on parameter choice and resulting effects. In a separate study, "compression-only" behavior of coated microbubbles was observed. Compression-only behavior could be beneficial for radial modulation imaging. This was investigated using high-speed camera recordings and simulations. We recorded the vibrations of 78 single microbubbles in a dual-frequency ultrasound field. The results showed that the LF pulse induced significant compression-only behavior, which for microbubble sizes below and at HF resonance resulted in high radial amplitude modulation. It, however, also appeared that, for radial modulation imaging, microbubble size is more important than resonance and compression-only effects. [J158]

"Depth-resolved positron annihilation studies of argon nanobubbles in aluminum"

The formation of Ar bubbles in Al has been investigated by using depth-resolved positron annihilation spectroscopy and transmission electron microscopy. Due to Ar bubble formation, the Doppler-broadening Sparameter decreases, while the Wparameter increases compared to the reference unimplanted Al sample. The effect of Ar ion fluence and annealing temperature on these parameters has been investigated. The presence of Ar at near-surface region has been confirmed by Rutherford backscattering spectroscopy. Transmission electron microscopy also shows that the Ar bubbles are in solid state with fcc structure after annealing at 870 K. The average diameter and lattice parameter of these solid Ar bubbles are estimated to be about 4±1nmand 0.495±0.005nm, respectively. [J159]

"Doppler Compensation & Single Pulse Imaging using Adaptive Pulse Compression"

The effects of target Doppler are addressed in relation to adaptive receive processing for radar pulse compression. To correct for Doppler-induced filter mismatch over a single pulse, the Doppler-compensated adaptive pulse compression (DC-APC) algorithm is presented whereby the respective Doppler shifts for large target returns are jointly estimated with the illuminated range profile and subsequently incorporated into the original APC adaptive receive filter formulation. As a result, the Doppler-mismatch-induced range sidelobes can be suppressed thereby regaining a significant portion of the sensitivity improvement that is possible when applying adaptive pulse compression (APC) without the existence of significant Doppler mismatch. In contrast, instead of compensating for Doppler mismatch, the single pulse imaging (SPI) algorithm generalizes the APC formulation for a bank of Doppler-shifted matched filters thereby producing a sidelobe-suppressed range-Doppler image from the return signal of a single radar pulse which is applicable for targets with substantial variation in Doppler. Both techniques are based on the recently proposed APC algorithm and its generalization, the multistatic adaptive pulse compression (MAPC) algorithm, which have been shown to be effective for the suppression of pulse compression range sidelobes thus dramatically increasing the sensitivity of pulse compression radar. [J160]

"Atomic-scale structural evolution in amorphous Nd 9 Fe 85 B 6 subjected to severe plastic deformation at room temperature"

Understanding the deformation-induced nanocrystallization in amorphous alloys at room temperature is proved to be a great challenge. In the present study, the formation of vacancy-type defects richly surrounded with Fe atoms in amorphous Nd9Fe85B6subjected to room-temperature high-pressure torsion deformation is directly evidenced by positron lifetime measurements combined with a coincident Doppler broadening measurement of the positron-electron annihilation photons. This demonstrates a direct experimental evidence for shear inducing the enrichment of Fe atoms in the deformed amorphous alloy. These results presented here are of importance for understanding the deformation-induced nanocrystallization and for the technique development of nanocrystalline materials. [J161]

"Effects of Non-Uniform Motion in Through-the-Wall SAR Imaging"

Synthetic aperture radar (SAR) provides high resolution images that are well suited for through-the-wall target detection and recognition. As targets behind-the-wall undergo non-uniform motions, such as vibration, rotation and acceleration, their patterns can be recognized. To understand these signatures in through-the-wall SAR, we model and analyze the non-uniform motion-induced Doppler effect as well as the focused target SAR image. In particular, the wall effects on the focused SAR image and the micro-Doppler are formulated and analyzed. These analyses facilitate improving the target recognition performance by quantitatively estimating the parameters of the micro-Doppler signatures as well as the SAR imaging. We further analyze the detection performance of the non-uniform motion-induced target based on the generalized likelihood ratio test (GLRT) technique. The relationship between motion parameters and the detection performance allows us to evaluate the performance bound and the minimum detectable parameters. [J162]

"3-D ultrasound guidance of autonomous robot for location of ferrous shrapnel"

Vibrations can be induced in ferromagnetic shrapnel by a variable electromagnet. Real time 3-D color Doppler ultrasound located the induced motion in a needle fragment and determined its 3-D position in the scanner coordinates. This information was used to guide a robot which moved a probe to touch the shrapnel fragment. [J163]

"Influence of thin porous Al 2 O 3 layer on aluminum cathode to the H alpha line shape in glow discharge"

The results of the Balmer alfa line shape study in a plane cathode-hollow anode Grimm discharge with aluminum (Al) cathode covered with thin layer of porous Al2O3are presented. The comparison with same line profile recorded with pure Al cathode shows lack of excessive Doppler broadened line wings, which are always detected in glow discharge with metal cathode. The effect is explained by the lack of strong electric field in the cathode sheath region, which is missing in the presence of thin oxide layer in, so called, spray discharge. [J164]

"Gas temperature measurement in C F 4, S F 6, O 2, Cl 2, and HBr inductively coupled plasmas"

Neutral gas temperature (Tg)is measured in an industrial high-density inductively coupled etch reactor operating in CF4, SF6, O2, Cl2, or HBr plasmas. Two laser diodes are used to deduce Tgfrom the Doppler widths of 772.38 and 811.5nmlines absorbed by Ar*(3P2)metastable atoms, when a small amount of argon (5%) is added to the gas flow. With the 811.5nmbeam passing parallel to the wafer, Tgnear the wafer surface is obtained by laser absorption technique. With the 772.38nmbeam entering the top of the reactor perpendicular to the wafer surface, the volume averaged temperature is deduced by laser induced fluorescence technique. The volume averaged Tgincreases with radio frequency power and with pressure, although the temperature near the walls is only weakly dependent on gas pressure. The main effect of increasing the pressure is an enhancement of the temperature gradient between the discharge center and the wall boundary. Due to the thermal accommodation, the authors always observe a significant temperature jump between the surface and the gas in its vicinity. This gap is typically about 200K. Gas temperatures for a wide range of pressure and rf powers are reported. These data will be useful to validate and improve numerical models of high-density reactive plasmas. [J165]

"Dynamic Radar Cross Section and Radar Doppler Measurements of Commercial General Electric Windmill Power Turbines Part 1: Predicted and Measured Radar Signatures"

Commercial windmill-driven power turbines ("wind turbines") are expanding in popularity and use in the commercial power industry, since they can generate significant electricity without using fuel or emitting carbon-dioxide ldquogreenhouse gasrdquo. In-country and near-off-shore wind turbines are becoming more common on the European continent. The United States has recently set long-term goals to generate 10% of national electric power using renewable sources. In order to make such turbines efficient, current 1.5 MW wind-turbine towers and rotors are very large, with blades exceeding 67 m in diameter, and tower heights exceeding 55 m. Newer 4.5 MW designs are expected to be even larger. The problem with such large, moving, metallic devices is the potential interference such structures present to an array of civilian air-traffic-control radars. A recent study by the Undersecretary of Defense for Space and Sensor Technology acknowledged the potential performance impact wind turbines introduce when located within line of site of air-traffic-control or air-route radars [Report to the Congressional Defense Committees on The Effect of Windmill Farms On Military Readiness, 2006]. In the spring of 2006, the Air Force Research Laboratory embarked on a rigorous measurement and prediction program to provide credible data to national decision makers on the magnitude of the signatures, so that the interference issues could be credibly studied. This paper, the first of two parts, will discuss the calibrated RCS measurement of the turbines, and compare this data (with its uncertainty) to modeled data. [J166]

"Carrier loop architectures for tracking weak GPS signals"

The performance of various carrier recovery loop architectures (phase lock loop (PLL), Doppler-aided PLL, frequency lock loop (FLL), and Doppler-aided FLL) in tracking weak GPS signals are analyzed and experimentally validated. The effects of phase or frequency detector design, oscillator quality, coherent averaging time, and external Doppler aiding information on delaying loss of lock are quantified. It is shown that for PLLs the metric of total phase jitter is a reliable metric for assessing low C/N performance of the tracking loop provided the loop bandwidth is not too small (~> 5 Hz). For loop bandwidths that are not too small, total phase jitter accurately predicts carrier-to-noise ratio (C/N) at which loss of lock occurs. This predicted C/N is very close to the C/N predicted by bit error rate (BER). However, unlike BER, total phase jitter can be computed in real-time and an estimator for it is developed and experimentally validated. Total phase jitter is not a replacement for BER, since at low bandwidths it is less accurate than BER in that the receiver loses lock at a higher C/N than predicted by the estimator. Similarly, for FLLs operating at small loop bandwidths, it is found that normalized total frequency jitter is not a reliable metric for assessing loss of lock in weak signal or low C/N conditions. At small loop bandwidths, while total frequency jitter may indicate that a loop is still tracking, the Doppler estimates provided by the FLL will be biased. [J167]

"Localization of Narrowband Radio Emitters Based on Doppler Frequency Shifts"

Several techniques for emitter localization based on the Doppler effect have been described in the literature. One example is the differential Doppler (DD) method in which the signal of a stationary emitter is intercepted by at least two moving receivers. The frequency difference between the receivers is measured at several locations along their trajectories and the emitter's position is then estimated based on these measurements. This two-step approach is suboptimal since each frequency difference measurement is performed independently, although all measurements correspond to a common emitter position. Instead, a single-step approach based on the maximum likelihood criterion is proposed here for both known and unknown waveforms. The position is determined directly from all the observations by a search in the position space. The method can only be used for narrowband signals, that is, under the assumption that the signal bandwidth must be small compared to the inverse of the propagation time between the receivers. Simulations show that the proposed method outperforms the DD method for weak signals while both methods converge to the Cramer-Rao bound for strong known signals. Finally, it is shown that in some cases of interest the proposed method inherently selects reliable observations while ignoring unreliable data. [J168]

"Assessing Aortic Stenosis Using Sample Entropy of the Phonocardiographic Signal in Dogs"

In aortic valve stenosis (AS), heart murmurs arise as an effect of turbulent blood flow distal to the obstructed valves. With increasing AS severity, the flow becomes more unstable, and the ensuing murmur becomes more complex. We hypothesize that these hemodynamic flow changes can be quantified based on the complexity of the phonocardiographic (PCG) signal. In this study, sample entropy (SampEn) was investigated as a measure of complexity using a dog model. Twenty-seven boxer dogs with various degrees of AS were examined with Doppler echocardiography, and the peak aortic flow velocity (Vmax) was used as a reference of AS severity. SampEn correlated to Vmaxwith R = 0.70 using logarithmic regression. In a separate analysis, significant differences were found between physiologic murmurs and murmurs caused by AS ($p < 0.05$), and the area under a receiver operating characteristic curve was calculated to 0.96. Comparison with previously presented PCG measures for AS assessment showed improved performance when using SampEn, especially for differentiation between physiological murmurs and murmurs caused by mild AS. Studies in patients will be needed to properly assess the technique in humans. [J169]

"Optical Frequency Standard by HI Doppler-Broadened Absorption and External-Cavity Laser Diode at 1.541"

An external-cavity laser diode was frequency locked on the molecular absorption line R(3) of hydrogen iodide at 1.541 mum using the wavelength-modulation technique. Stabilization is realized by means of two feedback loops acting on two different frequency ranges. Measurements of the closed-loop error signal provided a relative frequency stability of a few parts in 10-10in a 50-kHz acquisition bandwidth. [J170]

"Focusing Azimuth-Invariant Bistatic SAR Data With Chirp Scaling"

This letter presents a bistatic chirp scaling algorithm to processing the azimuth-invariant bistatic synthetic aperture radar data. Two methods are used to derive the different parts of the range-Doppler expression of the point target. Compared with the method relying on the two-order expansion of the bistatic range model, the new algorithm can give the close-form azimuth modulation. Through the introduction of the fractional Fourier

transform into the range processing, the resolutions are enhanced further. [J171]

"Study of Temperature Parameter in Au-Ag Wire Bonding"

The effect of the temperature on bondability and bonding process for wire bonding are investigated. Bondability is characterized by shear bonding strength and bonding process is represented by input and output power of ultrasonic transducer. A laser Doppler vibrometer and Labview software were used to record the velocity, voltage and current of transducer at different temperature settings. A K-type thermocouple sensor was used to measure the bonding temperature. Experimental results show that unsuccessful bonding happens at low temperature, and over bonding appears if the temperature is too high. Only when the temperature is at appropriate settings, can a stable and satisfied bondability be attained. The reason for this experimental observation is analyzed. By using a high resolution transmission electron microscope, the atom diffusion depth of Au-Ag bonding interface was measured and the result is about 200 nm. By using joint time-frequency analysis, the instantaneous characteristics of bonding process were observed completely and clearly. It is found that input and output ultrasonic power vs. time-frequency in a bonding process, including resonance frequency, harmonic components and amplitude of ultrasonic energy, vary along with the change of temperature settings. [J172]

"Multicarrier Communication Over Underwater Acoustic Channels With Nonuniform Doppler Shifts"

Underwater acoustic (UWA) channels are wideband in nature due to the small ratio of the carrier frequency to the signal bandwidth, which introduces frequency-dependent Doppler shifts. In this paper, we treat the channel as having a common Doppler scaling factor on all propagation paths, and propose a two-step approach to mitigating the Doppler effect: 1) nonuniform Doppler compensation via resampling that converts a "wideband" problem into a "narrowband" problem and 2) high-resolution uniform compensation of the residual Doppler. We focus on zero-padded orthogonal frequency-division multiplexing (OFDM) to minimize the transmission power. Null subcarriers are used to facilitate Doppler compensation, and pilot subcarriers are used for channel estimation. The receiver is based on block-by-block processing, and does not rely on channel dependence across OFDM blocks; thus, it is suitable for fast-varying UWA channels. The data from two shallow-water experiments near Woods Hole, MA, are used to demonstrate the receiver performance. Excellent performance results are obtained even when the transmitter and the receiver are moving at a relative speed of up to 10 kn, at which the Doppler shifts are greater than the OFDM subcarrier spacing. These results suggest that OFDM is a viable option for high-rate communications over wideband UWA channels with nonuniform Doppler shifts. [J173]

"Charging and Discharging of Oxide Defects in Reliability Issues"

Advances in the microelectronic design implicate a reduction of device dimensions requiring a better understanding of the microscopic processes involved. One of these processes concern charging and discharging of defects via tunneling, which is supposed to constitute a grave contribution to various ongoing reliability issues. A deep understanding and a correct modeling of this mechanism are of utmost importance in this context. Conventionally, tunneling levels are believed to remain at fixed positions within the oxide bandgap regardless whether they are occupied or not. From a theoretical point of view, defect energy levels undergo shifts within the silicon dioxide bandgap after charging or discharging. As a result, defect levels for tunneling into and out of traps have to be distinguished. Based on this understanding of trapping, defects can be characterized as fixed charges, switching oxide charges, interface traps, or other types of defects. In this study, we conduct first-principle investigations on the energetics for a series of individual defects encountered in the context of reliability. In order to deduce their tunneling dynamics, a new model, which accounts for the effects of shifting tunneling levels, has been established. On the basis of the Egamma'center, the main discrepancies between the model relying on trap level shifts and the model with coinciding trap levels have been highlighted. [J174]

"Adaptation of turbo coding and equalization in turbo equalization for time-varying and frequency-selective channels"

A number of authors have sought to combine equalization and decoding in an iterative system in order to reduce the effects of frequency and temporal dispersiveness of time-varying frequency-selective channels. In the recent literature, several architectures based on these iterative systems have been proposed. One can note architectures which combine a maximum a posteriori (MAP) equalizer and decoder, architectures formed by an interference canceller and MAP decoder, architectures implementing a decision feedback equalizer and a MAP decoder, etc. Most of these architectures require accurate channel estimation to adapt the equalizer filters or to execute the MAP equalizers. This article presents a turbo equalizer architecture for time-varying frequency-selective channels without channel estimators. The proposed turbo equalizer consists of an interference canceller in direct-adaptation mode and a turbo decoder. In order to reduce noise correlation, the addition of a transverse filter to the interference-canceller architecture is proposed. The reliability factor for variable time-varying

frequency-selective channels is also redefined in order to improve the performance of the turbo decoder. The architecture of the proposed turbo equalizer reduces considerably the effects of frequency and temporal dispersiveness of time-varying frequency-selective channels depending on the normalized Doppler frequency range. [J175]

"Motion compensation in ISAR imaging using the registration-restoration-fusion approach"

The distortion in the inverse synthetic aperture radar (ISAR) image of a target is a result of small time-varying perturbed motion experienced by the target during the image integration period and is attributed to a phase modulation effect of the radar return from the target. Large distortion in ISAR images of a moving target has been investigated and demonstrated under controlled experiments and simulation. Results from the analysis suggest that severe distortion is attributed to the phase modulation effect where a time-varying Doppler frequency provides the smearing mechanism. For applications of target identification, the registration-restoration-fusion method has been developed to refocus the distorted ISAR images. This method has been applied to both the experimental and simulated ISAR data. Results demonstrate that the registration-restoration-fusion motion compensation approach can improve the distorted ISAR image better than what can be achieved by conventional Fourier transform methods. This study also adds insight into the distortion mechanisms that affect the ISAR images of a target in motion. [J176]

"Space-Time Code Selection for Transmit Antenna Diversity Systems"

In this correspondence, a space-time code selection approach for transmit antenna diversity (TAD) systems is proposed. The receiver compares the equivalent single-input-single-output channel envelopes with a set of predetermined threshold levels, decides the antennas to be used, and sends this information to the transmitter, which adjusts the space-time code to the number of selected antennas using a small amount of feedback information. Threshold levels are found out-of-line based on the Doppler frequency in such a way that channel state information outdate at the transmitter is taken into account. Analysis and simulation results show that the system performs well for a wide range of Doppler frequencies, outperforming transmit antenna selection techniques and adaptive TAD systems. [J177]

"Stretch processing for masking effect removal in noise radar"

A method of removing the masking effect caused by strong target echoes in a noise radar is presented. Signal processing in noise radar is based on the calculation of the correlation between transmitted and received signals. Strong echoes of nearby targets produce relatively high sidelobes in the correlation function, thus masking weak echoes of far targets. The classical method of masking effect removal, taking into consideration only the Doppler shift of target echoes, does not remove the strong target echo completely when targets migrate between range resolution cells in the integration time. The method proposed, based on signal stretch processing and a point target model, shows an improvement over existing methods and allows for the detection of weak targets also in the presence of the fast and strong ones. [J178]

"Doppler effect compensation scheme based on constellation estimation for OFDM system"

A new and effective Doppler effects compensation scheme for orthogonal frequency division multiplex (OFDM) systems based on constellation estimation is presented with analytical descriptions that quantitatively clarify the mechanism of inter-carrier interference. The proposed compensation techniques, applicable in both frequency and time domain with remarkable accuracy, are crucial to the future OFDM system operating on ultra-high-speed mobile vehicles. [J179]

"Urban RF multipath mitigation"

Sensing in urban environments is of growing interest to the surveillance community, as is observation of targets with micro-Doppler features-elements of the target structure with independent range-Doppler behaviour about some target centroid. Multipath effects unique in character to urban sensing can conceal important features in the range-Doppler response of a target with micro-Doppler behaviour. The range-Doppler smearing because of multipath is analysed, and this analysis serves as the basis for a prominent point multipath mitigation algorithm. The effectiveness of this technique is evaluated with simulated micro-Doppler data with artificial multipath effects. [J180]

"A Novel Simulation Model for Coded OFDM in Doppler Scenarios"

This paper proposes a novel simulation model to characterize the bit-error rate (BER) performance of coded orthogonal frequency-division multiplexing (OFDM) systems that are affected by the Doppler spread. The

proposed equivalent frequency-domain OFDM model (EFDOM) avoids the exact generation of the time-varying channel by introducing several parameters that summarize the statistical properties of the channel and of the intercarrier interference (ICI) that is generated by the time variation of the channel. Simulation results are used to prove that the proposed model can be used to accurately predict the BER of coded OFDM systems in Rayleigh and Rice doubly selective channels. An attractive feature of the proposed model is the significant reduction of the simulation time with respect to the exact model. We show by simulation that the simulation efficiency increases for channels with many multipath components, whereas it is independent of the size of the fast Fourier transform (FFT). [J181]

"Assessment of Radar Signal Attenuation Caused by the Melting Hydrometeor Layer"

Attenuation of radar signals by melting hydrometeors is studied using modeling approaches and comparisons of simulated and observed results. In spite that the melting layer in precipitating systems is usually relatively thin (~ 500 m), this attenuation can be substantial at X-band frequencies for low elevation angles and at millimeter-wavelength frequencies that are used by the U.S. Department of Energy's Atmospheric Radiation Measurement Program and CloudSat radars operating at vertical/nadir incidence. Melting layer attenuation is stronger than the attenuation in the resultant rain at comparable path lengths and needs to be accounted for in remote sensing methods that use radar reflectivity measurements for retrieving cloud and precipitation parameters if the radar beam penetrates this layer. The choice of the mixing rule for calculating dielectric constants of melting hydrometeors determines, to a significant degree, the magnitude of the modeled attenuation values. A relatively simple Wiener mixing rule provides results that are consistent with melting layer reflectivity enhancements and attenuation estimates from the X-band radar observations. The total melting layer attenuation Ais related to the resultant rain rate Rin an approximately linear manner at X- and Kalpha-band frequencies, whereas at W-band, the melting layer attenuation increase with rain rate is slower due to strong non-Rayleigh scattering effects. Typical A-Rrelations are suggested, and the variability of these relations is discussed. This paper is mostly concerned with precipitating systems associated with snowflakes that are unrimed or only slightly rimed above the freezing level, as indicated by relatively low values of vertical Doppler velocities. [J182]

"Analysis and Characterization of the SSMIS Upper Atmosphere Sounding Channel Measurements"

Analyses and results of the radiometric calibration accuracy and measurement characteristics of the first Defense Meteorological Satellite Program (DMSP)'s Special Sensor Microwave Imager/Sounder (SSMIS) upper atmosphere sounding (UAS) channels are presented herein. Launched on October 18, 2003, aboard the DMSP F-16 spacecraft in a sun-synchronous orbit, the SSMIS UAS channels provide the first operational measurements of microwave radiation emitted by the Earth's atmosphere at mesospheric altitudes. The analysis of the SSMIS radiometer absolute calibration and stability is based upon extensive comparisons with a fully polarimetric radiative transfer model (RTM) that solves for all four Stokes parameters using coincident atmospheric temperature profiles derived from collocated Rayleigh lidar observations merged with the European Centre for Medium-Range Weather Forecasting temperature analyses and climatological data sets. The resulting merged profiles provide a physically consistent temperature profile from the surface to 100 km, as needed by the RTMs. The results presented herein of the SSMIS instrument show that significant hardware and scientific technical challenges arise from microwave temperature sounding of the mesosphere. These include the following: 1) addressing the impact of large noise-equivalent temperature difference associated with narrow channel bandwidths; 2) achieving high channel center-frequency stability; 3) compensation of large spacecraft-induced Doppler shift; 4) better characterization of the Zeeman splitting of the oxygen absorption lines; 5) development of a fast polarimetric RTM; and 6) designing stable and accurate on-orbit radiometric calibration targets. Results to date show that the uncertainties of the calibration accuracy of the SSMIS UAS channels are consistent and in agreement with the limits derived for the SSMIS UAS channels and with the simulated radiances derived from the merged lidar profiles. [J183]

"Application of Subarray Averaging and Entropy Minimization Algorithm to Stepped-Frequency ISAR Autofocus"

Subarray averaging and entropy minimization (SAEM) algorithm is applied to stepped-frequency ISAR autofocus to compensate for the phase error along the down-range due to high target speed and low pulse repetition frequency (PRF) of radar systems. In stepped-frequency radar systems, the phase error due to target motion in each burst make range profiles blur. Thus, the stepped-frequency ISAR often adopts a high PRF radar system in order to suppress the effect of target motion in each burst. However, it inevitably leads to loss of many advantages by adopting low PRF radars in stepped-frequency ISAR imaging. In order to take advantage of a low PRF radar in stepped-frequency ISAR imaging, this paper makes use of a method called SAEM (subarray averaging and entropy minimization) that uses a subarray averaging concept in conjunction with the entropy cost

function in order to find the target's motion parameters. Well-focused ISAR images also can be provided from the combination of the SAEM and a traditional autofocus algorithm, even when low PRF stepped-frequency waveform is used. The effectiveness of this method is illustrated and analyzed with simulated targets comprised of point scatters and measured Boeing-737 data. [J184]

"Polarimetric Detection of Targets in Heavy Inhomogeneous Clutter"

Polarization diversity has proved to be a useful tool for radar detection, especially when discrimination by Doppler effect is not possible. In this paper, we address the problem of improving the performance of polarimetric detectors for targets in heavy inhomogeneous clutter. First, we introduce a new polarimetric radar model that includes the realistic dependence of the clutter reflections on the transmitted signal. Then, we develop a polarimetric detection test that is robust to inhomogeneous clutter. We run this polarimetric test against synthetic and real data to assess its performance in comparison with existing polarimetric detectors. Finally, we propose a polarimetric waveform-design algorithm to further improve the target-detection performance. A numerical analysis is presented to demonstrate the potential performance improvement that can be achieved with this algorithm. [J185]

"Numerical Study of Microwave Scattering in Breast Tissue via Coupled Dielectric and Elastic Contrasts"

A computational investigation of microwave scattering in mechanically (or acoustically) excited breast tissue is conducted to explore the feasibility of combining dielectric and elastic properties contrasts to enhance breast cancer detection. The mechanical excitation induces tissue-dependent displacements in the heterogeneous breast interior, which modulate the scattered microwave signals. Sheet boundary conditions are implemented using the finite-difference time-domain (FDTD) method to efficiently compute the Doppler component of the scattered microwave signals. Simulation results for a 2D numerical phantom testbed demonstrate increased microwave scattering contrast between malignant and normal fibroglandular inclusions when elastic properties are exploited. [J186]

"Performance Analysis of Optimum Diversity Combining for Partially Coherent Frequency-Selective Fading Channel With Intersymbol Interference"

The performance of coherent BPSK and QPSK systems in the presence of frequency-selective fading and carrier phase errors is analyzed. Frequency-selective fading channels are modeled as multipath Rayleigh, Nakagami-m, or Rician two-ray fading models wherein the presence of a delayed ray causes intersymbol interference (ISI). A diversity system with L-branches is used for signal detection using an optimum equal-gain-combining receiver. The effect of ISI on system performance is assessed using a truncated pulse train of the ISI signal. For Rayleigh-faded channels, the simulation result that demonstrates the influence of Doppler spread on system performance was also included. The following two performance criteria are considered: the average bit error probability and the signal-to-noise-ratio (SNR) gain penalty due to ISI. [J187]

"Azimuth dependence of Doppler spectra of sea clutter at low grazing angle"

The effect of varying the azimuth angle of a cliff-top radar on the Doppler spectra of low grazing angle sea clutter has been investigated. The peak of the horizontally polarised Doppler spectra was found to depend on the component of the phase velocity of the breaking waves in the line of sight of the radar. The analysis was presented in terms of two main scattering components, one slow and one fast, which could explain the Doppler spectra as well as the higher moments of the spectra. The connection to the amplitude statistics for the two components was also discussed. The slow component was present all the time and had amplitude statistics that were Rayleigh-distributed. The fast component was present only intermittently and had amplitude statistics that were spikier than the Rayleigh distribution. The width of the spectra varied with azimuth in a way unrelated to the direction relative to the wind. A wave tank experiment with long wavelength mechanical waves and wind-generated waves illustrated that the cause of the broadening of the spectra was probably due to the effect of swell waves. [J188]

"UWB in Millimeter Wave Band With Pulsed ILO"

A simple but efficient transmitter for ultra-wide-band impulse radio wavelet generator in millimeter-wave band is presented. It is suitable for RADAR, gigabit wireless personal area network, and localization applications. This front-end involves a subharmonic injection-locked oscillator driven by a pulse generator (PG) with fast transition time (<25 ps). Its frequency oscillation is locked on one of the numerous harmonic components generated by the PG around 30 GHz. This allows to obtain a stable pulse-to-pulse phase condition and a very low phase noise

(<-110 dBc/Hz@100 kHz). Two monolithic microwave integrated circuits have been designed using a commercial pseudomorphic high-electron mobility transistor foundry process (ft = 100 GHz). The first one is a PG with position and width modulation capabilities, and the second one is an oscillator with a 30-GHz free-running output frequency. The start of the oscillations is studied, using the external quality factor as main factor. [J189]

"Reply to "Comments on 'Discrete Frequency-Coding Waveform Design for Netted Radar Systems'""

For original paper see H. Deng, ibid., vol.11, no.2, p.179-182, (2004). This paper presents reply to "comments on 'discrete frequency-coding waveform design for netted radar systems'". [J190]

"A Comparative Study for the Assessment on Blood Flow Measurement Using Self-Mixing Laser Speckle Interferometer"

We study a self-mixing laser diode (SM-LD) as a low-cost compact optical sensor for noninvasive blood flow measurement over the surface of the skin. We compare the SM-LD system with a commercially available Doppler flowmeter to assess the accuracy and feasibility of the SM-LD sensors for such applications. For the SM-LD flowmeter, we apply two different signal processing methods: (1) the counting method, i.e., counting the intensity fluctuations of the signal to obtain a frequency value, and (2) the autocorrelation method, i.e., measuring the autocorrelation time of the signal. In vitro measurements show good agreement with the commercially available flowmeter. In vivo measurements performed on test subjects revealed that the autocorrelation technique shows much better results. The results of in vitro and in vivo studies and the comparison with the commercial flowmeter confirm the applicability of the SM-LD flowmeter. [J191]

"A Systematic Construction for Radar Arrays"

The radar array problem arises from the need to design frequency hopping sequences with small out-of-phase autocorrelations. It assumes the reflected signals have negligible Doppler shifts, so the correlations are calculated along the time axis only. In this correspondence, a systematic construction for radar arrays is provided by means of homogeneous uniform difference matrices. A systematic construction for properly centered permutation matrices, a special kind of homogeneous uniform difference matrices, is also provided, which partially solves the open problems posed by Zhang and Tu. [J192]

"Doppler-Bearing Tracking in the Presence of Observer Location Error"

This paper investigates the Doppler-bearing tracking problem in the presence of random observer position error at one or two active observers. We first derive the CRLBs for the target and observer location parameters when the noise is Gaussian. The CRLB results indicate that the observer position uncertainty always leads to degradation in the target location estimation accuracy in both the two-observer and single-observer tracking scenarios. In the two-observer case, the Doppler-bearing measurements may be able to improve the observer positions while in the single-observer case, they cannot. This paper then studies the MSE of the target parameter estimate when the observer positions are assumed accurate but in fact have error. We show that for the two-observer case, the MSE is larger than the CRLB of the target parameter vector and thus, it is necessary for an algorithm to take the observer position error into account to achieve the optimum performance. On the other hand, for the single-observer case, the MSE is identical to the CRLB, indicating that the identification of the observer position can be eliminated without sacrificing the estimation accuracy of the target position. Simulations confirm the theoretical results. [J193]

"The Effect of the Bistatic Scattering Angle on the High-Frequency Radar Cross Sections of the Ocean Surface"

High-frequency (HF) bistatic Doppler cross sections of the ocean surface are examined with respect to their dependency on the bistatic angle. Previously derived results which incorporate a pulsed dipole source and two orders of scatter are considered. It is trivially seen that the first-order result has a linear dependence on the cosine of the bistatic angle. The second-order echo accounts for a double scatter of incident radiation from first-order surface waves-the so-called electromagnetic term-and a single scatter from a second-order ocean wave. The latter, generally referred to as the second-order hydrodynamic term because it originates from coupling between first-order ocean waves, predominates the Doppler continuum in most regions of interest. The analysis presented here verifies that in addition to a cosine-dependent reduction in cross section magnitude with increasing bistatic angle, both components of the second-order scatter tend to zero under the condition of near-forward scatter for bistatic HF radar operation. Of course, this imposes practical limitations on the region over which a bistatically configured HF radar system may be used to remotely sense ocean surface parameters.

[J194]

"Multi-frequency encoding for fast color flow or quadroplex imaging"

Ultrasonic color flow maps are made by estimating the velocities line by line over the region of interest. For each velocity estimate, multiple repetitions are needed. This sets a limit on the frame rate, which becomes increasingly severe when imaging deeper lying structures or when simultaneously acquiring spectrogram data for triplex imaging. This paper proposes a method for decreasing the data acquisition time by simultaneously sampling multiple lines for color flow maps, using narrow band signals with approximately disjoint spectral support. The signals are separated in the receiver by filters matched to the emitted waveforms, producing a number of data sets with different center frequencies. The autocorrelation estimator is then applied to each of the data sets. The method is presented, various side effects are considered, and the method is tested on data from a recirculating flow phantom. A mean standard deviation across the flow profile of 3.1, 2.5, and 2.1% of the peak velocity was found for bands at 5 MHz, 7 MHz, and 9 MHz, respectively. Alternatively, the method can be used for simultaneously sampling data for a color flow map and for multiple spectrograms using different spectral bands. Using three spectral bands, data for a color flow map and two independent spectrograms can be acquired at the time normally spent on acquiring data for a color flow map only. This yields an expansion of triplex imaging called multi-frequency quadroplex imaging, which enables study of the flow over an arterial stenosis by simultaneously acquiring spectrograms on both sides of the stenosis, while maintaining the color flow map. The method was tested in vivo on data from the common carotid artery of a healthy male volunteer, both for fast color flow mapping and for multi-frequency quadroplex imaging. [J195]

"Design and Analysis of MMSE Pilot-Aided Cyclic-Prefixed Block Transmissions for Doubly Selective Channels"

This paper considers affine cyclic-prefixed block-based pilot-aided transmission (PAT) over the single-antenna doubly selective channel, where the channel is assumed to obey a complex-exponential basis expansion model. First, a tight lower bound on the mean-squared error (MSE) of pilot-aided channel estimates is derived, along with necessary and sufficient conditions on the pilot/data pattern that achieves this bound. From these conditions, novel minimum-MSE (MMSE) PAT schemes are proposed and upper/lower bounds on their ergodic achievable rates are derived. A pilot/data power allocation technique is also developed. A high-SNR asymptotic analysis of the ergodic achievable rate of affine MMSE-PAT is then performed which suggests that the channel's spreading parameters should be taken into account when choosing among affine MMSE-PAT schemes. Specifically, we establish that multicarrier MMSE-PAT achieves higher rates than single-carrier MMSE-PAT when the channel's delay-spread dominates its Doppler-spread, and vice versa. [J196]

"Sea-Surface Current Features Observed by Doppler Radar"

A coherent X-band radar was operated from the shore to measure velocities at the sea surface. The test site at a tidal inlet (Lister Tief) in the German Bight lay protected from swell and long wind waves. A vertical-vertical antenna was used to obtain the backscattered radar signal caused by Bragg scattering. To cover a sector of the circle, the antenna was rotated in 1Dstroksteps. At each step, the data acquisition was performed to obtain a time series of the backscattered radar signal. The maximum range is 1905 m with a range resolution of 7.5 m and an azimuthal resolution of 3.5diam. Maps of the averaged backscattered radar power and radial Doppler velocities are obtained. The radar backscatter maps show the modulation of the radar cross section due to changes in the surface roughness. The radar Doppler velocity maps show the modulations of the surface scatterer speed. The maps show many features, for example, the impact of subsurface sand waves, eddies, current shears, slicks, ship wakes, atmospheric effects, and small-scale current changes behind sheet pile walls. As the radar backscatter is caused by short wind waves, the wind influence on the Doppler signal was calculated for a first attempt to obtain true current motions. The results were compared with in situ current measurements. By subsequently measuring the surfaces current from two radar positions and performing the wind correction, the current vector fields are assessed. [J197]

"Experiment and simulation of the compositional evolution of Ti-B thin films deposited by sputtering of a compound target"

The evolution of the coating stoichiometry with pressure, target-substrate distance, and angle was analyzed for dc sputtering of TixB(x=0.5,1,1.6)compound targets by elastic recoil detection analysis. For an investigation of the underlying fundamental processes primarily Ar was used as sputter gas. Additionally, the effect of a reactive gas (N2)as well as bias voltage (floating up to -200V) was briefly cross-checked. For deposition along the target normal (90°)a pronounced Ti-deficiency of up to 20% is detected. Increasing the pressure or distance from 0.5 to 2 Pa and from 5 to 20 cm, respectively, leads to an almost equivalent linear increase in Ti/B ratio surpassing

even the target composition. Off-axis depositions at lower angles (30°and 60°) on the other hand result in a higher Ti/B ratio. This is consistent with results obtained from Monte Carlo simulations combining the respective emission characteristics from the sputter process as well as the gas-phase transport. Hence, the pressure, distance, and sample position induced changes in chemical film composition can be understood by considering gas scattering and the angular distribution of the sputtered flux. The theoretically determined transition from a directional flux to thermal diffusion was experimentally verified by mass-energy analysis of the film-forming atoms. [J198]

"Photothermal excitation and laser Doppler velocimetry of higher cantilever vibration modes for dynamic atomic force microscopy in liquid"

The authors present an optically based method combining photothermal excitation and laser Doppler velocimetry of higher cantilever vibration modes for dynamic atomic force microscopy in liquid. The frequency spectrum of a silicon cantilever measured in water over frequencies ranging up to 10 MHz shows that the method allows us to excite and detect higher modes, from fundamental to fifth flexural, without enhancing spurious resonances. By reducing the tip oscillation amplitude using higher modes, the average tip-sample force gradient due to chemical bonds is effectively increased to achieve high-spatial-resolution imaging in liquid. The method's performance is demonstrated by atomic resolution imaging of a mica surface in water obtained using the second flexural mode with a small tip amplitude of 99 pm; individual atoms on the surface with small height differences of up to 60 pm are clearly resolved. [J199]

"The compact capacitor bank CQ-1.5 employed in magnetically driven isentropic compression and high velocity flyer plate experiments"

Based on the low inductance capacitor, the parallel-plate transmission line, and the explosive network closing switch, a compact pulsed power generator CQ-1.5 has been developed at the Institute of Fluid Physics and is capable to deliver a current of peak of 1.5MAwithin rise time of 500-570nsinto a 2-3nHinductive load. The work is motivated to do isentropic compression experiments (ICEs) on metals up to 30-50GPaand to launch flyer plates at velocities over 8km/s. The experiments were conducted with the diagnostics of both Doppler pin system and velocity interferometer system for any reflectors, and the measured free surface velocity histories of ICE samples were treated with a backward integration code. The results show that the isentropes of Cu and Al samples under 35GPaare close to their Hugoniots within a deviation of 3%. The LY12 aluminum flyer plates were accelerated to a velocity over 8.96km/s. [J200]

"A liquid metal flume for free surface magnetohydrodynamic experiments"

We present an experiment designed to study magnetohydrodynamic effects in free surface channel flow. The wide aspect ratio channel (the width to height ratio is about 15) is completely enclosed in an inert atmosphere to prevent oxidization of the liquid metal. A custom-designed pump reduces entrainment of oxygen, which was found to be a problem with standard centrifugal and gear pumps. Laser Doppler velocimetry experiments characterize velocity profiles of the flow. Various flow constraints mitigate secondary circulation and end effects on the flow. Measurements of the wave propagation characteristics in the liquid metal demonstrate the surfactant effect of surface oxides and the damping of fluctuations by a cross-channel magnetic field. [J201]

"Reverberation Suppression Using Wideband Doppler-Sensitive Pulses"

The influence of transmitted waveforms on the signal-to-reverberation ratio (SRR) of a low-frequency active sonar is analyzed both theoretically and experimentally. Reverberation experiments have been conducted during a sea trial in a littoral water environment in October 1999. The aim of the trials was to compare the performance of three classes of waveforms: standard hyperbolic frequency-modulated (HFM) waveforms, continuous waveforms (CWs), and innovative pulse trains of linear frequency-modulated (PTFM) waveforms. Transmissions were combined (CW/PTFM train) or intermitted (HFM) to compare the performance of the three classes in (exactly) the same environment. Experimental results in highly reverberant environment illustrated that PTFM pulses allow a reduction in reverberation power greater than 10 dB over the standard detection pulses for slowly moving targets. The results are in agreement with theoretical predictions. [J202]

"Self-scattering of the HF heater emissions observed at geographically dispersed receiving sites"

Results of investigating the scattering and propagation effects for the HF radiation from the HAARP heating facility (Alaska, USA) are presented. The latest data were collected during the HAARP measurement campaign that was conducted from February 21 through March 3, 2008. The transmissions from the HAARP HF heater were monitored at geographically dispersed sites in the USA, Europe, and Arctic, using digital Doppler receivers

of the Institute of Radio Astronomy (Kharkov, Ukraine) and Digisondes of the University of Massachusetts Lowell (Lowell, USA). A number of characteristics features of the detected scattered signals suggest that the received radiowaves were scattered by ionospheric irregularities produced by the same HF emission. This effect is known as "self-scattering." Average relaxation times for the self-scattered signals were shown to be several tens of seconds (40-60 s), while the observed risetime was much longer, up to a few minutes. These numbers are characteristics of the types of the irregularities responsible for the scattering of the heater signal. A time constant of 50-60 s is usually associated with the relaxation time of small-scale irregularities with spatial scale sizes from a few meters to tens of meters. Several possibilities for explaining the observed longer risetime constant of two to three minutes are discussed. The power and spectral width of the scattered signals depend on the HAARP beam orientation and local ionospheric conditions. The possibility of extracting parameters of the stimulated plasma irregularities is discussed. [J203]

"Real-time processing for Fourier domain optical coherence tomography using a field programmable gate array"

Real-time display of processed Fourier domain optical coherence tomography (FDOCT) images is important for applications that require instant feedback of image information, for example, systems developed for rapid screening or image-guided surgery. However, the computational requirements for high-speed FDOCT image processing usually exceeds the capabilities of most computers and therefore display rates rarely match acquisition rates for most devices. We have designed and developed an image processing system, including hardware based upon a field programmable gated array, firmware, and software that enables real-time display of processed images at rapid line rates. The system was designed to be extremely flexible and inserted in-line between any FDOCT detector and any Camera Link frame grabber. Two versions were developed for spectrometer-based and swept source-based FDOCT systems, the latter having an additional custom high-speed digitizer on the front end but using all the capabilities and features of the former. The system was tested in humans and monkeys using an adaptive optics retinal imager, in zebrafish using a dual-beam Doppler instrument, and in human tissue using a swept source microscope. A display frame rate of 27 fps for fully processed FDOCT images (1024axialpixelsЧ512lateral A-scans) was achieved in the spectrometer-based systems. [J204]

"Erratum: "photoacoustic Doppler flow measurement in optically scattering media" [JAppl. Phys. Lett. 91, 264103 (2007)]"

First Page of the Article [J205]

"Comment on "Accuracy limits and window corrections for photon Doppler velocimetry" [JJ. Appl. Phys. 101, 013523 (2007)]"

This comment addresses limitations of optical Doppler velocimetry in the presence of ejecta. [J206]

"Probes for measuring fluctuation-induced Maxwell and Reynolds stresses in the edge of the Madison Symmetric Torus reversed field pinch"

Several probes have been constructed to measure fluctuation-induced Maxwell and Reynolds stresses in the edge of the Madison Symmetric Torus reversed field pinch (RFP). The magnetic probe is composed of six magnetic pickup coil triplets. The triplets are separated spatially, which allows for local measurements of the Maxwell stress. To measure the plasma flow components for evaluation of the Reynolds stress, we employ a combination of an optical probe [Kuritsyn etal, Rev. Sci. Indrum. 77, 10F112 (2006)] and a Mach probe. The optical probe measures the radial ion flow locally using Doppler spectroscopy. The Mach probe consists of four current collectors biased negatively with respect to a reference tip and allows for measurements of the poloidal and toroidal components of the bulk plasma flow. The stresses are observed to play an important role in the momentum balance in the RFP edge during internal reconnection events. [J207]

"Detection of zonal flow spectra in DIII-D by a dual-channel Doppler backscattering system"

Doppler backscattering (DBS) has been successfully used to measure the ЕЧВflow velocity and local intermediate wavenumber density fluctuation levels in the DIII-D tokamak. Depending on the launch angle and the frequency of the probing beam, the signal backscattered from the plasma cut-off layer is sensitive to density fluctuations at a specific perpendicular wavenumber (1≤k rho s≤4). Due to the localization and high time resolution for poloidal flow measurements, DBS is well suited to detect stationary and time-dependent shear flows [zonal flows (ZFs)]. We present a novel scheme to measure ZF spectra using a dual-channel DBS system capable of simultaneously probing two minor radii separated by a distance of 0.2cm Delta r 3cm. Frequency

spectra of geodesic acoustic modes and low frequency ZFs (f≤10kHz)have been obtained for 0.6 r/a 0.95. [J208]

"Simulation of the motional Stark effect diagnostic gas-filled torus calibration"

Many motional Stark effect diagnostics around the world make use of a calibration procedure in which the observed neutral beam is injected into a gas-filled torus with known vacuum fields. The instrument is calibrated by reconciling measured angles with vacuum magnetic reconstructions through a range of pitch angles. This in situ gas-filled torus calibration most closely approximates the working conditions of the diagnostic and includes effects such as beam and viewing geometries, beam voltages, Faraday and stress induced birefringence (in most cases) of the transmissive optics, as well as the polarimeter response. However, secondary neutrals, produced after ionization then reneutralization of a beam neutral, have been found to contaminate measured angles by emitting Balmer alpha with similar Doppler shifts and Stark polarizations as beam neutrals, but with different polarization angles. Simulation results that show spectral and angle behavior versus calibration parameters such as fill gas pressure will be presented. Data from NSTX and C-Mod will be compared to simulations results. [J209]

"The motional Stark effect diagnostic on NSTX"

This work describes the implementation and recent results from the motional Stark effect (MSE) collisionally induced fluorescence diagnostic on NSTX. Due to the low magnetic field on NSTX the MSE diagnostic requires a new approach for the viewing optics and spectral filter. This has been accomplished with a novel optical design that reduces the geometric Doppler broadening, and a high throughput, high resolution spectral filter to optimize signal-to-noise ratio. With these improvements the polarization fraction is 30%-40%and, combined with the large throughput, a time resolution of 5ms. The MSE diagnostic presently has 16 sight lines operating, providing measurements of the magnetic field line pitch from the plasma center to near the outboard edge of the plasma. [J210]

"Thermal effect on slider flight height in heat assisted magnetic recording"

In this paper, the real time thermal effect of the heat assisted magnetic recording (HAMR) on the slider flying height is investigated with HAMR spin stand. In the experiment, a modulated laser beam is used to heat the media and the slider vibration is measured with laser Doppler vibrometer. The slider vibrations at different laser modulation frequencies and different laser powers are investigated and near 0.2nmflying height change is observed. Analysis shows that the main reason to cause the flying height change results from the disk surface thermal distortion caused by thermal expansion. [J211]

"Calculation of the gas temperature in a throughflow atmospheric pressure dielectric barrier discharge torch by spectral line shape analysis"

An analysis of spectral line profiles is used to calculate the gas temperature and to estimate the upper limit of the electron density in an atmospheric pressure dielectric barrier discharge torch. Two transitions are studied, that of helium (He) at 587.5nmand that of hydrogen (Hbeta)at 486.1nm, both observed in the spectra of the light emitted from the gap-space region. Relevant broadening mechanisms including the Doppler and Stark effects, as well as the collision processes between an emitter and a neutral particle, are reviewed. It is deduced that the main contribution to the broadened profiles is due to collisions. Through knowledge of the van der Waals interaction potential, a general expression for determining the gas temperature is derived and applied to each transition. The results obtained from both lines are in agreement; i.e., the gas temperature is found to be 460±60Kat the highest voltage applied. This value is consistent with the experimental observation that at these conditions the afterglow plasma cannot ignite paper, whose ignition temperature is 507K. Since no signature of the Stark effect can be detected either in He or Hbeta transition, the upper limit of the electron density, estimated from the uncertainty on the Hbeta linewidth, is 4Ч1012cm-3. The generality of the method allows one to determine the temperature as a function of other parameters, such as voltage and flow rate. Concerning the applied voltage, the gas temperature increases linearly from 315±30to460±60K,- as derived from both lines. Over the same voltage range, a similar behavior is found for the rotational temperature, as deduced from the first negative B(2Sigma u+,v=0)→X(2Sigma g+,v=0)transition of the molecular nitrogen ion. However, the temperature varies between 325±30and 533±15K, indicating an overestimation of the gas temperature. On the other hand, the gas temperature derived from each of the lines does not show a significant variation with the He flow rate in the range of 5-40l/min. [J212]

"Robust measurement of group delay in the presence of density fluctuations by means of ultrafast swept reflectometry"

It is well known that reflectometric measurements can be seriously disturbed by density fluctuations. In this paper the basic mechanisms that critically affect the measurements are outlined with the help of a simplified two-dimensional model which simultaneously mimics the dynamic of the plasma turbulence and the frequency sweep. It turns out that an adequate modulation rate can easily overcome the adverse effect of wave scattering produced by short wavelength fluctuations even when measurements taken at a single frequency would fail. Nevertheless the Doppler effect caused by long wavelength fluctuations can produce a substantial shift in the group delay, which accounts for nonmonotonous density profile reconstructions. In turn this effect can be corrected using a very fast ascending and descending frequency modulation, similarly to what is done in FM radars. The technical feasibility of such a system is demonstrated using the Kaband reflectometer of RFX, where a triangular modulation of 2.5 MHz, with a bidirectional modulation rate up to 4 GHz/200 ns, has been obtained. [J213]

"Calculation of extracted ion beam particle distribution including within-extractor collisions from H-alpha Doppler shift measurements"

Prototype long pulse ion sources are being developed and tested toward the goal of a deuterium beam extraction of 120keV/65A. The latest prototype source consists of a magnetic bucket plasma generator and a four-grid copper accelerator system with multicircular apertures of 568 holes. To measure the angular divergence and the ion species of the ion beam, an optical multichannel analyzer (OMA) system for a Doppler-shifted H-alpha lights was set up at the end of a gas-cell neutralizer. But the OMA data are very difficult to analyze due to a large background level on the top of the three energy peaks (coming from H+, H2+, and H3+). These background spectra in the OMA signals seem to result from partially accelerated ion beams in the accelerator. Extracted ions could undergo a premature charge exchange as the accelerator column tends to have a high hydrogen partial pressure from the unused gas from the plasma generator, resulting in a continuous background of partially accelerated beam particles at the accelerator exit. This effect is calculated by accounting for all the possible atomic collision processes and numerically summing up three ion species across the accelerator column. The collection of all the atomic reaction cross sections and the numerical summing up will be presented. The result considerably depends on the background pressure and the ion beam species ratio (H+, H2+, and H3+). This effect constitutes more than 20% of the whole particle distribution. And the energy distribution of those suffering from collisions- is broad and shows a broad maximum in the vicinity of the half and the third energy region. [J214]

"Dynamic Synthesis of Microsystems Using the Segment Rayleigh-Ritz Method"

Microsystem development requires accurate and parametric-based modeling as well as experimental validation of the effects of multiphysics influences such as electrostatic, thermal, and mechanical on microsystems in a systematic manner. This work attempts to synthesize the influence of electrothermomechanical influences on microsystems using an energy-based method, namely, the segment Rayleigh-Ritz (SRR), thereby making it possible to study the multiphysics influences on the dynamic behavior of microsystems in a simplified and unified way. Electrostatic, thermal, and geometrical influences along with microfabrication limitations related to the boundary support are studied on cantilever-based microsystems. Silicon-on-insulator-based technology is used for demonstration purposes. The SRR energy method was developed in order to improve the theoretical formulation for microsystems with nonuniform properties. The method of artificial springs is employed to model the boundary support, electrostatic influences, and intersegmental boundaries. The microfabricated support conditions were quantified through a rotational stiffness, and its invariance with geometry, temperature, and electrostatic field was verified through dynamic testing under electrothermal influences. Comparison with test results validates the dynamic synthesis modeling for microstructures. This approach can be expanded further to nondimensional design optimization and for targeted performance tuning of the static and dynamic behavior of microsystems. [J215]

"Comparison of Processing Algorithms for a Delay/Doppler Altimeter"

The use of a radar altimeter is to measure the height of the reflecting surface when the instrument passes overhead. A delay/Doppler altimeter (DDA) reduces the along-track resolution cell using correlation of pulses within burst, as in a synthetic aperture radar, with the net effect of synthesizing an array with a narrower lobe. The processing of DDA data therefore implies the correction of the phase delay of pulses, which is said to be Dopplerbeamsharpeningsince it can be reduced to a DFT in the along-track direction. The noise term on Doppler echoes is decreased by incoherent summing of contributions of different bursts. Summation of these contributions requires that pointing of each beam is directed toward a given output grid of samples on ground, and this can be a nontrivial task, depending on the topography profile. In this letter, a comparison between different beam sharpening algorithms is presented: Two of them are similar in their basic idea even if with different implementations; the third one can be considered as reference since no approximations are needed in principle,

but is computationally inefficient. What results is that the first couple can be considered basically equivalent in terms of precision and computational efficiency, with little differences at the change of the environmental conditions. Results based on simulated data of simple and complex scenarios are presented as support of the reasoning. [J216]

"A High-Resolution MEMS Piezoelectric Strain Sensor for Structural Vibration Detection"

This paper presents the modeling, fabrication, and testing of a high-performance dynamic strain sensor. Using microelectromechanical systems (MEMS) technology, ZnO piezoelectric microsensors are directly fabricated on silicon and steel substrates. The sensors are intended to be used as point sensors for vibration sensing without putting an extra burden on the host structures. A model that incorporates piezoelectric effects into an RC circuit, representing the sensor architecture, is developed to describe the voltage output characteristics of the piezoelectric microsensors. It is shown that the sensitivity of microplanar piezoelectric sensors that utilize the e31effect is linearly proportional to sensor thickness but unrelated to sensor area. Sensor characterization was performed on a cantilever beam cut from a fabricated silicon wafer. The experimental data indicate that the overall sensor and circuit system is capable of resolving better than 40.3 nanostrain time domain signal at frequencies above 2 kHz. The corresponding noise floor is lower than 200 femto-strain per root hertz and the sensitivity, defined as the sensor voltage output over strain input, is calculated to be 340 V/epsiv . Micro ZnO piezoelectric sensors fabricated on steel hard disk drive suspensions also show excellent results. The sensor not only has a better signal-to-noise ratio but also detects more vibration information than the combination of two laser-Doppler-vibrometer measurements in different directions. [J217]

"Cramer-Rao bounds for target parameters in space-based radar applications"

The Cramer-Rao (CR) bounds for target Doppler and power are presented when detecting targets using a space-based radar (SBR) platform. The target in noise-only case is considered first and the results are compared with those obtained for a centro-symmetric uniform linear pulse array. When clutter is also present, the effect of the Earth's rotation and range foldover becomes significant; and they must be taken into consideration. The CR bounds are computed for target Doppler and power, and compared with their variance estimates obtained from simulation results corresponding to various airborne and SBR situations. From the simulation results, the Earth's rotation together with range foldover significantly increase the CR bounds for both target Doppler and power. This is in agreement with other results that show the Earth's rotation and range foldover together degrade the clutter suppression performance of adaptive processing algorithms. It is shown that when both the Earth's rotation effect and range foldover effect are present in the data, target detection is difficult, and it is necessary to introduce waveform diversity into the transmit design to minimize the effect of clutter and other interference. In this context, using waveform diversity on transmit, it is possible to compensate the degradation in terms of the CR bounds and achieve performance close to the ideal case. [J218]

"Effects of mobile rotational movements in wireless propagation channels"

The impact of non-straight movements of a mobile station (MS), for example rotation of the MS, on the statistics of a wireless propagation channel needs to be studied in the modern literature of wireless channel modelling. The authors formulate the effects of MS rotation on a cross-correlation model for a multiple-input multiple-output Rayleigh fading channel in a two-dimensional (2D) multipath propagation medium. The authors consider communication over a non-isotropic wave propagation environment employing directional antenna propagation patterns (APPs) at both transmitter and receiver arrays. The cross-correlation function (CCF) is computed when the MS rotates with a constant angular velocity and moves with a constant linear speed on the 2D plane. It is shown that the angular movement of the MS results in a cyclostationary channel process. In such a situation, the authors analyse the derived CCF using the continuous-time Fourier series in terms of the MS angular velocity, the parameters of the propagation environment and the employed antennas. The numerical evaluation shows that the energy dispersion in different frequencies is significantly influenced by the type of the directional APP, the distribution of scatterers and the angular Doppler shift. Furthermore, the authors establish an approximate relationship between the coherence-time and the MS angular velocity using a numerical curve fitting. [J219]

"Micro-Doppler analysis of wheels and pedestrians in ISAR imaging"

In radar imaging, it is well known that relative motion or deformations of parts of illuminated objects induce additional features in the Doppler frequency spectrum. These features are called micro-Doppler effect and appear as sidebands around the central Doppler frequency. They can provide valuable information about the structure of the moving parts and may be used for identification purposes. Previous papers have mostly focused on 1D micro-Doppler analysis. The authors propose to emphasise the analysis of such `non-stationary targets`

using a 2D imaging space, using both the micro-Doppler and a high-range resolution analysis. As in 2D-ISAR imaging, range separation enables to better discriminate the various effects caused by the time-varying reflectors. The study is focused on two different common examples: rotating wheels and human motion. With the help of micro-Doppler signature, information on the geometrical features of wheels (position, orientation) and on the gait of pedestrians can be extracted. Examples will be shown with simulated and experimental data. [J220]

"Correction of the Sea State Impact in the L-Band Brightness Temperature by Means of Delay-Doppler Maps of Global Navigation Satellite Signals Reflected Over the Sea Surface"

This paper presents an efficient procedure based on 2-D convolutions to obtain delay-Doppler maps (DDMs) of Global Navigation Satellite Signals reflected (GNSS-R) over the sea surface and collected by a spaceborne receiver. Two DDM-derived observables (area and volume) are proposed to link the sea-state-induced brightness temperature to the measured normalized DDM. Finally, the requirements to use Global Positioning System reflectometry to accurately correct for the sea state impact on the L-band brightness temperature (quantization levels, decimation, truncation, and noise impact) are analyzed in view of its implementation in the Passive Advanced Unit instrument of the Spanish Earth Observation Satellite (SeoSAT/INGENIO) project. [J221]

"Principle and Methods on Bistatic SAR Signal Processing via Time Correlation"

In this paper, we discuss the mapping between the 3-D scene space and the bistatic synthetic aperture radar (SAR) image space and show that when the direction of the angular velocity of the bistatic SAR remains constant, the process of bistatic SAR imaging can be approximately modeled as a perspective operator from the 3-D scene space to the 2-D image space, and the perspective line is perpendicular to the plane determined by the composition direction of the T/R line of sight and the composition direction of the angular velocity of the T/R platform. Then, we show that the 2-D point spread function of the bistatic SAR is determined not only by the range and ldquoazimuthrdquo resolutions but also by the geometry of the bistatic SAR and the bases of the SAR image space, and the concept ldquoambiguity regionrdquo is introduced to describe the ambiguity problem in the 3-D scene space. Then, the range-Doppler algorithm is discussed, and a new translational-variant bistatic SAR imaging method is proposed, which uses the scaled inverse fast Fourier transform (IFFT) technique to eliminate the translational-variant feature of the SAR space resolution. The space truncation error of this new algorithm is discussed to analyze the depth of focus of the scaled IFFT bistatic SAR imaging algorithms, and we find that the upper bounce of the space truncation error is proportional to the square of the distance from the scatterer to the T/R platforms. Last, the effects of motion measurement errors are discussed in detail, and, through theoretical analysis and numerical experiments, we show that the absolute position measurement error, the baseline measurement error, the perpendicular (vertical) component of the absolute velocity measurement error (AVME), and the perpendicular component of the relative velocity measurement error (RVME) cause SAR image shifting in the image space mainly, and the parallel component of the AVME and the parallel component of the RVME cause the SAR image to s--everely defocus. [J222]

"Random Body Movement Cancellation in Doppler Radar Vital Sign Detection"

The complex signal demodulation and the arctangent demodulation are studied for random body movement cancellation in quadrature Doppler radar noncontact vital sign detection. This technique can be used in sleep apnea monitor, lie detector, and baby monitor to eliminate the false alarm caused by random body movement. It is shown that if the dc offset of the baseband signal is accurately calibrated, both demodulation techniques can be used for random body movement cancellation. While the complex signal demodulation is less likely to be affected by a dc offset, the arctangent demodulation has the advantage of eliminating harmonic and intermodulation interference at high carrier frequencies. When the dc offset cannot be accurately calibrated, the complex signal demodulation is more favorable. Ray-tracing model is used to show the effects of constellation deformation and optimum/null detection ambiguity caused by the phase offset due to finite antenna directivity. Experiments have been performed using 4-7 GHz radar to verify the theory. [J223]

"Performance analysis of MMSE detectors for high speed VSF-OFCDM"

This letter investigates the effect of Doppler frequency shift on the performance of MMSE receivers for high speed variable spreading factor (VSF) orthogonal frequency and code division multiplexing (OFCDM) systems in broadband wireless communications. In VSF-OFCDM systems, the existence of multicode interference (MCI) resulting from multiple code channels occupying the same bandwidth degrades the performance. A full MMSE receiver is analytically studied in this letter, exploiting correlation properties among transmitted data on different subcarriers to combat the MCI. Furthermore, considering the fact that the fast time-varying fading destroys the orthogonality of the time domain spreading codes and thus introduces time domain MCI, its effect on system performance is evaluated accurately. It is also shown that it is expected to use time domain spreading factor

NTof 8 for a large range of Doppler frequencies, and frequency domain spreading factor as large as possible, especially in high signal to noise ratio. Moreover, in order to improve performance, the pilot channel should occupy around 20% to 25% of the total transmitted power for a large range of Doppler. [J224]

"Statistical analysis of mobile radio reception: an extension of clarke's model"

Statistical analysis and modeling of wireless channels is essential to wireless communication systems. Clark's model [1] and the corresponding statistical analysis of mobile radio reception has been widely accepted in numerous wireless applications. Since the component phases in Clarke's model are assumed to be constant in time, the well-known results of statistical analysis based on this model, such as the autocorrelation and Doppler power spectrum, are not appropriate to describe real wireless channels for which the random environments (radio propagation paths) are time-varying and accordingly for which the channel is non-constant in the absence of Doppler frequency shift. In this paper, we extend the traditional Clarke's model incorporating the effect of fluctuations in the component phases, and perform the statistical analysis which results in a closed-form expression of the autocorrelation of the fading. The theoretical power spectral density function, which is the Fourier transform of the resultant autocorrelation of the fading, is shown to fit the practical measured spectra, which is in contrast to the traditional theoretical flat fading channel spectra (Jake's spectrum in [2]). The proposed model and statistical results should have important implications for detailed spectral analysis and channel simulations for real wireless communications systems in random fluctuating electromagnetic propagation environments. [J225]

"A state-space model for flat fading channels with a novel method of rational function filter design"

Clarkepsilas model and Jakespsila spectrum have been traditionally accepted in wireless channel modeling. In comparison with measured spectra, Jakespsila spectrum has limitations-it is unbounded and does not incorporate the effect of temporal phase fluctuations. Previous work extended Clarkepsilas model to yield a theoretical power spectrum that is consistent with measured data. The modified spectrum, which includes the effects of phase fluctuations explicitly, is more appropriate as a theoretical basis for channel spectrum analysis and simulations. We develop here a state-space model that represents a wireless channel with these modified spectral characteristics. This is achieved by developing the relationship between a continuous-time state-space model and the theory of the rational transfer function. A novel method for the design of a rational transfer function of a linear system is proposed. The system input is a Gaussian white noise process, which generates a wireless channel with a desired arbitrary power spectrum. We represent the rational transfer function via the observable canonical form (OCF) to obtain the continuous-time state-space model. A discrete-time version of the state-space model is then provided to represent and simulate a discrete-time flat fading wireless channel. [J226]

"Microwaves Doppler Transducer for Noninvasive Monitoring of the Cardiorespiratory Activity"

The cardiorespiratory monitoring is interesting in a number of situations, the most important being the case of intensive care patients, the patients that were given sedatives, which can result in diminished reflexes, for newborn babies, etc. At present, the cardiorespiratory activity is monitored by the direct contact of the patient with the respiration sensors using the tensometric marks, capacitive sensors of motion, or the electrodes that detects the heart bioelectric activity. The proposed method refers to noncontact detection of the cardiorespiratory activity, by means of a microwaves Doppler motion detector. Another problem is to identify in the complex Doppler signal, the two components: the signal due to the cardiac activity and the signals produced by the respiration activity. [J227]

"Iterative Carrier Frequency Offset and Channel Estimation for Underwater Acoustic OFDM Systems"

This paper presents a practical low-density parity-check (LDPC) coded OFDM system designed for the underwater acoustic channel with its attendant sparse multipath channel and Doppler effects. The carrier frequency offset (CFO) and channel state information (CSI) are assumed unavailable to both to the transmitter and the receiver. Several different receiver structures are considered, all of which perform CFO/channel estimation, detection and decoding in an iterative manner. The convergence behavior of the iterative receivers and their asymptotic performance are evaluated using the extrinsic information transfer (EXIT) chart method. OFDM receiver performance is further evaluated through simulations and field tests in shallow water. [J228]

"A compensated multi-pole linear ion trap mercury frequency standard for ultra-stable timekeeping"

The multi-pole linear ion trap frequency standard (LITS) being developed at the Jet Propulsion Laboratory (JPL) has demonstrated excellent short- and long-term stability. The technology has now demonstrated long-term field operation providing a new capability for timekeeping standards. Recently implemented enhancements have

resulted in a record line Q of 5 times 1012for a room temperature microwave atomic transition and a short-term fractional frequency stability of 5 times 10-14/tau1/2. A scheme for compensating the second order Doppler shift has led to a reduction of the combined sensitivity to the primary LITS systematic effects below 5 times 10-17fractional frequency. Initial comparisons to JPL's cesium fountain clock show a systematic floor of less than 2 times 10-16. The compensated multi-pole LITS at JPL was operated continuously and unattended for a 9-mo period from October 2006 to July 2007. During that time it was used as the frequency reference for the JPL geodetic receiver known as JPLT, enabling comparisons to any clock used as a reference for an International GNSS Service (IGS) site. Comparisons with the laser-cooled primary frequency standards that reported to the Bureau International des Poids et Mesures (BIPM) over this period show a frequency deviation less than 2.7 times 10-17/day. In the capacity of a stand-alone ultra-stable flywheel, such a standard could be invaluable for long-term timekeeping applications in metrology labs while its methodology and robustness make it ideal for space applications as well. [J229]

"Carrier Recovery Enhancement for Maximum-Likelihood Doppler Shift Estimation in Mars Exploration Missions"

One of the most crucial stages of the Mars exploration missions is the entry, descent, and landing (EDL) phase. During EDL, maintaining reliable communication from the spacecraft to Earth is extremely important for the success of future missions, especially in case of mission failure. EDL is characterized by very deep accelerations, caused by friction, parachute deployment and rocket firing among others. These dynamics cause a severe Doppler shift on the carrier communications link to Earth. Methods have been proposed to estimate the Doppler shift based on Maximum Likelihood. So far these methods have proved successful, but it is expected that the next Mars mission, known as the Mars Science Laboratory, will suffer from higher dynamics and lower SNR. Thus, improving the existing estimation methods becomes a necessity. We propose a Maximum Likelihood approach that takes into account the power in the data tones to enhance carrier recovery, and improve the estimation performance by up to 3 dB. Simulations are performed using real data obtained during the EDL stage of the Mars Exploration Rover B (MERB) mission. [J230]

"Efficient Multicarrier Communication for Highly Spread Underwater Acoustic Channels"

In this paper we propose a novel method for communication over underwater acoustic channels that exhibit simultaneously large delay spread and Doppler spread, such as those found in the surf zone. In particular, we propose a coded pulse-shaped multicarrier scheme that converts the doubly dispersive channel into an inter-carrier interference (ICI) channel with small ICI spread. The resulting ICI is mitigated using a soft noncoherent equalizer that leverages sparsity in the delay-power profile to generate near-optimal bit estimates with low complexity. The noncoherent equalizer uses a delay-power-profile estimate (rather than a channel estimate) which is obtained from pilots. Numerical simulations with surf-zone-like channels demonstrate performance close to genie-aided bounds. [J231]

"Pulse Compression Sidelobe Reduction by Minimization of Lp -Norms"

Most modern radar systems make extensive use of pulse compression techniques. This paper presents a technique for the design of mismatched receive finite impulse response (FIR) filters based on the minimization of Lp-norms of the sidelobes. The goal of the minimization process is to reduce the range sidelobe levels of the convolution of the transmit pulse and the receive filter. A closed-form solution is derived for the least-squares case (which is equivalent to the L2-norm) and an expression for the optimization of the higher order norms is developed. The solutions for the higher order norms have to be obtained by means of iterative numerical methods. The effect of using receive filters which are longer than the transmit pulses is also investigated. Results are presented for linear FM transmit waveforms having time-bandwidth products ranging from 10 to 100 in combination with selected values of the norm order ranging from 2 to 200. Receive filter lengths up to three times the transmit pulse lengths are investigated. Results are presented which highlight the tradeoffs between sidelobe level, mismatch loss and mainlobe width. The effect of Doppler shift on the sidelobe response of these receive filters is also investigated. [J232]

"Waveform Selection for Maneuvering Targets Within an IMM Framework"

We consider radar waveform selection algorithms for tracking accelerating targets. Tracking is handled within an interacting multiple model (IMM) framework, which produces a number of potential cost functions for minimization. The waveform library is obtained by implementing a fractional Fourier transform on a base waveform, thereby rotating its ambiguity function around its peak. This has the effect of rotating the lower bound of measurement covariance in the range-Doppler plane. Simulation results consider a number of potential cost functions, and show robustness to cases in which the target modes are not precisely known. [J233]

"Radar Pulse Compression Repair"

This correspondence presents an adaptive approach for range sidelobe mitigation for use by future radar systems as well as in-service radar systems in which the precompressed received signal may not be readily available or it may not be feasible to replace the current pulse compression system. The approach, denoted as pulse compression repair (PCR), utilizes a previously developed adaptive technique to operate on the match filtered output treating the resulting waveform autocorrelation as if it were the transmitted waveform thus "repairing" the effects of range-sidelobe masking that are induced by matched filtering. Illustrative results are presented comparing PCR with the matched filter and the CLEAN algorithm which demonstrate significant performance advantages for PCR as well as robustness to Doppler mismatch and system errors. [J234]

"A Fault-Tolerant Channel-Allocation Algorithm for Cellular Networks With Mobile Base Stations"

In this paper, the performance of scheduling algorithms exploiting the multiuser selection diversity is studied. The authors consider schedulers with affordable-rate transmission and adaptive transmission based on the absolute signal-to-noise ratio (SNR) and the normalized SNR. In contrast to previous studies on multiuser diversity systems, channel dynamics is taken into consideration in this paper by a novel formulation based on the level-crossing analysis of stochastic processes. Then, a connection is made between the Doppler frequency shift, which indicates the channel temporal correlation, and the average (channel) access time, the average waiting time between accesses, and the average access rate of active users. These properties are important for the scheduler design, especially for applications where delay is a concern. In addition, analytical expressions for the system throughput and the degree of fairness when users have nonidentical average channel conditions are presented. These expressions quantify the effect of disparateness in users' average channel conditions on the system performance [J235]

"Nonlinear analysis of a large-orbit coaxial-waveguide cyclotron autoresonance maser amplifier"

Nonlinear simulations are presented to analyze the influences of the electron beam and the magnetic field parameters on the output power of a large-orbit coaxial-waveguide cyclotron autoresonance maser (CARM) amplifier. It is found that the guiding-center spread of the relativistic electrons has negligible impact on the output power due to the small field change felt by the large-orbit electrons. The electron-beam velocity spread and energy spread substantially decrease the output power, because these spreads directly affect the beam-wave interaction through the Doppler term and the relativistic cyclotron frequency term in the cyclotron resonance condition. However, this adverse effect may be offset by properly tapering the operating magnetic field. The output power is sensitive to both the slope and the amplitude of the tapered magnetic field. Nonlinear simulation demonstrates the feasibility that a large-orbit coaxial-waveguide CARM amplifier can be expected to provide output power with several megawatts, ultrahigh gain, and good bandwidth in the millimeter and submillimeter wavelength ranges. [J236]

"Joint scale-lag diversity in wideband mobile direct sequence spread spectrum systems"

We consider the effect of mobility on a wideband direct sequence spread spectrum (DSSS) communication system, and study a scale-lag Rake receiver capable of leveraging the diversity that results from mobility. A wideband signal has a large bandwidth-to-center frequency ratio, such that the typical narrowband Doppler spread assumptions do not apply to mobile channels. Instead, we assume a more general temporal scaling phenomenon, i.e., a dilation of the transmitted signal's time support. Based on a uniform ring of scatterers model, we determine that the wideband scattering function, which quantifies the average scale spreading, has a "bathtub-shaped" scale profile. We compare the performances of a scale-lag Rake and a frequency-lag Rake, each capable of leveraging the diversity that results from mobility. Such analysis applies, for example, to ultra-wideband (UWB) radio frequency channels and underwater wideband acoustic channels. [J237]

"Tracking Performance of Least Squares MIMO Channel Estimation Algorithm"

In this paper, the tracking performance analysis of the least squares (LS) multiple-input multiple-output (MIMO) channel estimation and tracking algorithm is presented. MIMO channel estimation is a novel application of the LS algorithm that presents near-optimum performance by Karami and Shiva in 2003 and 2006. In this paper, the mean square error (MSE) of tracking of the LS MIMO channel estimator algorithm is derived as a closed-form function of the Doppler shift, forgetting factor, channel rank, and the length of training sequences. In the analysis, all training symbols are considered as randomly generated equal-power vectors on the unit circle, or in other words, phase-shift keying (PSK) signaling. By evaluating this function, some insights into the tracking behavior of the LS MIMO channel estimator are achieved. Then, the calculated tracking error is compared with the tracking error derived from Monte Carlo simulation for quaternary-PSK-based training signals to verify the validation of

the presented analysis. Finally, the optimum forgetting factor is derived to minimize the error function, and it is shown that the optimum forgetting factor is highly dependent on the training length, Doppler shift, and Eb/No. Also, it is concluded that in low Eb/Novalues, the number of transmitter antennas has negligible effect on the optimal value of the forgetting factor. [J238]

"Least Squares Estimation of Doppler and Polarimetric Parameters for Weather Targets"

Doppler and polarimetric parameters have shown to be of great utility in weather radar applications. Different measurement schemes have been proposed and implemented to obtain Doppler and polarimetric information of the sensed weather target. To date, none of these methods is capable of providing all polarimetric and Doppler parameters of interest for the whole range of temporal correlation conditions. To obtain all parameters, some of the systems require to assume different hypotheses about the Doppler or polarimetric characteristics of the targets. Failure of the assumed hypotheses leads to unacceptable bias and loss of performance of the estimated parameters. Other methods reach a tradeoff, reducing either the number of polarimetric parameters to be estimated or the maximum measurable range of Doppler parameters. With respect to polarimetric parameter estimation, it has already been shown that alternate transmission of three different polarizations improves polarimetric parameter estimation through decoupling of temporal and polarimetric effects. In this paper, this measurement system is generalized by means of a new data processing algorithm and a least squares estimation to provide joint estimates of all Doppler and polarimetric parameters for all temporal correlation conditions. No hypotheses are required. In fact, this method provides minimum variance unbiased linear estimates of all elements of the polarimetric covariance matrix. It also allows Doppler parameter estimation within their corresponding maximum measurable ranges, which are determined by the radar base pulse repetition frequency. The performance of Doppler parameter estimates is comparable to that reached by nonpolarimetric systems. Implementation of the method requires transmitting three known polarizations. Moreover, phase shifts between them should be either known or measured. [J239]

"Performance Analysis of Wireless Systems With Doubly Selective Rayleigh Fading"

Theoretical error performances of wireless communication systems suffering from both doubly selective (time varying and frequency selective) Rayleigh fading and sampler timing offset are analyzed in this paper. Single-input-single-output systems with doubly selective fading channels are equivalently represented as discrete-time single-input-multiple-output (SIMO) systems with correlated frequency-flat fading channels, with the correlation information being determined by the combined effects of sampler timing phase, maximum Doppler spread, and power delay profile of the physical fading. Based on the equivalent SIMO system representation, closed-form error-probability expressions are derived as tight lower bounds for linearly modulated systems with fractionally spaced equalizers. The information on the sampler timing offset and the statistical properties of the physical channel fading, along with the effects of the fractionally spaced equalizer, are incorporated in the error-probability expressions. Simulation results show that the new analytical results can accurately predict the error performances of maximum-likelihood sequence estimation and maximum a posteriori equalizers for practical wireless communication systems in a wide range of signal-to-noise ratio. Moreover, some interesting observations about receiver oversampling and system timing phase sensitivity are obtained based on the new analytical results [J240]

"Effects of Correlative Coding on OFDM Systems for Intercarrier-Interference Suppression"

Orthogonal frequency-division multiplexing (OFDM) is quite sensitive to phase noise, Doppler spread, and frequency offset, which will destroy the orthogonal properties among OFDM subcarriers and cause intercarrier interference (ICI). Correlative coding can be used to suppress the ICI effectively without reducing spectral efficiency. In this paper, a comprehensive expression for the ICI power of OFDM systems with the correlative coding as a function of the correlation of phase noise, the correlation of channel, and the frequency offset is derived. We further develop the upper and lower bounds for the comprehensive expression. Compared with the exact ICI power, these bounds are easier to calculate and tight enough to provide useful insight. [J241]

"Simulation of an Inertial Acoustic Navigation System With Range Aiding for an Autonomous Underwater Vehicle"

This paper presents an integrated navigation system for underwater vehicles to improve the performance of a conventional inertial acoustic navigation system by introducing range measurement. The integrated navigation system is based on a strapdown inertial navigation system (SDINS) accompanying range sensor, Doppler velocity log (DVL), magnetic compass, and depth sensor. Two measurement models of the range sensor are derived and augmented to the inertial acoustic navigation system, respectively. A multirate extended Kalman filter (EKF) is adopted to propagate the error covariance with the inertial sensors, where the filter updates the

measurement errors and the error covariance and corrects the system states when the external measurements are available. This paper demonstrates the improvement on the robustness and convergence of the integrated navigation system with range aiding (RA). This paper used experimental data obtained from a rotating arm test with a fish model to simulate the navigational performance. Strong points of the navigation system are the elimination of initial position errors and the robustness on the dropout of acoustic signals. The convergence speed and conditions of the initial error removal are examined with Monte Carlo simulation. In addition, numerical simulations are conducted with the six-degrees-of-freedom (6-DOF) equations of motion of an autonomous underwater vehicle (AUV) in a boustrophedon survey mode to illustrate the effectiveness of the integrated navigation system. [J242]

"In Situ Alignment Calibration of Attitude and Doppler Sensors for Precision Underwater Vehicle Navigation: Theory and Experiment"

This paper reports the development and experimental evaluation of two in situ least squares techniques for estimating the alignment matrix of Doppler sonars commonly used for precision navigation of oceanographic submersibles. Most previously reported methods addressed the problem of single degree-of-freedom heading alignment using bottom-lock Doppler sonar data and global positioning system (GPS) navigation data. This paper reports and evaluates two techniques for three degree-of-freedom calibration of attitude and Doppler sonar sensors using sensor data available to vehicles at full ocean depth. The first technique provides a general linear least squares estimate of the alignment matrix. The second technique results in a least squares alignment matrix estimate constrained to the group of rotation matrices. The performance of these estimates is evaluated with a laboratory remotely operated vehicle (ROV) and a field-deployed autonomous underwater vehicle (AUV). Experimental results are reported which demonstrate that Doppler navigation employing the reported alignment calibration techniques significantly improves navigation precision. The experiments show that the latter technique provides calibration estimates that improve Doppler navigation precision not only on the calibration data set itself, but also provide improved precision over a wide variety of vehicle trajectories other than the calibration data set. [J243]

"Underwater Vehicle Navigation Using Diffusion-Based Trajectory Observers"

This paper addresses the issue of estimating underwater vehicle trajectories using gyro-Doppler (body-fixed velocities) and acoustic positioning signals (earth-fixed positions). The approach consists of diffusion-based observers processing a whole trajectory segment at a time, allowing the consideration of important practical problems such as different information update rates, outages, and outliers in a very simple framework. Results of contraction theory are used to prove that the observers are convergent, i.e., stable in the incremental sense. Simulation and experimental results are presented to illustrate the potential of application of the method. [J244]

"Vibration and Rotation in Millimeter-Wave SAR"

Synthetic aperture radar (SAR) provides high-resolution images of static ground scenes, whereas processing of data containing ground object motion results in varying focusing effects. Special cases of such motion are vibration and rotation, which are closely related to each other. Their patterns may be distinctly recognizable in focused SAR intensity images as well as in a time-frequency analysis. Millimeter-wave (mmW) SAR is well suited to image vibration because its wavelength is close to typical vibration amplitudes. Through a thorough motion analysis in a standard SAR system model, we show the effects of rotation and vibration in mmW SAR theoretically and in simulated and real data [J245]

"Photonic Doppler velocimetry of laser-ablated ultrathin metals"

Obtaining velocity information from the interaction of a laser pulse on a metal layer provides insight into the rapid dynamics of material removal and plasma plume physics during ablation. A traditional approach involves using a velocity interferometer system for any reflector (VISAR) on a reflective metal surface. However, when the target is a thin metal layer, the cohesion of the surface is quickly lost resulting in a large spread of particle velocities that cannot be easily resolved by VISAR. This is due to material ejection"confusing" the VISAR measurement surface, effectively washing out the spatial fringe visibility in the VISAR interferometer. A new heterodyne-based optical velocimeter method is the photonic Doppler velocimeter (PDV). Because PDV tracks motion in a frequency encoded temporal electro-optical signal, velocity information is preserved and allows for multiple velocity components to be recorded simultaneously. The challenge lies in extracting PDV velocity information at short (nanosecond) laser ablation time scales with rapidly varying heterodyne beats by using electronic, optical, and analytical techniques to recover the velocity information from a fleeting signal. Here we show how we have been able to obtain velocity information on the nanosecond time scale and are able to compare it to hydrodynamic simulations. Also, we examine refinements to our PDV system by increasing the bandwidth,

utilizing different probes, and sampling different analysis techniques. [J246]

"Six time- and frequency- selective empirical channel models for vehicular wireless LANs"

Three vehicle-to-vehicle (V2V) models and three roadside-to-vehicle (RTV) models, each suitable for RF channel emulation and based on measurements at 5.9 GHz, are presented. Each model captures the joint Doppler-delay characteristics of a different environment. The packet error rate (PER) for each model, measured with an emulator and an 802.11p wireless access in vehicular environments (WAVE) prototype, is presented. [J247]

"Direct experimental verification of the sound-induced tunable resonance on a flexible electrorheological layer"

The tunable behaviors of low-frequency sound waves transmitted through a flexible electrorheological (ER) layer with plastic-aluminum electrodes are investigated. It shows that, within 80-210 Hz, the sound-pressure level (SPL) decreases with the electric field E, while within 210-300 Hz, the SPL increases with E. The vibration displacement of the ER layer surface is directly measured via a laser Doppler vibrometer. It reveals that two resonance modes exist on the ER layer and all the modes are tunable via the electric field. Around the first resonant frequency of 100 Hz, the vibration displacement decreases with the increase of E, while around the second resonant frequency of about 180 Hz, the vibration displacement increases with E. The consistently varying characteristics with respect to the electric field imply an intrinsic relation between the vibration of the ER layer and the sound transmission. The relation is further qualitatively explained by the vibration-radiation model. The tunable resonance effect in the ER layer would be useful in constructing tunable phononic crystals and other acoustic devices. [J248]

"Laser Doppler flowmetry signals to quantify effects of isoflurane on the peripheral cardiovascular system of healthy rats"

The optical Doppler effect resulting from interactions between laser light photons and red blood cells of the microcirculation is used to characterize the influence of isoflurane, an halogenated volatile anesthetic, on the peripheral cardiovascular system. After having recorded laser Doppler flowmetry blood perfusion signals on isoflurane-induced anesthetized healthy rats, wavelet analyses show a significant decrease of the myogenic and neurogenic activities when isoflurane dose increases from 1.5% to 3%. Moreover, the approximate entropy shows a weak decrease of signal irregularity when dose of isoflurane increases. These findings demonstrate the usefulness of the optical Doppler effect in physiological and pharmacological applications. [J249]

"Photoacoustic Doppler flow measurement in optically scattering media"

We recently observed the photoacoustic Doppler effect from flowing small light-absorbing particles. Here, we apply the effect to measure blood-mimicking fluid flow in an optically scattering medium. The light scattering in the medium decreases the amplitude of the photoacoustic Doppler signal but does not affect either the magnitude or the directional discrimination of the photoacoustic Doppler shift. This technology may hold promise for a new Doppler method for measuring blood flow in microcirculation with high sensitivity. [J250]

"Sensitive ultrasonic vibrometer for very low frequency applications"

Ultrasonic measurement of distance is a well-known low cost method but only a few vibrometers have been developed because sensitivity, spatial resolution, and bandwidth are not high or wide enough for standard laboratory applications. Nevertheless, compared to optical vibrometers, two interesting properties should be considered: very low frequency noise (0.1Hzto1kHz)is reduced and the long wavelength enables rough surfaces to be investigated. Moreover, the ultrasonic probe is a differential sensor, without being a mechanical load for the vibrating structure as usual accelerometers based on contacting transducers are. The main specificity of the presented probe is its ultralow noise electronics including a 3/2order phase locked loop which extracts the phase modulation related to the amplitude of the detected vibration. This article presents the main useful physical aspects and details of the actual probe. The given application is the measurement of the vibration of an isolated optical bench excited at very low frequency with an electromagnetic transducer. [J251]

"Stress dependence and effect of plastic deformation on magnetic hysteresis and anhysteretic magnetization of FeNi32% films"

The magnetic hysteresis and anhysteretic magnetization of FeNi32% films were investigated as a function of isotropic stress. The magnetostriction contribution to dc magnetization under elastic stress and the effect of the plastic strain on the hysteresis loops are discussed. Also, a role of the plastic deformation interrelated with the elastic stress in the magnetization process is established. An experimental system based on a conventional

vibrating sample magnetometer equipped with a specially designed loading fixture and optical resonant spectroscopy tension monitoring technique are used to measure anhysteretic permeability and magnetization curve as a function of stress. Measurements of magnetostriction as a function of magnetic field were shown to be also possible using this fixture. Stresses are deduced from the characteristic resonant frequency of the sample in the fixture and verified via pulse propagation velocity measurement. Both indirect stress measurements are contactless, relying on remote vibration measurement using a laser Doppler vibrometer. Uniaxial stresses up to 1GPacan be applied for samples down to 50mcmspecimens. Anhysteretic permeability was extracted from the anhysteretic B-Hcurves constructed by degaussing the sample at the given longitudinal (parallel to the stresses) dc field. The large positive magnetostriction constant leads to higher susceptibility and lower coercivity with tensile stress while the large volume magnetostriction results in reduced saturation magnetization. Large stresses imposed on the sample result in plastic strain of the sample which induces increase in dislocation density and domain wall pinning. This causes the gain in hysteresis loss and coercivity to increase at the highest stresses. [J252]

"Noise Control Due to the Stator Wake Blade Interaction via Tail Articulation"

The biologically inspired method of tail articulation is investigated as a means of reducing tonal noise due to wake deficit blade interaction in underwater vehicles. Experiments are carried out in a water tunnel under typical operating conditions for underwater vehicles. Tail articulation is implemented using a life scale stator model with a hinged flapping tail operating both in free-stream velocities corresponding to Reynolds number in the range 75000 < Re < 300000 and at frequencies up to 30 Hz to investigate the range of Strouhal number 0.0 < St < 0.35. Velocity measurements of the active stator wake are carried out by laser Doppler velocimetry (LDV) and particle image velocimetry (PIV) to investigate the effects of tail articulation on the stator wake. Time-averaged measurements of the stator wake by LDV show that of the tail articulation has a dominant effect on the time mean stator drag. Instantaneous phase-averaged measurements of the stator wake by PIV show a transition in the unsteady stator wake as is increased, from a deflected vortex sheet to a series of rolled up, discrete vortices. Measurements are made of the wake due to both sinusoidal and nonsinusoidal tail motion profiles, which show that significant wake alteration is achieved with tail articulation. A low-order model describing the creation and convection of vorticity by tail articulation is developed which describes wake phenomena observed in LDV and PIV measurements. Finally, a 3-D unsteady propeller simulation using both experimental wake velocity data by PIV and simulated wake velocity data generated with the reduced-order model are used to predict the effect of sinusoidal tail articulation on radiated noise. Results using simulated data indicate that a significant noise alteration is achieved in all cases, and noise reduction of 5-8 dB is achieved in some cases. [J253]

"Adding Sensitivity to the MLBF Doppler Centroid Estimator"

The multilook beat frequency (MLBF) algorithm is the Doppler centroid estimator most commonly used in practice to solve the Doppler ambiguity. However, it still makes errors, notably in medium- or low-contrast scenes. In this paper, we present two ways in which the estimation sensitivity of the MLBF algorithm can be improved. First, we give a more thorough frequency-domain explanation of how the MLBF algorithm works and explain how cross beating and range migration cause estimation difficulties. The first improvement to the algorithm replaces the fast Fourier transform (FFT)-based beat frequency estimator with a more accurate one that uses phase increments. It avoids the FFT limitations of resolution and quantization, especially when the signal is discontinuous in one range cell due to range cell migration or burst mode operation (ScanSAR). A second improvement uses range cell migration correction to straighten the target trajectories before the beat frequency estimator is applied. This has the effect of narrowing the bandwidth of the beat signal and reducing the effect of cross beating. Finally, experiments with RADARSAT-1 data are used to illustrate the improved estimation accuracy of the modified algorithm [J254]

"Performance Analysis and Parameter Optimization of DLL and MEDLL in Fading Multipath Environments for Next Generation Navigation Receivers"

In this paper the choice of DLL parameters is studied with special focus on multipath and Doppler sensitivity. The envisaged application is code tracking on navigation receivers and the multipath fading environments defined for next generation navigation systems are considered. Given the particular properties of these propagation environments, multipath estimating delay lock loop is shown to have the best performance within a particular signal to noise ratio range if some specific parameters such as the Predetection Integration Time and channel estimation time interval match the time-varying nature of the channel and the spacing in the early-late scheme is chosen accordingly to the multipath characteristics. [J255]

"Instability of relativistic electron-beam-dielectric system as a mechanism for microwave

generation"

The dispersion relation of relativistic rectilinear electron beam propagating along a guide magnetic field in a dielectric is investigated by cold fluid model. In such a system, due to anomalous Doppler effect, the instability occurs when the electron velocity exceeds the wave phase velocity. The growth rate and spatial growth rate are studied analytically and the nonlinear saturated efficiency is given analytically for the first time. Numerical results show that the saturated efficiency approaches about 10%-30%. The distinctive interaction mechanism is promising for the design of a new kind of compact high-power microwave generation devices. [J256]

"A GPS-Reflections Receiver That Computes Doppler/Delay Maps in Real Time"

This paper describes a new instrument that was specially designed and developed to gather Global Positioning System (GPS) signals after they have been reflected from suitable surfaces (sea, ice, and ground), for Earth remote sensing. The device has been called the GPS open-loop differential real-time receiver (GOLD-RTR). Its main and most innovative feature is its computation and storage, in real time, of complex-valued (I and Q) cross correlations (waveforms) between GPS L1-C/A signals-received directly and after reflection-and the corresponding models of these signals. Particularly, the GOLD-RTR schedules consecutive coherent integration time slots of 1 ms over which ten parallel correlation channels, with 64 lags each, work simultaneously and continuously with the input raw data sampled at 40 MHz. The total throughput is 10 000 waveforms per second, each waveform being 64 lags long. These real-time correlation resources can be flexibly distributed in several configurations according to the observational requirements, for instance: Doppler/delay maps or up to ten simultaneous reflected waveforms for ten different GPS satellites are examples of what can be done. The further processing of the real-time computed 1-ms waveforms in a flight campaign over the ocean, ice, or ground can be used to obtain geophysical parameters such as sea level and tides, sea surface mean-square slopes, ice roughness and thickness, soil moisture and biomass, or future applications. This paper covers the GOLD-RTR architecture and hardware, signal processing and data storage issues, machine-user interface, laboratory readiness tests, and waveform data samples from the first two jet aircraft campaigns at 9300 m over the sea [J257]

"Application of tape-cast graded impedance impactors for light-gas gun experiments"

Fabrication of compositionally graded structures for use as light-gas gun impactors has been demonstrated using a tape casting technique. Mixtures of metal powders in the Mg-Cu system were cast into a series of 19 tapes with uniform compositions ranging from 100%Mg to 100%Cu. The individual compositions were fabricated into monolithic pellets for characterization of microstructure, density, and sound wave velocity. Graded impactors were fabricated by stacking layers of different compositions in a sequence calculated to yield a tailored acoustic impedance profile, and were characterized by ultrasonic C-scan and white light interferometry. The graded impactors were launched into stationary Al targets using a two-stage light-gas gun, and the resulting wave profiles were measured with either VISAR or Photonic Doppler Velocimetry. For an impactor using only seven compositions ranging from Mg to Cu, the composition steps are visible in the wave profiles. An impactor utilizing the full series of 19 compositions produces smoother compression with no visible manifestation of the discrete-layer structure. Hydrodynamic simulations of these impactors also suggest smooth compression profiles within the impactor. [J258]

"Designing Waveforms for Temporal Encoding Using a Frequency Sampling Method"

In this paper a method for designing waveforms for temporal encoding in medical ultrasound imaging is described. The method is based on least squares optimization and is used to design nonlinear frequency modulated signals for synthetic transmit aperture imaging. By using the proposed design method, the amplitude spectrum of the transmitted waveform can be optimized, such that most of the energy is transmitted where the transducer has large amplification. To test the design method, a waveform was designed for a BK8804 linear array transducer. The resulting nonlinear frequency modulated waveform was compared to a linear frequency modulated signal with amplitude tapering, previously used in clinical studies for synthetic transmit aperture imaging. The latter had a relatively flat spectrum which implied that the waveform tried to excite all frequencies including ones with low amplification. The proposed waveform, on the other hand, was designed so that only frequencies where the transducer had a large amplification were excited. Hereby, unnecessary heating of the transducer could be avoided and the signal-to-noise ratio could be increased. The experimental ultrasound scanner RASMUS was used to evaluate the method experimentally. Due to the careful waveform design optimized for the transducer at hand, a theoretic gain in signal-to-noise ratio of 4.9 dB compared to the reference excitation was found, even though the energy of the nonlinear frequency modulated signal was 71% of the energy of the reference signal. This was supported by a signal-to-noise ratio measurement and comparison in penetration depth, where an increase of 1 cm was found in favor for the proposed waveform. Axial and lateral resolutions at full-width half-maximum were compared in a water phantom at depths of 42, 62, 82, and 102 mm.

The axial resolutions of the nonlinear frequency modulated signal were 0.62, 0.69, 0.60, and 0.60 mm, respectively. The corresponding axial resolutions for the reference wav--eform were 0.58, 0.65, 0.62, and 0.60 mm, respectively. The compression properties of the matched filter (mismatched filter for the linear frequency modulated signal) were tested for both waveforms in simulation with respect to the Doppler frequency shift occurring when probing moving objects. It was concluded that the Doppler effect of moving targets does not significantly degrade the filtered output. Finally, in vivo measurements are shown for both methods, wherein the common carotid artery on a 27-year-old healthy male was scanned. [J259]

"SNR Comparisons of Beamforming Strategies"

This paper defines the echo signal-to-noise ratio (eSNR) for pulse-echo systems that adapts to the effects of shift-varying impulse responses, spatiotemporal coding, and various beamformers. Measurement techniques using point targets or random scattering media can be interrelated for a broad range of experimental conditions through the eSNR. The eSNR definitions are also illustrated by comparing a spatial matched filter (SMF) beamformer to conventional dynamic receive focusing methods to evaluate performance based on resolution arid sensitivity. Closed-form expressions are presented that predict eSNR gains from SMF approaches relative to other beamformers [J260]

"High-Resolution Estimation of Ranges Using Multiple-Frequency CW Radar"

The problem of ranging multiple vehicles traveling at similar speeds using multiple-frequency continuous-wave (CW) radar is considered. A new method based on the compensation of vehicle movement and MUSIC-based time delay estimator is presented. The method is tested using a commercially available multiple-frequency CW radar sensor in real traffic situations. Test results show that the proposed method makes it possible to estimate the positions of two vehicles moving at similar speeds. Test results also demonstrate that under a given bandwidth, the multiple-frequency CW radar can provide about ten times higher resolution as compared with the coherent spread spectrum radar [J261]

"A Frequency Offset Estimation Technique Based on Frequency Error Characterization for OFDM Communications on Multipath Fading Channels"

A novel frequency offset estimation technique based on maximum-likelihood estimation for wireless orthogonal frequency division multiplexing communications on frequency-selective fading channels is proposed. By taking advantage of subcarrier-level differential operation and coherent error characterization, the proposed estimator based on the frequency error characteristics can effectively overcome multipath fading effects. Frequency error characterization is achieved by means of pseudonoise matched filters in the frequency direction; thus, the proposed estimation technique exploits frequency diversity without assistance in the form of accurate timing information. In addition, the proposed technique can combat the rapid time selectivity caused by a wide Doppler spread because it requires channel stationarity for only a short duration due to the exploitation of both a single preamble in its training operation and the following semiblind estimation aided from several pilot subchannels. The proposed technique can easily switch between training mode and semiblind mode by sharing the same system architecture. Extensive simulation results in conjunction with statistical analysis verify the superiority of the proposed technique [J262]

"An Approximately MAI-Free Multiaccess OFDM System in Fast Time-Varying Channels"

A new multiuser orthogonal frequency division multiplexing (OFDM) transceiver with preceding, called the precoded multiuser OFDM (PMU-OFDM) system, was recently introduced by Tsai et al. (2005). The PMU-OFDM system can reduce multiaccess interference (MAI) due to the carrier frequency offset (CFO) to a negligible amount by preceding the data of each user with a codeword selected from either even or odd Hadamard-Walsh codes. The performance of the PMU-OFDM system in a mobile environment, where the channel response varies within one OFDM symbol due to the Doppler effect, is evaluated in this paper. It is shown by analysis and simulation that the use of even or odd Hadamard-Walsh codewords can greatly reduce the MAI effect due to the Doppler effect as well. Generally, all Hadamard-Walsh codewords except for the all-one codeword result in considerable suppression of intercarrier interference (ICI) induced by the Doppler effect. Furthermore, we discuss codeword priority schemes to minimize ICI as much as possible. Finally, simulations results are given to demonstrate the advantage of PMU-OFDM over OFDMA with a codeword priority scheme in the Doppler environment. We show that the PMU-OFDM system with odd Hadamard-Walsh codewords outperforms a half-loaded OFDMA system in a mobile environment. [J263]

"Null Steering Approach With Minimized PCV and GD for Large Aperture Vertical Antenna Arrays"

A novel null-steering method that minimizes the effect of radio frequency interference (RFI) and the effect of

antenna phase center variation (PCV) and group delay (GD) is proposed. PCV and GD are important to characterize for global navigation satellite system (GNSS) antenna arrays used in satellite based landing architectures, since they directly affect the pseudo-range and accumulated Doppler observables. The proposed method is denoted as the beam subtraction method (BS). The BS method is compared against a conventional null-steering (CNS) method applied to a large aperture antenna array. Simulation results reveal noticeable improvement in both the PCV and GD curves as a function of azimuth and elevation angles when using the BS method compared to the CNS thus reducing the error on the range measurements as well as improving system availability in the presence of RFI. [J264]

"Analysis of Acousto-Electromagnetic Wave Interaction Using Sheet Boundary Conditions and the Finite-Difference Time-Domain Method"

Acousto-electromagnetic wave interaction occurs when an electromagnetic wave scatters from an object under seismic or acoustic illumination. The vibration of the object under acoustic excitation gives rise to a frequency modulated scattered field which depends on both the object and electromagnetic and acoustic source parameters. The objective of this study is to accurately calculate the Doppler spectrum of the bistatic scattered field which is usually orders of magnitude smaller than the fundamental component of the scattered field (the stationary target response). In this analysis the recently developed sheet boundary conditions are used to set up a duplicate problem of a stationary object having time varying sheet impedance and admittance accounting for the object vibration. The problem is formulated using the two-dimensional finite-difference time-domain (FDTD) method in an iterative scheme in order to find the broadband response of the scattered field Doppler component. Two-dimensional analytical solutions for a canonical geometry are used to verify the FDTD simulation results. [J265]

"Coded Decision-Directed Channel Estimation for Coherent Detection in Terrestrial DMB Receivers"

This paper proposes a coded decision-directed (DD) channel-estimation method with two-dimensional averaging for T-DMB receivers. Since the noncoherent differential demodulation of existing T-DMB receivers can not track channel variation, it may not work well in fast-fading channels. To overcome this problem, coherent detection based on channel estimation is introduced. The proposed method re- modulates the output of the soft-decision Viterbi decoder for coded DD channel estimation to obtain more accurate decision symbols than hard-decision symbols. To both mitigate the effects of noise and smooth incorrectly-estimated coefficients, the estimated channel coefficients are two- dimensionally averaged. The enhanced accuracy leads to the high-performance DQPSK demodulation robust to Doppler spread and noise. The proposed method may also contribute to the launch of the future T-DMB service of providing a higher data rate. Simulation results show that the proposed scheme performs much better than the conventional method, especially at high speed-moving receivers. [J266]

"Random Noise Radar/Sodar With Ultrawideband Waveforms"

Random noise waveforms with ultrawide bandwidth improve the range resolution and reduces the probability of intercept in radar/sodar. As a result of the nonperiodic waveform, the range ambiguity is removed as well. By transmitting a sine signal that is phase or frequency modulated by random noise, autocorrelation functions with improved side lobe suppression in range can be formed. There are great similarities in the signal-processing algorithms applied in noise radar and sodar. The much slower propagation velocity of sound compared to light reduces the signal bandwidth but increases the time of measurement, however. In both sodar and radar, the range resolution is determined by the wavelength band occupied by the transmitted waveform, while the velocity resolution is controlled by the ratio of wavelength and time of measurement. The slower sound velocity also enhances the range/Doppler ambiguity problem in sodar when periodic waveforms are applied. This ambiguity could be suppressed if nonperiodic waveforms are introduced, such as random noise. In this paper, fundamental similarities and differences on system level between sodar and radar are first discussed, and signal-processing algorithms applied in random noise radar/sodar are reviewed. In particular, the noise floor of the ambiguity function and its relationship to spectrum width and time of measurement are analyzed, including improved side lobe suppression using mismatched filtering. The signal-processing algorithms were tested on raw data from sodar measurements on moving targets, buildings, vegetation, and water surfaces. An adaptive filter algorithm for suppression of the increased noise floor from dominant reflectors was derived and successfully applied to both sodar and stepped frequency radar data [J267]

"An Adaptive Doppler Shift Estimator in Mobile Communication Systems"

In this paper, an adaptive Doppler shift estimator based on the square envelope autocorrelation function of the mobile propagation channel is proposed. Furthermore, the proposed estimator exploits the iterative minimum

finding procedure to reduce the effect of additive noise. Both the theoretical analysis and the experiments are provided to show that the proposed method yields fairly good signal-to-noise ratio (SNR) insensitive performance in a wide range of velocities and SNRs [J268]

"System free of channel problems inherent in changing mobile communication systems"

A proposal is put forward for an innovative method of multiple access, termed frequency Bank signal (FBS). The major advantage of FBS is that the error probability is almost non-sensitive to, either, the Doppler effect, separate signal delay or to the negative effect of reflected signals. In addition, FBS signals do not require special pilot or equalisation signals [J269]

"Mathematics of Synthesizing Range Profile"

The mathematics of synthesizing a high-range resolution profile (HRRP) is discussed. With a generalized model of synthetic wideband signal and its echo signal, stretch processing technique is extended and refined. Then, an investigation on the mathematic principle of synthesizing a range profile demonstrates that quadratic phase error criterion does not exactly represent the effect of motion on a synthetic range profile (SRP). Therefore, a least-mean-square error criterion is proposed, and several conclusions about the new criterion are derived. In addition, specific conclusions about the distortion for a stepped-frequency waveform (SFW) are investigated with some simulations [J270]

"MIMO Radar Ambiguity Functions"

Multiple-Input Multiple-Output (MIMO) radar has been shown to provide enhanced performance in theory and in practice. MIMO radars are equipped with the ability to choose freely their transmitted waveforms at each aperture. In conventional radar systems Woodward's ambiguity function is used to characterize waveform resolution performance. In this paper we extend the idea of waveform ambiguity functions to MIMO radars. MIMO ambiguity functions are developed that simultaneously characterize the effects of array geometry and transmitted waveforms on resolution performance. Overall resolution performance is shown to be governed by a space-time covariance function that can be controlled by the system on transmit using waveform diversity. Visual examples are provided to illustrate the resolution enhancement possible using MIMO technology [J271]

"Doppler aliasing reduction in SAR imagery using stepped-frequency waveforms"

A new technique for eliminating Doppler aliasing artifacts in synthetic aperture radar (SAR) imagery is presented. The technique uses continuous transmission of stepped-frequency (SF) waveforms to generate a simple, but effective, approximation of a two-dimensional |sinc|2 ambiguity function. This approach ensures aliasing artifacts are placed at nulls in a Doppler filter, effectively removing them from the imagery. Various methods of generating SF waveforms are introduced and their performance is quantified. Finally, simulated SAR imagery shows elimination of more than 99% of the aliased energy [J272]

"Pilot-Assisted Time-Varying Channel Estimation for OFDM Systems"

In this paper, we deal with channel estimation for orthogonal frequency-division multiplexing (OFDM) systems. The channels are assumed to be time-varying (TV) and approximated by a basis expansion model (BEM). Due to the time-variation, the resulting channel matrix in the frequency domain is no longer diagonal, but approximately banded. Based on this observation, we propose novel channel estimators to combat both the noise and the out-of-band interference. In addition, the effect of a receiver window on channel estimation is also studied. Our claims are supported by simulation results, which are obtained considering Jakes' channels with fairly high Doppler spreads [J273]

"Doppler Mode Pulse Sequences Mitigate Glomerular Capillary Hemorrhage in Contrast-Aided Diagnostic Ultrasound of Rat Kidney"

Glomerular capillary hemorrhage (GCH) induced in rat kidney by diagnostic ultrasound involving contrast agent destruction was characterized for different modes to explore possible mitigation strategies. Anesthetized hairless rats were scanned at 2.5 MHz in a water bath with contrast agent infused at 10 mul/kg/minute via tail vein. B mode flash echo imaging (FEI), color Doppler (CD) FEI and realtime Doppler imaging at 1 frame per second were tested, which had image pulse sequences of approximately 0.53 ms, 15.8 ms, and 83.5 ms duration, respectively. Bioeffects endpoints included grossly observed blood-filled tubules, histological evaluation of GCH, and detection of hematuria. B mode FEI for 1 minute induced GCH in 38.6plusmn17.1% of glomeruli in histology from the scan plane for a peak rarefactional pressure amplitude (RPA) of 2.6 MPa. The threshold for GCH was approximately 1.5 MPa, confirmed by 10-minute exposure with agent infusion. Paradoxically, CD mode FEI

delivered many more pulses but produced less GCH (P < 0.02), and real-time Doppler mode induced only 5.3plusmn3.8% (P < 0.005). Hematuria results followed the GCH trends. These findings indicate a promising strategy, which is to use relatively slow ramp-up of pulse RPAs in agent-destroying image pulse sequences, for mitigating potential bioeffects in contrast-aided diagnostic ultrasound. [J274]

"Analysis of a Vibrating Interventional Device to Improve 3-D Colormark Tracking"

Ultrasound guidance of interventional devices during minimally invasive surgical procedures has been investigated by many researchers. Previously, we extended the methods used by the Colormark tracking system to several interventional devices using a real-time, three- dimensional (3-D) ultrasound system. Those results showed that we needed to improve the efficiency and reliability of the tracking. In this paper, we describe an analytical model to predict the transverse vibrations along the length of an atrial septal puncture needle to enable design improvements of the tracking system. We assume the needle can be modeled as a hollow bar with a circular cross section with a fixed proximal end and a free distal end that is suspended vertically to ignore gravity effects. The initial results show an ability to predict the natural nodes and antinodes along the needle using the characteristic equation for free vibrations. Simulations show that applying a forcing function to the device at a natural antinode yields an order of magnitude larger vibration than when driving the device at a node. Pulsed wave spectral Doppler data was acquired along the distal portion of the needle in a water tank using a 2-D matrix array transesophageal echocardiography probe. This data was compared to simulations of forced vibrations from the model. These initial results suggest that the model is a good first order approximation of the vibrating device in a water tank. It is our belief that knowing the location of the natural nodes and antinodes will improve our ability to drive the device to ensure the vibrations at the proximal end will reach the tip of the device, which in turn should improve our ability to track the device in vivo. [J275]

"Photoacoustic Imaging of Multiple Targets Using Gold Nanorods"

Photoacoustic (PA) imaging has been used mainly for anatomical and functional imaging. Although functionalized nanoparticles also have been developed for PA molecular imaging, only single targeting has been demonstrated. In this study, PA imaging of multiple targets using gold nanorods is demonstrated experimentally using HER2 and CXCR4 as target molecules. The two corresponding monoclonal antibodies were conjugated to two types of gold nanorod with different aspect ratios. Gold nanorods with mean aspect ratios of 5.9 and 3.7 exhibited peak optical absorptions at 1000 and 785 nm, respectively. Appropriate selection of laser irradiation wavelength enhances PA signals by 7-12 dB and allows signals from gold nanorods corresponding to specific bindings to be distinguished. This approach potentially allows the expression levels of different oncogenes of cancer cells to be revealed simultaneously. [J276]

"Precise BER analysis of π/4-DQPSK OFDM with carrier frequency offset over frequency selective fast fading channels"

An exact closed-form bit error rate (BER) expression is derived for an orthogonal frequency-division multiplexing system with π/4-shifted differentially encoded quadrature phase shift keying (π/4-DQPSK) in the presence of carrier frequency offset over frequency-selective fast Rayleigh fading channels. Different system configurations, including time domain differential modulation, frequency domain differential modulation, single channel reception, and multi-channel reception with maximal ratio combining diversity, are considered in the exact BER analysis. For a small number of subcarriers, the BER expression can be calculated directly. A Monte Carlo method is designed to evaluate the BER for a large number of subcarriers. The analytical expression can be used to investigate the effect of several channel parameters, including mean delay spread and maximum Doppler spread, on the system BER performance. Particularly, the effect of carrier frequency offset on the system performance, and the differences and opportunities to use frequency domain differential modulation or time domain differential modulation, can be studied in a quantitative way for a more realistic wireless channel environment model. By using the exact closed-form BER expression, an optimum number of subcarriers can be found, and the allowable carrier frequency offset, Doppler spread, and mean delay spread for given operating conditions can be determined. [J277]

"Ultrasonic Doppler Sensor for Voice Activity Detection"

This letter describes a robust voice activity detector using an ultrasonic Doppler sonar device. An ultrasonic beam is incident on the talker's face. Facial movements result in Doppler frequency shifts in the reflected signal that are sensed by an ultrasonic sensor. Speech-related facial movements result in identifiable patterns in the spectrum of the received signal that can be used to identify speech activity. These sensors are not affected by even high levels of ambient audio noise. Unlike most other non-acoustic sensors, the device need not be taped to a talker. A simple yet robust method of extracting the voice activity information from the ultrasonic Doppler

signal is developed and presented in this letter. The algorithm is seen to be very effective and robust to noise, and it can be implemented in real time. [J278]

"Nonlinearity and frequency-path modelling of three-longitudinal-mode nanometric displacement measurement system"

The effects of periodic nonlinearity, intermodulation distortion, phase detection uncertainty and electrical cross-talk in a three-longitudinal-mode laser heterodyne Doppler interferometer (TLMI) displacement measurement system are presented. A frequency-path model consisting of three frequency components and two paths is also designed. As a result, there will be six frequency-path elements and 21 distinct interference terms. The periodic nonlinearity in the TLMI is mathematically modelled and simulated. Simulation results are compared with the typical two-mode heterodyne interferometer to confirm the designed model performance. The authors demonstrate that the nonlinearity of TLMI can be greatly reduced using the same compensation method as used in a two-frequency interferometer proposed by Hou et al. [J279]

"Iterative Channel Estimation and Decoding of Turbo Coded SFBC-OFDM Systems"

We consider the design of turbo receiver structures for space-frequency block coded orthogonal frequency division multiplexing (SFBC-OFDM) systems in the presence of unknown frequency and time selective fading channels. The turbo receiver structures for SFBC-OFDM systems under consideration consists of an iterative MAP expectation/maximization (EM) channel estimation algorithm, soft MMSE-SFBC decoder and a soft MAP outer-channel-code decoder. MAP-EM employs iterative channel estimation and it improves receiver performance by re-estimating the channel after each decoder iteration. Moreover, the MAP-EM approach considers the channel variations as random processes and applies the Karhunen-Loeve (KL) orthogonal series expansion. The optimal truncation property of the KL expansion can reduce computational load on the iterative estimation approach. The performance of the proposed approaches are studied in terms of mean square error and bit-error rate. Through computer simulations, the effect of a pilot spacing on the channel estimator performance and sensitivity of turbo receiver structures on channel estimation error are studied. Simulation results illustrate that receivers with turbo coding are very sensitive to channel estimation errors compared to receivers with convolutional codes. Moreover, superiority of the turbo coded SFBC-OFDM systems over the turbo coded STBC-OFDM systems is observed especially for high Doppler frequencies. [J280]

"Optimum Receiver Design for Broadband Doppler Compensation in Multipath/Doppler Channels With Rational Orthogonal Wavelet Signaling"

In this paper, we address the issue of signal transmission and Doppler compensation in multipath/Doppler channels. Based on a wavelet-based broadband Doppler compensation structure, this paper presents the design and performance characterization of optimum receivers for this class of communication systems. The wavelet-based Doppler compensation structure takes account of the coexistence of multiple Doppler scales in a multipath/Doppler channel and captures the information carried by multiple scaled replicas of the transmitted signal rather than an estimation of an average Doppler as in conventional Doppler compensation schemes. The transmitted signal is recovered by the perfect reconstruction (PR) wavelet analysis filter bank (FB). We demonstrate that with rational orthogonal wavelet signaling, the proposed communication structure corresponds to a Lth-order diversity system, where L is the number of dominant transmission paths. Two receiver designs for pulse amplitude modulation (PAM) signal transmission are presented. Both receiver designs are optimal under the maximum-likelihood (ML) criterion for diversity combination and symbol detection. Good performance is achieved for both receivers in combating the Doppler effect and intersymbol interference (ISI) caused by multipath while mitigating the channel noise. In particular, the second receiver design overcomes symbol timing sensitivities present in the first design at reasonable cost to performance. [J281]

"Time, Frequency Synchronization, and Equalization for Asynchronous Multiuser MIMO Systems"

An asynchronous multiuser MIMO system with multipath channels and carrier frequency offsets (CFOs) or Doppler shifts is remodeled into another system. A blind method based on second order statistics is then used for estimating the shaped channels with ambiguity. Based on the shaped channels, specially designed pilots are proposed to find the CFOs. The same pilots are also used to resolve the time delays and the ambiguity in the estimated channels. After the CFOs, time delays and ambiguity are found, an equalization method based on the minimum mean square error (MMSE) criteria is obtained to recover the transmitted symbols. Only upper bounds for the channel orders and time delays are needed for implementing the algorithms, which makes them applicable to practical multiuser MIMO systems. [J282]

"A Chirp Transform Algorithm for Processing Squint Mode FMCW SAR Data"

Frequency-modulated continuous-wave (FMCW) synthetic aperture radar (SAR) is a lightweight cost-effective high-resolution airborne imaging radar. In squint case, the frequency scaling algorithm, which is suitable for processing nonchirped raw data, cannot be used directly in FMCW SAR data processing because of low system sampling frequency. On the other hand, the continuous antenna motion of FMCW SAR can cause serious distortions in the reconstructed images. In this letter, an improved algorithm called the chirp transform algorithm is proposed. When the effects of the residual video phase are negligible, the algorithm uses a chirp transform to perform the time scaling operation to alleviate the sampling frequency problem. It requires only fast Fourier transforms and multiplications. The range cell migration introduced by the continuous motion is also compensated completely in range-Doppler domain. The algorithm performances are analyzed and are supported by point target simulation experiments. [J283]

"On the Critical Ionization Velocity Effect in Interstellar Space and Possible Detection of Related Continuum Emission"

Interstellar neutral hydrogen (HI) emission spectra manifest several families of linewidths whose numerical values (34, 13, and 6 km/s) appear to be related to the critical ionization velocities (CIVs) of the most abundant interstellar atomic species. Extended new analysis of HI emission profiles shows that the 34-km/s-wide component, which probably corresponds to the CIV for helium, is pervasive. The 34-km/s-wide linewidth family is found in low-velocity (local) HI profiles and in the so-called high-velocity clouds (HVCs). In addition, published studies of HI linewidths found in the Magellanic Stream, Very High Velocity Clouds, and Compact HVCs, all of which are believed to be intergalactic, have noted that the typical values are of the same order. If the CIV effect does play a role in interstellar space, it may be expected to produce locally enhanced electron densities where rapidly moving neutral gas masses interact with the surrounding plasma. Evidence that suggests that this phenomenon is occurring in interstellar space is presented. It manifests as a spatial association between peaks in HI structure offset with respect to peaks in high-frequency radio continuum data obtained with the Wilkinson Microwave Anisotropy Probe. [J284]

"Optimum and decentralized detection for multistatic airborne radar"

The likelihood ratio test (LRT) for multistatic detection detection is derived for the case where each sensor platform is a coherent space-time radar. Due to the geometric separation of the platforms, target statistics are modeled as independent from platform to platform but constant over the local data on a single platform. Clutter statistics are also assumed independent from platform to platform but have a local space-time correlation structure typical of monostatic space-time adaptive processing (STAP). Moreover, the target Doppler hypothesis varies from platform to platform due to multiple viewing perspectives. Previous published work has investigated the detection improvement obtained by multiple input, multiple output (MIMO) radar. This prior work, however, has only considered white noise. When clutter is considered, the diversity benefit of a MIMO or multistatic radar system is strongly dependent on geometry. We investigate the relationship between geometry and diversity gain for multistatic airborne space-time radar and the effects of this relationship on decentralized and centralized detection. [J285]

"Template-Based Target Identification and Confusion Matrices [JAESS Tutorial IV]"

One-dimensional high-range-resolution (HRR) and two-dimensional range-Doppler-imaging (RDI) radar represent possible sensor technologies where template-based techniques can be applied to perform combat identification (CID). The majority of the research reported in these areas consists of empirical studies. This article provides a theoretical basis for understanding some of the fundamental trade-offs associated with these CID techniques, such as the following: What are the relative advantages of RDI over HRR radar or of finer versus coarser resolution in the HRR process? What is the relative advantage of coherent over noncoherent processing? How do target correlations, signal-to-noise ratio (SNR), and target scintillation affect the ability to identify targets? Because confusion matrices are often used to characterize the performance of CID systems, we provide analytical methods for calculating the entries in confusion matrices as a function of the issues cited above. These formulations provide analytical bases to guide system trade-off decisions. The organization of this paper is as follows. We begin with a short overview of HRR and RDI and then explore a number of ways to process the associated target templates that range from an ideal, theoretical approach to an approach that would be more feasible to implement within current-day radars. We first develop analytic template-based methodologies for constructing confusion matrix entries for nonscintillating targets for both coherent and noncoherent processing assumptions. The confusion matrix entries in these cases are conditional probabilities obtained from a simple rule: find the probability that among m (in general, correlated) random variables, each associated with a possible target, that any one is the largest. For the noncoherent case, the successful application of this rule requires the target template values to explicitly include the effects of thermal noise (noise-adjusted templates). We conclude by showing h--ow to calculate theoretically optimum results (e.g., using maximum likelihood techniques) for

noncoherent processing of targets that exhibit uncorrelated Swerling 1 scintillation in ail resolution bins as a function of the SNR. This approach allows us to include overall target intensity (e.g., total radar cross section (RCS)) as a further factor in the target decision process. [J286]

"Discrete time-scale characterization of wideband time-varying systems"

Wideband time-varying systems can be found in many applications, including underwater acoustics and ultra-wideband technologies. The time variation due to Doppler scaling effects, coupled with dispersive scattering due to multipath propagation, can severely limit the performance of wideband systems. Just as the discrete time-frequency model can efficiently improve narrowband processing, a discrete time-scale system characterization is important in processing wideband time-varying systems. In this paper, a time-scale model is proposed as a discrete characterization of wideband time-varying systems. This representation decomposes a wideband system output into discrete time shifts and Doppler scalings on the input signal, weighted by a smoothed and sampled version of the wideband spreading function. The proposed transform-based approach uses the Mellin transform that is inherently matched to scalings to geometrically sample the scale parameter and the Fourier transform to arithmetically sample the time-delay parameter. Using this proposed model, and by properly designing the signaling and reception schemes using wavelet techniques, a joint multipath-scale diversity can be achieved over a dyadic time-scale framework in wideband wireless systems. The simulation results demonstrate that, based on the proposed model, performance can be increased by exploiting the diversity intrinsically afforded by the wideband system. [J287]

"Performance of multicarrier DS/SSMA over fast Rayleigh fading channels with Doppler diversity"

The significant loss in performance of multicarrier direct-sequence spread-spectrum multiple-access systems over fast-fading channels is investigated. First, the channel model for individual subchannels is obtained, using a canonical decomposition to a wide-sense stationary (WSS), uncorrelated scattering channel. Next, a receiver structure, which features both Doppler diversity and frequency diversity, is presented and analyzed. It is found that large Doppler spreads cause the average magnitude of the desired signals to diminish dramatically. Expressions for the bit-error rate are derived for both uncoded and coded systems by applying the standard Gaussian approximation. Numerical results, which show that Doppler diversity is preferable over frequency diversity in fast-fading channels, are provided for different combinations of the diversity orders. Numerical results, which show that the intersymbol and intersubchannel interference can be effectively suppressed, and the multiple-access interference tends to degenerate into a WSS process with the statistical periodicity destroyed by the fast-fading channels, are also provided. [J288]

"Results of the ISDB-T system tests, as part of digital TV study carried out in Brazil"

Since the year 2000, Mackenzie Presbyterian University has been carrying out lab and field tests to evaluate the performance of current DTV systems, with the aim of providing backing for the Brazilian Government's decision on the standard to be adopted. This paper presents the results of tests using the Japanese DTV system ISDB-T. Initially, the tests were done using a first generation prototype of the ISDB-T DTV set-top box. When DTV transmissions began in Japan in November 2003, the Brazilian tests were repeated using several new commercial set-top boxes. The main tests accomplished in 2000 were: measurement of the C/N ratio, behavior of the signal with multipath, Doppler effect and immunity to impulse noise. In 2003/2004, these tests were repeated using new receivers to analyze the evolution of the system. Furthermore, two new tests were introduced: resilience to phase noise and simultaneous transmission of two types of modulation in the same TV channel, in order to evaluate the band segmentation. Also, a one-segment DTV receiver (1STV) in a portable handset was tested in the laboratory. [J289]

"Micro-Doppler effect in radar: phenomenon, model, and simulation study"

When, in addition to the constant Doppler frequency shift induced by the bulk motion of a radar target, the target or any structure on the target undergoes micro-motion dynamics, such as mechanical vibrations or rotations, the micro-motion dynamics induce Doppler modulations on the returned signal, referred to as the micro-Doppler effect. We introduce the micro-Doppler phenomenon in radar, develop a model of Doppler modulations, derive formulas of micro-Doppler induced by targets with vibration, rotation, tumbling and coning motions, and verify them by simulation studies, analyze time-varying micro-Doppler features using high-resolution time-frequency transforms, and demonstrate the micro-Doppler effect observed in real radar data. [J290]

"Image feature-based space-time processing for ground moving target detection"

An image feature-based space time processing (IFSTP) algorithm is introduced to effectively detect ground moving targets in clutter and jamming via airborne radar. This new approach exploits the distinct image features

of targets and interference signals in the angle-Doppler domain. An image segmentation algorithm, referred to as region growing, extracts targets and interference features in the angle-Doppler domain, and an innovative block-size detection algorithm discriminates between moving targets and interference based on the extracted image features. The proposed IFSTP algorithm is particularly suitable for detecting ground moving targets in highly nonhomogeneous clutter environments, without any requirement for clutter covariance estimation. [J291]

"High-sensitivity and high-mobility compact DVB-T receiver for in-car entertainment"

A compact DVB-T receiver with better than -94 dBm sensitivity for in-car usage is presented in this work. Dual tuners are included in the receiver to reduce multi-path effects as well as realize the diversity technique. A robust audio/video interface (AVIO) is defined to accommodate different kinds of in-car displays with a variety of A/V specs. In addition, a protection circuit is proposed to provide the convenience that either active antennas or passive antennas can be plugged in the same antenna sockets. Field trials proved that the receiver works perfectly when the car is running over 180 Km/hr. [J292]

"A cross-layer TCP modelling framework for MIMO wireless systems"

We propose a general framework based in the Gilbert model for cross-layer analysis of TCP and UDP over MIMO wireless systems. Our framework takes into consideration diverse system characteristics often difficult to express as a Gilbert model such as fading, space-time transmission schemes, modulation, channel coding and ARQ. We apply our framework to analyze the TCP performance of two representative MIMO systems, namely, the BLAST system and the orthogonal space-time block coded (STBC) system. In particular, we investigate the optimal information rate that maximizes the TCP throughput, the effect of Doppler on the optimal TCP throughput and the optimal channel coding rate for various modulations. We provide simulations results from the ns-2 network simulator to demonstrate the accuracy of the proposed analytical framework in characterizing the TCP performance. We further apply the framework to two additional cross-layer applications: the analysis of the buffer occupancy on the base station, and the analysis of CBR video transmission over MIMO systems. We show that while the optimal rate for maximum TCP throughput is far from the channel capacity, the optimal rate for error and delay-tolerant video transmission requires much higher rates, and so the physical layer should be aware and adapt to the type of application in order to increase the system performance. We also show that mobility benefits systems with larger buffers, especially for TCP, as the ARQ scheme is able to recover the shorter burst errors. In general, our investigation shows that the type of application plays a crucial role in the optimization of a wireless system, and that our modelling framework is useful for the cross-layer analysis and design of those systems. [J293]

"Vector-velocity estimation in swept-scan using a K-space approach"

The swept-scan technique (i.e., continuously moving a single-crystal transducer during pulse-echo data acquisition) is used in high-frequency, ultrasonic flow imaging. Relative to the conventional step-scan technique, swept scanning improves the rate of data acquisition and enables near-real-time, high-frequency color flow mapping. However, the continuous transducer movement may have nonnegligible effects on accuracy of velocity estimation. This paper introduces a spatial frequency domain (i.e., k-space) approach that quantifies the effects of both lateral and axial motions in a swept scan. It is shown that the k-space representation is equivalent to a Doppler-radio frequency (RF) frequency domain representation, and that transducer movement in the swept-scan technique results in a change in Doppler bandwidth. In addition, a vector velocity estimator is developed based on the proposed k-space approach. Both simulations and flow-phantom experiments were performed to evaluate the performance of the proposed vector velocity estimator. A 45-MHz transducer was scanned at 20 mm/s. The Doppler angle ranged from 29deg to 90deg, and the flow velocities ranged from 15 to 30 mm/s. The results show that the proposed k-space vector velocity estimator exhibited a mean error of 2.6deg for flow-direction estimation, with the standard deviation ranging from 2.2deg to 8.2deg. In comparison, for the conventional spectral-broadening-based vector velocity estimator ignoring the swept-scan effect, the mean error became 15deg and the standard deviations were from 2.7deg to 6.6deg [J294]

"Analysis and characterization of intercarrier and interblock interferences for wireless mobile OFDM systems"

OFDM has been applied in a wide variety of wireless communications in recent years since it has the advantage over the conventional single-carrier modulation schemes when enduring the frequency-selective fading. However, intercarrier-interference (ICI) and interblock interference (IBI) due to the Doppler effect, carrier frequency drift of local oscillators and multipath fading limit the capability of OFDM systems. In this paper, a new generalized mathematical model for intercarrier and interblock interferences is derived for wireless mobile OFDM systems, in which Doppler frequency drift, local carrier frequency offset, multipath fading, and cyclic prefix coding

are all present in reality. Such a new ICI/IBI model can be applied for OFDM performance evaluation in different environments. This new formulation of IBI and ICI provides a generalized framework which includes special ICI models appearing in the previous literature. Besides, the derived OFDM performance evaluation analysis in this paper can greatly benefit OFDM designers for wireless multimedia networks and digital video broadcasting technologies. [J295]

"Doppler effect in flexible and expandable light waveguide and development of new fiber-optic vibration/acoustic sensor"

New principle and a geometrical arrangement of an optical fiber for a vibration/acoustic measurement are proposed in the present paper. The sensor is based on a new finding that a frequency of light wave transmitted through a bent optical fiber is shifted by vibration at the bent region. The phenomenon can be explained as Doppler's effect in flexible and expandable light waveguide. Several configurations of the sensor have been designed, and very high sensitivity is achieved in the extremely wide frequency range. Principle, sensor configuration and theoretical sensitivity, measurement system, and some experimental consideration are described in the present paper. The sensor sensitivity was examined experimentally in the low and middle frequency range, and the detectability was confirmed experimentally in the frequency range of acoustic emission signals. [J296]

"Equalization for OFDM over doubly selective channels"

In this paper, we propose a time-domain as well as a frequency-domain per-tone equalization for orthogonal frequency-division multiplexing (OFDM) over doubly selective channels. We consider the most general case, where the channel delay spread is larger than the cyclic prefix (CP), which results in interblock interference (IBI). IBI in conjunction with the Doppler effect destroys the orthogonality between subcarriers and, hence, results in severe intercarrier interference (ICI). In this paper, we propose a time-varying finite-impulse-response (TV-FIR) time-domain equalizer (TEQ) to restore the orthogonality between subcarriers, and hence to eliminate ICI/IBI. Due to the fact that the TEQ optimizes the performance over all subcarriers in a joint fashion, it has a poor performance. An optimal frequency-domain per-tone equalizer (PTEQ) is then obtained by transferring the TEQ operation to the frequency domain. Through computer simulations, we demonstrate the performance of the proposed equalization techniques. [J297]

"Transit-time broadening in pulsed Doppler ultrasound: a generalized amplitude modulation model"

In Doppler ultrasound, transit-time broadening arises from the finite scatterer transit time through the sample volume. As a unifying description of this broadening mechanism, a generalized amplitude modulation signal model was developed to collectively account for the transit-time effects of the ultrasound beam geometry and the range gate characteristics. Simulations based on a pulsed linear-array system also were performed to study the broadening extent for different scatterer flow lines. With our signal model and simulation results, some generalized insights were obtained on the characteristics of transit-time broadening. First, as consistent with previous findings, we found that, for scatterers passing though the center of the sample volume, the broadening extent mainly depends on beamforming characteristics at higher beam-flow angles, but it is more dependent on range gate parameters at smaller angles. Second, for the central flow line, a transition angle exists in which a significant change occurs in the governing parameters of transit-time broadening. Third, for the general case in which scatterers undertake an off-central path through the sample volume, the broadening extent depends on both the beam geometry and the range gate. Bandwidth skewing and further spectral broadening also can be seen for these off-central flow lines [J298]

"A novel blind adaptive space-time receiver for multi-code DS-CDMA"

Field=03 -The capacity of conventional wireless communications systems based upon Direct-Sequence Code Division Multiple Access (DS-CDMA) schemes, is mainly limited by Multiple Access Interference (MAI). Therefore, methods aimed at reducing MAI are mandatory solutions to increase the capacity of such systems. Smart Antennas are a promising technology for improving the performance of high capacity mobile communications systems, because they are expected to be able to increase the Signal to Interference plus Noise power Ratio (SINR) of the received signals by dynamically adapting the equivalent array beam pattern in order to track the movements of the users within the cell. In this paper we propose a novel blind adaptive beamforming algorithm tailored for the up-link of multi-code multi-rate DS-CDMA wireless communications systems. Our proposal is based upon a modified Constant Modulus (CM) criterion, whose fundamental feature is the capability to overcome the main drawback of the classic CM algorithm, which lies in its difficulty of ensuring the convergence toward the desired user. The proposed algorithm exploits user-specific information intrinsically known at the receiver, which is the code uniquely associated to each user, without requiring the knowledge of

the spatiotemporal propagation channel nor any specific training sequence. Within this paper we present a broadband solution, designed to temporally re-align uncorrelated clusters of multipaths, as well as spatially recombine correlated multipaths belonging to the same cluster. Computer simulations show that our proposed technique can effectively exploit path diversity and multipath correlation, also in the presence of Doppler effect and time-variable propagation conditions. [J299]

"An asymptotically unbiased estimator for bearings-only and Doppler-bearing target motion analysis"

Bearings-only (BO) and Doppler-bearing (DB) target motion analysis (TMA) attempt to obtain a target trajectory based on bearings and on Doppler and bearing measurements, respectively, from an observer to the target. The BO-TMA and DB-TMA problems are nontrivial because the measurement equations are nonlinearly related to the target location parameters. The pseudolinear formulation provides a linear estimator solution, but the resulting location estimate is biased. The instrumental variable method and the numerical maximum likelihood approach can eliminate the bias. Their convergence behavior, however, is not easy to control. This paper proposes an asymptotically unbiased estimator of the tracking problem. The proposed method applies least squares minimization on the pseudolinear equations with a quadratic constraint on the unknown parameters. The resulting estimator is shown to be solving the generalized eigenvalue problem. The proposed solution does not require initial guesses and does not have convergence problems. Sequential forms of the proposed algorithms for both BO-TMA and DB-TMA are derived. The sequential algorithms improve the estimation accuracy as a new measurement arrives and do not require generalized eigenvalue decomposition for solution update. The proposed estimator achieves the Cramer-Rao Lower Bound (CRLB) asymptotically for Gaussian noise before the thresholding effect occurs. [J300]

"Design of the Tore Supra motional Stark effect diagnostic"

This article describes the overall design of the motional Stark effect diagnostic on Tore Supra (not water cooled in its first version) and the results obtained. The diagnostic is composed of nine viewing lines measuring the plasma every 8cmwith a spatial resolution varying from 3to6cm. A tube placed inside the port adjacent to the neutral beam contains a stainless-steel mirror and SFL6 optic lenses that carry the image of the neutral beam towards the optical fibers. On Tore Supra the diagnostics having components inside the machine have to face thermal load difficulties linked with the long shots, and this will be the case for ITER diagnostics. This is why for safety reasons the insulating window is placed at the rear side of the tube, and consequently the optics is under the machine vacuum. For motional Stark effect, before reaching the thermal limits on the components, a first limitation comes from the polarization modifications induced by the temperature gradients on the lenses (birefringence effect). This limitation is estimated in terms of plasma duration. The associated diagnostic neutral beam (60keV, 400kW, 5s) works in hydrogen for a higher velocity and a better plasma penetration. As a consequence the beam spectrum exhibits a large Doppler shift and a clear separation of the Stark components. The detection uses the classical elements of the polarimetry method, wide aperture photoelastic modulators, linear polarizer, narrow interference filters, and photomultipliers. The signal is processed digitally (250kHz)for the extraction of the Fourier components that allow the calculation of the magnetic field pitch angles. The first measurements obtained during Ohmic shots for v- arious plasma currents are in good agreement with the current diffusion calculations done with the CRONOS code. [J301]

"Motional Stark effect diagnostic pilot experiment for MAST"

Exploiting the motional Stark effect (MSE) in the low magnetic fields of spherical tokamaks such as MAST is complicated by the Doppler smearing of the relatively closely spaced Stark components. Extensive modeling of MSE spectra and the subsequent polarized fraction (20%)of spectrally filtered light and signal to noice ratios have been performed taking account of real experimental conditions including neutral beam parameters, port sizes, optical losses, filter characteristics, etc. A design is selected which uses high throughput interference filters (0.1nmbandpass) for separation of the spectral components. An accuracy of 0.5°compared with typically 15° is estimated for field angle measurements. The design allows for early implementation, starting with a pilot two chord system, and for an economic expansion to a multiplicity of chords. Matching the Doppler shifted Dalpha from the beam neutrals will be accomplished by a combination of filter selection and fine-tuning of the beam voltage. Avoiding filter tuning in the design greatly simplifies the diagnostic. Calibration results of the diagnostic support the calculations. [J302]

"Electron density measurements in the National Spherical Torus Experiment detached divertor region using Stark broadening of deuterium infrared Paschen emission lines"

Spatially resolved measurements of deuterium Balmer and Paschen line emission have been performed in the

divertor region of the National Spherical Torus Experiment using a commercial 0.5mCzerny-Turner spectrometer. While the Balmer emission lines, as well as the Balmer and Paschen continua in the ultraviolet and visible regions have been extensively used for tokamak divertor plasma temperature and density measurements, the diagnostic potential of infrared Paschen lines has been largely overlooked. We analyze Stark broadening of the lines corresponding to 2-nand 3-mtransitions with principal quantum numbers n=7-12and m=10-12using recent model microfield method calculations [C. Stehle and R. Hutcheon, Astron. Astrophys., Suppl. Ser. 140, 93 (1999)]. Densities in the range (5-50)Ч1019m-3are obtained in the recombining inner divertor plasma in 2-6MWneutral beam heated H-mode discharges. The measured Paschen line profiles show good sensitivity to Stark effects and low sensitivity to instrumental and Doppler broadenings. The lines are situated in the near-infrared wavelength domain, where optical signal extraction schemes for harsh nuclear environments are practically realizable and where a recombining divertor plasma is optically thin. These properties make them an attractive recombining divertor density diagnostic for a burning plasma experiment. [J303]

"Isentropic compression of cyclotetramethylene tetranitramine (HMX) single crystals to 50 GPa"

Single crystals of cyclotetramethylene tetranitramine (HMX) were isentropically compressed perpendicular to (010) and (011) faces at the Sandia Z-Machine. A 50GParamped magnetic pressure load of about 200nsrise time loaded four specimens of each orientation. HMX specimens were from 300-600mcmthick. Velocity histories at the rear of each crystal were measured by Doppler velocimetry. Although a phase change in HMX at 27GPahas been proposed based upon isothermal data, no evidence of this change is seen in our analyses between 5 and 50GPaalong the isentrope. Previous isentropic loading experiments on HMX had not shown evidence of a phase change either, but those experiments were complicated by the use of NaCl interferometer windows that have a phase change near the pressure of interest. The experiments described in this paper employed LiF interferometer windows that are known to be absent phase changes in the regime of application. Accurate determination of isentropic compressibility for HMX was not possible using data from these experiments owing to uncertainty in the very large compressibility at low pressures. [J304]

"Vacancy-impurity complexes in polycrystalline Si used as gate electrodes of HfSiON-based metal-oxide-semiconductors probed using monoenergetic positron beams"

Vacancy-impurity complexes in polycrystalline Si (poly-Si) used as a gate electrode of the metal-oxide-semiconductor field-effect transistor (MOSFET) were probed using monoenergetic positron beams. Doppler broadening spectra of the annihilation radiation and the positron lifetimes were measured for poly-Si(150nm)/HfSiON(5nm)/Si. In addition, first principles calculations were used to identify impurities coupled with defects in the poly-Si film. The major defect species in the poly-Si film was identified as vacancy-type defects; their mean open volume was close to that of a divacancy. Vacancy-oxygen complexes were observed in the P-implanted poly-Si film after annealing (at 1000°C); the number of oxygen atoms coupled with each defect was estimated to be one or two. For the B-implanted poly-Si film, however, the formation of the complexes was suppressed, suggesting the formation of oxygen clusters or precipitate. We discuss the interaction between such oxygen-related defects and boron in terms of the electric properties of p-channel MOSFETs. [J305]

"Elastic-plastic shock wave profiles in oriented single crystals of cyclotrimethylene trinitramine (RDX) at 2.25 GPa"

Plate impact experiments were performed on oriented single crystals of the energetic material cyclotrimethylene trinitramine (RDX). The experiments were performed to determine the anisotropic dynamic yield point for the RDX crystal, as well as to provide data for continuum modeling efforts. Impact was on the (111), (210), and (100) planes to access 3, 2, and 0 slip systems, respectively. Velocity history profiles were measured using Doppler interferometry. Impacts on the (210) plane resulted in nominally conventional results, with distinct elastic and plastic waves, stress relaxation, elastic precursor decay, and increasing wave separation with propagation distance. Velocity profiles from impacts on the (111) plane had no discernable precursor, although an inflection seen in the thicker samples might be the nearly overdriven elastic wave. Wave arrival times signaled a slower elastic wave speed in the (111) profiles. Several unexpected features were observed in the elastic precursor of the profiles from impacts on the (100) plane. Up to three distinct step features were resolved in these profiles in the region of the elastic precursor; these features are not understood. In preparing samples for these experiments, it was noted that the (100) crystal slabs were exceptionally brittle. Wave speeds determined from the shock experiments were consistent with both pulse-echo wave speed measurements and wave speeds calculated from the measured elastic tensor. The elastic limit, as indicated by the peak of the leading wave, was relatively isotropic. [J306]

"Laser Doppler vibrometry for evaluating the piezoelectric coefficient d33 on thin film"

The problem of electromechanical film characterization, and, in particular, the determination of the piezoelectric activities of thin films deposited on substrates, is of fundamental importance in the development of structures for microelectromechanical system (MEMS) applications. The design and the architecture of the piezoelectric MEMS are directly related to the mechanical and the piezoelectric performances of the material. In this article, we present and compare some results obtained on different experimental setup for the determination of the d33coefficient. We have optimized the experimental conditions using a laser Doppler vibrometer. The main problem is the contribution of the bending effect of the substrates on the d33coefficient, which is an intrinsic property of the film. We show that the d33values are directly related to parameters such as the top electrode diameter and the substrate holder. The results are in agreement with those obtained with the conventional double beam interferometer used to account for substrate bending. [J307]

"HDTV Mobile Reception in Automobiles"

Mobile reception of digital terrestrial broadcasting carrying an 18-Mb/s digital HDTV signals is achieved. The effect of diversity reception in moving automobiles for a 64 quadrature amplitude modulation-orthogonal frequency division multiplexing (QAM-OFDM) signal is investigated by prototype hardware. There are two methods for diversity reception of OFDM signals. The first is the Doppler compensation directivity control system. For this method, high-performance on-glass antennas and new diversity reception systems for OFDM reception have been developed to verify HDTV service availability in mobile reception environments. Novel horizontally polarized on-glass antennas suitable for DTV were developed. The antenna elements were printed on the inside surface of the rear window glass of a passenger van. OFDM signals received by the four antenna elements were weighted and combined using maximal ratio combining (MRC). The experiments were conducted in urban areas and they showed that employing diversity techniques would make HDTV mobile reception possible in many areas. The other method is post-FFT diversity. In the receiver, MRC is performed after an FFT operation on each branch signal. Experimental results show that accurate HDTV mobile reception can be achieved by using a four-branch MRC system. Also, the minimum usable electric field strength could be reduced compared with that of a single dipole antenna. [J308]

"Numerical Simulation of scattering of electromagnetic waves from traveling and/or vibrating perfect conducting planes"

This paper presents the one-dimensional computational results for electromagnetic waves scattered from traveling and/or vibrating perfect conducting planes via the application of the characteristic-based method. Relativistic boundary conditions combined with the characteristic variable boundary conditions are employed to account for relativistic effects due to the very high-speed motion of the conductor. The variations in both magnitude and frequency of the reflected electric field were investigated by comparing the computational results with the theoretical double-Doppler shift values. A maximum error percentage of less than 0.50% was found. It is also concluded that when the perfect conducting plane travels and vibrates simultaneously, the Doppler effects in frequency that are impressed on the reflected fields can be predicted, on the basis of computational results, simply dividing the vibrating frequency of perfect conducting plane by the factor (1+βt) where βtis the ratio of the traveling velocity to the speed of light. [J309]

"Modified range-Doppler processing for FM-CW synthetic aperture radar"

The combination of compact frequency-modulated continuous-wave (FM-CW) technology and high-resolution synthetic aperture radar (SAR) processing techniques should pave the way for the development of a lightweight, cost-effective, high-resolution, airborne imaging radar. Regarding FM-CW SAR signal processing, the motion during the transmission of a sweep and the reception of the corresponding echo were expected to be one of the major problems. In FM-CW SAR, the so-called stop-and-go approximation is no longer valid due to the relatively long sweeps that FM-CW radars transmit. The main effect of the continuous motion is a Doppler frequency shift throughout the SAR observation time. This Doppler frequency shift can be compensated for by modifying the range migration compensation. [J310]

"Effect of quantum confinement on higher transitions in HgTe nanocrystals"

Spectroscopic ellipsometry measurements on 1-10 bilayers of HgTe nanocrystals and polymer were performed in the spectral range from 0.5to5eV. The experiments show that the band model, respectively, band energy shifts due to quantization, can be applied onto nanocrystals with as few as five unit cells in diameter. These nanocrystals exhibit strong transitions at higher critical points. The critical point energies shift up to 0.4eV. It turns out that transitions between bands which are closer to the Fermi energy and have a smaller carrier mass are more strongly affected by quantum confinement. [J311]

"Tissue Doppler optical coherence elastography for real time strain rate and strain mapping of soft tissue"

The authors present a tissue Doppler optical coherence elastography (tDOCE) method to image tissue movements, strain rates, and strains of soft tissue in real time. The method exploits the Doppler effect in optical coherence interferograms induced by tissue motion and measures the phase changes between successive A scans to resolve the instantaneous tissue displacement. The tDOCE system is capable of displaying the strain rates and strain maps of tissue subjected to a dynamic compression in real time. The system is demonstrated by the use of a heterogeneous tissue phantom with known mechanical properties. [J312]

"Switching in C 60 -fullerene based field effect transistors"

We are reporting on the electrical properties of a bottom gate C60-fullerene based n-channel organic field effect transistor. The C60thin film was epitaxially grown using hot wall epitaxy on top of an organic dielectric divinyltetramethyldisiloxane-bis(benzocyclobutene). The device performance depends on the growth parameters during the C60film growth. Optimization of the growth parameters leads to a C60film of a low total number of traps, and the drain-source current is increased by two orders in magnitude. We propose that the high current-densities are caused by space charge limited currents beside the gate induced space charge. [J313]

"Performance Analysis of Multiuser Selection Diversity"

In this paper, the authors study the performance of scheduling algorithms exploiting the multiuser selection diversity. Schedulers with affordable-rate transmission and adaptive transmission based on the absolute signal-to-noise ratio (SNR) and the normalized SNR are considered. In contrast to previous studies on the multiuser-diversity systems, the channel dynamics is taken into consideration in this paper by a novel formulation based on the level crossing analysis of stochastic processes. Then, the authors make the connection between the Doppler frequency shift, which indicates the channel temporal correlation, and the average (channel) access time, the average waiting time (AWT) between accesses, and the average access rate (AAR) of active users. These properties are important for the scheduler design, especially for applications where delay is a concern. In addition, analytical expressions for the system throughput and the degree of fairness (DOF) when users have nonidentical average channel conditions are presented. These expressions quantify the effect of disparateness in users' average channel conditions on the system performance [J314]

"Training strategies for joint domain localised-space-time adaptive processing in a bistatic environment"

Optimum space-time adaptive processing (STAP) requires knowledge of the true interference covariance matrix. In practice, this matrix is not known and must be estimated from training data, which must be target free and statistically homogeneous with respect to the range gate under test. These conditions are often not satisfied, which degrades the detection performance. Particularly for bistatic ground moving target indication radar, the clutter Doppler frequency depends on range for all array geometries. This range dependency leads to problems in clutter suppression through STAP techniques. The main aim in this paper is to access the relative merits of several strategies associated with STAP weight training for bistatic airborne radar applications. In particular, the issues associated with applying reduced-dimension conventional STAP and in-the-gate processing are studied. Simulation results show that, for a bistatic radar environment, in-the-gate processing approach performs better than conventional STAP approaches [J315]

"A Novel Scatter Detector for High-Resolution SPECT Imaging With Compton Telescopes"

We propose a novel Silicon Drift Detector (SDD) that can fulfill the demanding requirements of the ideal scatter detector for a high-resolution Compton Camera for medical imaging. This kind of detector demonstrates excellent performance in terms of energy and position resolution, maximum readout rate and the more relevant results are reported. The SDD proposed here is based on a multilinear architecture [controlled drift detector (CDD)] in which the backside has been segmented and instrumented to pick up the signal induced by the electron-hole (e-h) pairs generated by the interaction thus providing a fast coincidence signal between the recoil electron signal and the scattered gamma-ray signal. Several measurements have been carried out to study the shape of the induced signals and the achievable time resolution. Experimental tests with annihilation photons of a 22 Na source in a time coincidence setup showed best time resolution of 6 ns FWHM. These results confirm that SDD technology with fast pickup on the back electrodes and optimized design has the potential to develop a Compton telescope with Doppler limited performance for medical imaging [J316]

"Robust Multiuser Interference Cancellation for OFDM Systems With Frequency Offset"

In orthogonal frequency division multiple access systems clusters of subcarriers are assigned to different users for parallel data transmissions. The subcarriers are overlapped, but orthogonal to each other such that there is no intercarrier interference (ICI). However, synchronization errors among users cause the loss of the orthogonality and introduce ICI resulting in multiple-access interference. Synchronization between users is particularly difficult in the uplink channel where the user signals are potentially asynchronous and affected by different frequency offsets due to misalignment in carrier frequencies and Doppler shifts. This paper proposes a method to lower the effects of different frequency offsets among user signals in an OFDMA uplink system. The multiple access interference due to the user frequency misalignments is reduced by reconstructing and removing the interfering signals in the frequency domain. An approach based on the selective cancellation method, is proposed and its performance is analyzed by means of theoretical analysis and computer simulations. The effectiveness of the proposed system has been evaluated in the case of ideal and no-ideal frequency offset estimation and has been compared with that of the classical successive and parallel cancellation schemes. Simulation results show that the proposed approach allows performance close to the ideal case, i.e., with ideal frequency synchronization among users, with a low increase of the implementation complexity. Moreover, it is also highlighted here, that the successive cancellation method slightly outperforms the selective scheme, at the expense of a higher computational complexity and processing delay [J317]

"Range/Doppler ambiguity elimination in high-frequency chirp radars"

Range/Doppler ambiguity is an important problem in chirp radar operations with all the existing schemes for ambiguity elimination relying on multiple waveform switching. Now, a new method for ambiguity elimination is proposed. It is based on a single waveform and only involves a series of software computations associated with the instantaneous amplitudes of the target under consideration at adjacent range bins. Besides the ambiguity factor, the instantaneous range of the target is also estimated. The method can greatly improve the target detection and tracking capability of high-frequency chirp radars. Both simulation and real data processing results are demonstrated to validate of the method [J318]

"Reduction of Doppler effects in OFDM systems"

This paper observes the inter-carrier interference (ICI) by Doppler effect in time domain in orthogonal frequency division multiplexing systems. This observation allows us to propose a new time domain two-stage equalization scheme that iteratively cancels the ICI. The proposed scheme consists of the following two stages: First, we apply low-complexity linear minimum mean squared error (MMSE) employing partial rank of time impulse response matrix to shorten the ICI components into diagonal region. Second, we propose new parallel interference cancellation with hard decision feedback to remove the residual ICI. Performance evaluations and complexity analyses show that the bit error rate and the signal-to-interference-plus-noise ratio performances of the proposed scheme are very close to those of the classical frequency domain linear MMSE equalization scheme with much reduced complexity [J319]

"Performance of convolutional codes with finite-depth interleaving and noisy channel estimates"

In this paper, we derive the Chernoff bound of the pairwise error probability (PEP) and the exact PEP of convolutional codes in a time-varying Rician fading channel. With the assumptions that the channel estimator is a finite impulse response filter and the interleaving depth is finite, we are able to investigate the estimation-diversity tradeoff resulting from the effects of the Doppler spread on the system performance via the channel-estimation accuracy and the channel diversity. In addition, we verify that, in the special case when the pilot signal-to-noise ratio is infinitely large and the channel estimator is well-designed, our analysis leads to the same result as the existing perfect channel-state information analysis. Finally, the analytical results are compared with results from Monte Carlo simulation, and the comparison shows that the analytical results match well with the simulation results [J320]

"Piezoelectric properties and charge dynamics in poly(vinylidene fluoride-hexafluoropropylene) copolymer films with different content of HEP"

In this paper, the electret properties of three types of castings prepared P(VDF-HFP) (poly(vinylidene fluoride-hexafluoropropylene)) copolymer films whose contents of HFP are 4.2, 4.7 and 5.9% are discussed. Experimental results point out that the copolymer film is a polar material, i.e. there exists both oriented dipoles and deposited space charge in the film after charging. Estimating polarizations at different charging fields based on analysis of charging current curves indicate a comparatively high polarization formed under the charging field above 200 MVm-1for the copolymer film. The mechanically thermal stretching process not only increases the density of the oriented dipoles and deposited space charge but also improves the thermal stability of deposited space charge. However, the increase of HFP content in the copolymer has a negative impact on the density of oriented dipoles

and deposited space charge. The measurements by means of laser doppler vibrometer show that the copolymer in which the HFP content is 4.2% and 4.7%, respectively has a notable converse piezoelectric coefficient as high as 140 pmV-1and 130 pmV -1. Dynamics of interaction of space charge with oriented dipoles for the copolymer with HFP content of 4.7% are investigated by means of isothermal surface potential decay at different temperatures. At the same time, pyroelectric effect of the copolymer is also discussed [J321]

"Characterizing Observed Environmental Variability With HF Doppler Radar Surface Current Mappers and Acoustic Doppler Current Profilers: Environmental Variability in the Coastal Ocean"

A network of high-frequency (HF) radars is deployed along the New Jersey coast providing synoptic current maps across the entire shelf. These data serve a variety of user groups from scientific research to Coast Guard search and rescue. In addition, model forecasts have been shown to improve with surface current assimilation. In all applications, there is a need for better definitions and assessment of the measurement uncertainty. During a summer coastal predictive skill experiment in 2001, an array of in situ current profilers was deployed near two HF radar sites, one long-range and one standard-range system. Comparison statistics were calculated between different vertical bins on the same current profiler, between different current profilers, and between the current profilers and the different HF radars. The velocity difference in the vertical and horizontal directions were then characterized using the observed root-mean-square (rms) differences. We further focused on two cases, one with relatively high vertical variability, and the second with relatively low vertical variability. Observed differences between the top bin of the current profiler and the HF radar were influenced by both system accuracy and the environment. Using the in situ current profilers, the environmental variability over scales based on the HF radar sampling was quantified. HF radar comparisons with the current profilers were on the same order as the observed environmental difference over the same scales, indicating that the environment has a significant influence on the observed differences. Velocity variability in the vertical and horizontal directions both contribute to these differences. When the potential effects of the vertical variability could be minimized, the remaining difference between the current profiler and the HF radar was similar to the measured horizontal velocity difference (~2.5 cm/s) and below the resolution of the raw radial data at the time of the deployment [J322]

"Relativistic Scattering of a Plane-Wave by a Uniformly Moving Half-Plane"

We discuss the effect of motion on the scattering by an edge. To this end, one considers the simplest canonical structure formed by a uniformly moving perfectly conducting half-plane illuminated by a time-harmonic plane wave and investigates the effect of the motion on the reflection and shadow zones, aberration, Doppler shift, edge-diffracted wave, etc. The cases where the velocity is parallel and normal to the half-plane are considered separately. Some of the interesting results which were obtained, in addition to the classical Doppler shift and aberration phenomena, are that (i) the edge-excited wave is never time-harmonic while the waves excited by the plane (both in the shadow and in the reflection zones) are always time-harmonic, (ii) the shadow and reflection boundaries are not parallel to the incident and reflected rays, (iii) at certain values of the velocity and incidence angle, a shadow region appears in the apparent illuminated region while a lit region appears in the apparent shadow region, (iv) the moving half-plane provides, sometimes, energy to the reflected wave. The cases of upsiLtc and upsi~c are examined in detail [J323]

"Effect of Disk Topography on Slider Dynamics"

In this paper, the vertical, pitch, and roll components of the motion of a femto slider is studied as a function of disk topography. Laser Doppler vibrometry was used to measure the dynamic motion of the slider, as well as the disk topography in the vertical, pitch, and roll directions. Defining the gain of the slider as the ratio of slider motion to disk topography, we find that the gain of the slider is similar for all disks below the first pitch resonance frequency (150 kHz). Above this frequency, the gain of the slider is affected by the topography of the disks used [J324]

"A High-Resolution Dual-Doppler Technique for Fixed Multiantenna Airborne Radar"

A new technique is presented for the analysis of data collected by pairs of aircraft (AC)-mounted fixed radar beams directed ~30deg apart, leading to two-dimensional wind field syntheses in the horizontal and vertical planes. The technique was applied to the 95-GHz Wyoming Cloud Radar (WCR) configurations aboard the University of Wyoming King Air and the National Center for Atmospheric Research C-130 research AC. The construction of the data grid allows to closely follow the AC flight attitude, and thus the beam scanned surfaces, with a resolution between 30 and 45 m. A weighted least squares method is employed to solve the velocity inverse decomposition problem for every valid grid cell. The effect on the solution of the nonmeasured (cross-plane) wind component is minimized by using an external estimate of the ambient wind. The error sources are discussed, and maximum expected values for the velocity field errors are provided with reference to the radar

system, the data collection process, and specific aspects of the target under investigation. These uncertainties (1-2 m/s) are quantified for two case studies that show the potential of the technique in retrieving the kinematic field in transects of cumulus and stratus clouds. The technique produces smooth fine-scale kinematic fields although each velocity point is the result of an independent calculation, and no binding constraint is imposed among neighboring points as is done in other dual-Doppler techniques [J325]

"Experimental Setup for Studying Induced Backward Scattering of Microwaves by a Subnanosecond High-Current Electron Beam"

This paper presents the results of an experiment in which the effect of generation of picosecond superradiation pulses was first observed during the induced backward scattering of a high-power pump microwave by a short high-density relativistic electron beam. These investigations became feasible due to an experimental setup built around two high-current electron accelerators of the Radan series that were set to operate synchronously to within ~300 ps. The pump wave was generated by a relativistic Ka-band backward-wave oscillator with a power of ~100 MW. To direct this wave into the scattering region, a quasioptical system was used. The scattered radiation detected in the experiment was a short (~200 ps) pulse with a spectrum-integrated power of up to 1 MW. Due to the relativistic Doppler shift, the scattered radiation spectrum covered frequencies up to 150 GHz [J326]

"Optimal beam-selection algorithm to improve reception performance of ATSC 8-VSB DTV"

This paper proposes an optimal beam-selection DTV receiver which uses switched beam-selection techniques. Usually the ATSC DTV receiver uses equalizer for compensating channel distortion. But multipath signals and Doppler effect easily affected performance of the receiver in mobile and indoor environment. A proposed optimal beam-selection DTV receiver reduces multipath signals so a burden of equalizer is reduced, so channel compensation is easier than a conventional DTV receiver which uses only equalizer. Simulation results show that performance of the proposed system is better than a conventional DTV receiver [J327]

"Adaptive Channel Estimation Using Pilot-Embedded Data-Bearing Approach for MIMO-OFDM Systems"

Multiple-input multiple-output (MIMO) orthogonal-frequency-division-multiplexing (OFDM) systems employing coherent receivers crucially require channel state information (CSI). Since the multipath delay profile of channels is arbitrary in the MIMO-OFDM systems, an effective channel estimator is needed. In this paper, we first develop a pilot-embedded data-bearing (PEDB) approach for joint channel estimation and data detection, in which PEDB least-square (LS) channel estimator and maximum-likelihood (ML) data detection are employed. Then, we propose an LS fast Fourier transform (FFT)-based channel estimator by employing the concept of FFT-based channel estimation to improve the PEDB-LS one via choosing a certain number of significant taps for constructing a channel frequency response. The effects of model mismatch error inherent in the proposed LS FFT-based estimator when considering noninteger multipath delay profiles and its performance analysis are investigated. The relationship between the mean-squared error (MSE) and the number of chosen significant taps is revealed, and hence, the optimal criterion for obtaining the optimum number of significant taps is explored. Under the framework of pilot embedding, we further propose an adaptive LS FFT-based channel estimator employing the optimum number of significant taps to compensate the model mismatch error as well as minimize the corresponding noise effect. Simulation results reveal that the adaptive LS FFT-based estimator is superior to the LS FFT-based and PEDB-LS estimators under quasi-static channels or low Doppler's shift regimes [J328]

"Performance Analysis of Multiuser Selection Diversity"

In this paper, the performance of scheduling algorithms exploiting the multiuser selection diversity is studied. The authors consider schedulers with affordable-rate transmission and adaptive transmission based on the absolute signal-to-noise ratio (SNR) and the normalized SNR. In contrast to previous studies on multiuser diversity systems, channel dynamics is taken into consideration in this paper by a novel formulation based on the level-crossing analysis of stochastic processes. Then, a connection is made between the Doppler frequency shift, which indicates the channel temporal correlation, and the average (channel) access time, the average waiting time between accesses, and the average access rate of active users. These properties are important for the scheduler design, especially for applications where delay is a concern. In addition, analytical expressions for the system throughput and the degree of fairness when users have nonidentical average channel conditions are presented. These expressions quantify the effect of disparateness in users' average channel conditions on the system performance. [J329]

"QoS guarantee and provisioning for realtime digital video over mobile ad hoc cdma networks with

cross-layer design"

In this article we investigate the trade-offs and the constraints for multimedia over mobile ad hoc CDMA networks, and propose a cross-layer distributed power control and scheduling protocol to resolve those trade-offs and constraints in order to provide high-quality video over wireless ad hoc CDMA networks. In particular, a distributed power control and scheduling protocol is proposed to control the incurred delay of video streaming over multihop wireless ad hoc networks, as well as the multiple access interference (MAI). We also investigate the impacts of Doppler spread and noisy channel estimates upon the end-to-end video quality, and provide a relatively robust system which employs a combination of power control and coding/interleaving to combat the effects of Doppler spread by exploiting the increased time diversity when the Doppler spread becomes large. Thus, more robust end-to-end video quality can be achieved over a wide range of channel conditions [J330]

"Doppler visibility of coherent ultrawideband random noise radar systems"

Random noise radar has recently been used in a variety of imaging and surveillance applications. These systems can be made phase coherent using the technique of heterodyne correlation. Phase coherence has been exploited to measure Doppler and thereby the velocity of moving targets. The Doppler visibility, i.e., the ability to extract Doppler information over the inherent clutter spectra, is constrained by system parameters, especially the phase noise generated by microwave components. Our paper proposes a new phase noise model for the heterodyne mixer as applicable for ultrawideband (UWB) random noise radar and for the local oscillator in the time domain. The Doppler spectra are simulated by including phase noise contamination effects and compared with our previous experimental results. A genetic algorithm (GA) optimization routine is applied to synthesize the effects of a variety of parameter combinations to derive a suitable empirical formula for estimating the Doppler visibility in dB. According to the phase noise analysis and the simulation results, the Doppler visibility of UWB random noise radar depends primarily on the following parameters: 1) the local oscillator (LO) drive level of the receiver heterodyne mixer, 2) the saturation current in the receiver heterodyne mixer, 3) the bandwidth of the transmit noise source, and 4) the target velocity. Other parameters such as the carrier frequency of the receiver LO and the loaded quality factor of the LO have a small effect over the range of applicability of the model and are therefore neglected in the model formulation. The Doppler visibility curves generated from this formula match the simulation results very well over the applicable parameter range within 1 dB. Our model may therefore be used to quickly estimate the Doppler visibility of random UWB noise radars for trade-off analysis [J331]

"Effect of earth's rotation and range foldover on space-based radar performance"

Space-based radar (SBR) by virtue of its motion generates a Doppler frequency component to the clutter return from any point on the Earth as a function of the SBR-Earth geometry. The effect of the rotation of the Earth around its own axis also adds an additional component to this Doppler frequency. The overall effect of the rotation of the Earth on the Doppler turns out to be two correction factors in terms of a crab angle affecting the azimuth angle, and a crab magnitude scaling the Doppler magnitude of the clutter patch. Interestingly, both these quantities depend only on the SBR orbit inclination and its latitude and not on the location of the clutter patch of interest. Further, the crab angle has maximum effect for an SBR on a polar orbit that is above the equator. The crab magnitude, on the other hand, peaks for an SBR on an equatorial orbit. Together with the range foldover phenomenon, their overall effect is to generate Doppler spread/splitting resulting in wider clutter notches that degrade the clutter nulling performance of adaptive processing techniques. A detailed performance analysis and methods to minimize these effects are discussed here [J332]

"Optimum Doppler compensation scheme for DVB-H receivers"

The Doppler spread in digital video broadcasting for handheld (DVB-H) terminals receivers is responsible for the inter-carrier interference (ICI). Proposed is a new scheme to estimate and compensate the ICI term with reduced hardware complexity, especially suited for mobile terminals. Simulation results compare the proposed technique with another existing method, showing similar performances, with a significant hardware reduction. [J333]

"Modeling techniques for marine-mammal risk assessment"

Propagation modeling in the ocean may be said to be a fairly mature subject, with a number of reliable and efficient acoustic models freely distributed. However, acoustic modeling to predict effects of sound on marine mammals presents some particular challenges. Standard sonar models predict the mean power levels for static receivers. However, marine-mammal researchers have shown a strong interest in being able to predict the actual time series that a moving mammal would experience as it swims through an ensonified ocean. The time series can then be used to directly model auditory models of the mammalian ear. To do this properly requires attention to subtle Doppler effects. The authors present a Gaussian-beam-tracing method that handles all these issues. Another key element needed for such models is the ability to rapidly predict three-dimensional (3-D) acoustic

fields for lots of source/receiver combinations. This problem arises in trying to choose optimal locations for navy exercises, considering also a variety of hypothesized mammal-migration patterns. The authors discuss a precomputation approach to solve this problem. Finally, they examine a technique to reduce the computation needed for the one-third octave transmission loss (TL) averages. The one-third octave average is often used as a metric for the assessment of risk to mammals. The brute-force solution to this problem requires propagation modeling at many frequencies in the band. Here, the authors develop a general relationship to replace those frequency averages with much more easily computed range averages. The novelty of this approach relative to the previous range-averaging techniques is that it extends those methods to the range-dependent conditions [J334]

"Mass transit power traction networks as communication channels"

The rapid progress of power line communications (PLC) for data transmission over electric power supply systems is now opening ways for special applications such as train automation in local transportation and mass transit (MT) systems. These DC-powered traction networks can be used as communication links between wayside equipment and the moving trains. As MT networks significantly differ from usual electricity supply systems, the usage of existing models and communication equipment for conventional PLC channels turns out infeasible. Therefore, the work reported in this paper focuses on MT channel investigation and modeling, in order to develop novel adapted solutions. The outcome is a stochastic MT channel model, which-besides multipath and time-variance-also includes peculiar properties such as the behavior of ring structures and the impact of the Doppler effect invoked by moving trains. In addition, a very special interference scenario is treated, caused by the rectifiers in these DC-powered environments. Besides a complete simulation model, this paper presents detailed guidelines for building emulation hardware, so that channel adapted PLC system design for MT networks can now be successfully started without further expensive field trials. [J335]

"Time-variant Doppler frequency estimation and compensation for mobile OFDM systems"

In mobile OFDM communication systems, Doppler spread leads to the loss of orthogonality between the sub-carriers, limiting the achievable throughput of the moving transceivers. In this paper, the effect of Doppler spread in Rayleigh fading channels is investigated, and a method of time-variant Doppler frequency estimation and compensation is proposed for mobile OFDM systems. Computer simulation results are included to support our development. [J336]

"Downlink transmission of broadband OFCDM Systems-part II: effect of Doppler shift"

The orthogonal frequency and code division multiplexing (OFCDM) system with 2-D spreading (time- and frequency-domain spreading) is becoming a promising candidate for future broadband wireless communication systems. OFCDM is more attractive than orthogonal frequency-division multiplexing (OFDM) both by introducing frequency-domain spreading for frequency diversity provision and time-domain spreading for flexible data rate provision. To provide high-speed mobile services, multicode transmission is employed in conjunction with OFCDM. In a Gaussian or flat-fading channel, multicode channels are orthogonal. However, in a realistic wireless channel, the orthogonality no longer maintains. Thus, multicode interference (MCI) is caused. This paper focuses on the investigation of the effect of Doppler shift on the downlink transmission of high-speed mobile OFCDM systems. A practical channel estimation algorithm based on a code-multiplexed pilot channel is employed to track the variations of fading channels. Hybrid MCI cancellation and minimum mean-square error (MMSE) detection proposed by the authors is employed as an efficient way to eliminate the MCI in the frequency domain. The system performance is analytically studied with imperfect channel estimation to show how it is affected by parameters such as the window size in the channel estimation, Doppler shift, the number of stages of the hybrid detection, the power ratio of pilot to data channels, spreading factor, and so on [J337]

"Performance degradation of OFDM systems due to Doppler spreading"

The focus of this paper is on the performance of orthogonal frequency division multiplexing (OFDM) signals in mobile radio applications, such as 802.11a and digital video broadcasting (DVB) systems, e.g., DVB-CS2. The paper considers the evaluation of the error probability of an OFDM system transmitting over channels characterized by frequency selectivity and Rayleigh fading. The time variations of the channel during one OFDM symbol interval destroy the orthogonality of the different subcarriers and generate power leakage among the subcarriers, known as inter-carrier interference (ICI). For conventional modulation methods such as phase-shift keying (PSK) and quadrature-amplitude modulation (QAM), the bivariate probability density function (pdf) of the ICI is shown to be a weighted Gaussian mixture. The large computational complexity involved in using the weighted Gaussian mixture pdf to evaluate the error probability serves as the motivation for developing a two-dimensional Gram-Charlier representation for the bivariate pdf of the ICI. It is demonstrated that its truncated

version of order 4 or 6 provides a very good approximation in the evaluation of the error probability for PSK and QAM in the presence of ICI. Based on Jakes' model for the Doppler effects, and an exponential multipath intensity profile, numerical results for the error probability are illustrated for several mobile speeds [J338]

"An iterative algorithm for Doppler spread estimation in LOS environments"

An iterative algorithm is proposed to estimate the maximum Doppler frequency in a line-of-sight (LOS) environment. While the autocorrelation function of a Rayleigh fading signal depends only on the maximum Doppler frequency, that of a Rician fading signal is also related to the K factor and the angle of arrival (AOA) of the LOS component. The performance of conventional Doppler spread estimators based on the Rayleigh fading assumption degrades in LOS environments due to the autocorrelation function mismatch. The proposed estimator estimates the Rician K factor first, then iteratively estimates the Doppler spread and the AOA of the LOS component. The performance degradation due to channel parameter variations is investigated by means of matching the autocorrelation functions. The simulation results indicate that the proposed estimator is not only superior to the conventional autocorrelation-based Doppler spread estimator but also robust to the channel parameter variation in both LOS and non-LOS environments [J339]

"Performance improvement for constellation SAR using signal processing techniques"

A new concept of spaceborne synthetic aperture radar (SAR) implementation has recently been proposed-the constellation of small spaceborne SAR systems. In this implementation, several formation-flying small satellites cooperate to perform multiple space missions. We investigate the possibility to produce high-resolution wide-area SAR images and fine ground moving-target indicator (GMTI) performance with constellation of small spaceborne SAR systems. In particular, we focus on the problems introduced by this particular SAR system, such as Doppler ambiguities, high sparseness of the satellite array, and array element errors. A space-time adaptive processing (STAP) approach combined with conventional SAR imaging algorithms is proposed which can solve these problems to some extent. The main idea of the approach is to use a STAP-based method to properly overcome the aliasing effect caused by the lower pulse-repetition frequency (PRF) and thereby retrieve the unambiguous azimuth wide (full) spectrum signals from the received echoes. Following this operation, conventional SAR data processing tools can be applied to focus the SAR images fully. The proposed approach can simultaneously achieve both high-resolution SAR mapping of wide ground scenes and GMTI with high efficiency. To obtain array element errors, an array auto-calibration technique is proposed to estimate them based on the angular and Doppler ambiguity analysis of the clutter echo. The optimizing of satellite formations is also analyzed, and a platform velocity/PRF criterion for array configurations is presented. An approach is given to make it possible that almost any given sparse array configuration can satisfy the criterion by slightly adjusting the PRF. Simulated results are presented to verify the effectiveness of the proposed approaches. [J340]

"SR ARQ delay statistics on N-state Markov channels with non-instantaneous feedback"

In this paper the packet delay statistics of a fully reliable selective repeat ARQ (SR ARQ) scheme is investigated. An N-state discrete time Markov channel model is used to describe the packet error process and the channel round trip delay is considered to be non zero, i.e., ACK/NACK messages are received at the transmitter m channel slots after the packet transmission started. The ARQ packet delay statistics is evaluated by means of an exact analysis by jointly tracking packet errors and channel state evolution. Furthermore, procedures to derive a Markov channel description of a Rayleigh fading process are discussed and the delay statistics obtained from the Markov analysis is compared with that estimated by simulation of the SR ARQ protocol over the actual fading process. The accuracy of the delay statistics obtained from the Markov Channel representation of the actual fading process is investigated by explicitly addressing the effect of the number of states considered in the Markov channel model and the impact of the Doppler frequency. Finally, besides giving a new analysis to obtain link layer statistics over N-state Markov channels, the paper provides important considerations on the adequacy of the widely used Markov modeling approach for the characterization of higher layer performance [J341]

"Doppler Spectra From a Two-Dimensional Ocean Surface at L-Band"

An approximate time-harmonic three-dimensional electromagnetic boundary-integral method, the small-slope integral equation, is combined with a series expansion of the Creamer surface representation at second order with respect to the height, denoted by Creamer (2). The resulting model provides at low numerical cost simulations of the nonlinear ocean surface Doppler spectrum at L-band. As a result of approximations, the model is designed for a low-wind speed, typically up to 5 m/s. It is shown that applying directly a second-order model such as Creamer (2) to a semiempirical sea surface spectrum induces an unrealistic magnification of small-scale roughness that is involved in the scattering process at microwave frequencies. This paper thus proposes an

undressed version of the Pierson-Moskowitz spectrum that corrects this artifact. Full-polarized Doppler simulations at L-band and 70deg incidence are presented. Effects of the surface nonlinearities are outlined, and the simulated Doppler spectra show correct variations with respect to wind speed and direction [J342]

"Separation of target rigid body and micro-doppler effects in ISAR imaging"

Micro-Doppler (m-D) effect is caused by moving parts of the radar target. It can cover rigid parts of a target and degrade the inverse synthetic aperture radar (ISAR) image. Separation of the patterns caused by stationary parts of the target from those caused by moving (rotating or vibrating) parts is the topic of this paper. Two techniques for separation of the rigid part from the rotating parts have been proposed. The first technique is based on time-frequency (TF) representation with sliding window and order statistics techniques. The first step in this technique is recognition of rigid parts in the range/cross-range plane. In the second step, reviewed TF representation and order statistics setup are employed to obtain signals caused by moving parts. The second technique can be applied in the case of very emphatic m-D effect. In the first step the rotating parts are recognized, based on the inverse Radon transform (RT). After masking these patterns, a radar image with the rigid body reflection can be obtained. The proposed methods are illustrated by examples [J343]

"Performance of Convolutional Codes With Finite-Depth Interleaving and Noisy Channel Estimates"

In this paper, we derive the Chernoff bound of the pairwise error probability (PEP) and the exact PEP of convolutional codes in a time-varying Rician fading channel. With the assumptions that the channel estimator is a finite impulse response filter and the interleaving depth is finite, we are able to investigate the estimation-diversity tradeoff resulting from the effects of the Doppler spread on the system performance, via the channel estimation accuracy and the channel diversity. In addition, we verify that, in the special case when the pilot signal-to-noise ratio is infinitely large and the channel estimator is well-designed, our analysis leads to the same result as the existing perfect channel-state information analysis. Finally, the analytical results are compared with results from Monte Carlo simulation, and the comparison shows that the analytical results match well with the simulation results. [J344]

"Integrated Optoelectronic Probe Including a Vertical Cavity Surface Emitting Laser for Laser Doppler Perfusion Monitoring"

An integrated optoelectronic probe with small dimensions, for direct-contact laser Doppler blood flow monitoring has been realized. A vertical cavity surface emitting laser (VCSEL), and a chip with photodetectors and all necessary electronics are integrated in a miniature probe head connected to a laptop computer. The computer sound processor is utilized for acquisition and digital signal processing of the incoming Doppler signal. In this paper, the design of the laser Doppler perfusion monitor is described and its performance is evaluated. We demonstrate our perfusion monitor to be less sensitive to subject motion than a commercial fiber-optic device. For medium and high perfusion levels, the performance of our integrated probe is comparable to the fiber-optic flowmeter containing a normal edge-emitting laser diode. For very low perfusion levels, the signal-to-noise ratio of the fiber-optic device is higher. This difference can mainly be attributed to the shorter coherence length of the VCSEL compared with the edge-emitting laser diode [J345]

"Super-orthogonal space-time codes with rectangular constellations and two transmit antennas for high data rate wireless communications"

We demonstrate super-orthogonal space-time (ST) trellis codes with rectangular signal constellations for wireless communications with a spectral efficiency of 4 bits/s/Hz. Considering a mobile wireless communications system with two transmit antennas, we form a 4D signal constellation as Cartesian product of two 2D rectangular signal sets, a 4D point being transmitted by the first antenna as two concatenated 2D points in two consecutive channel uses. The 2D symbols transmitted by the second antenna are not independent, but so chosen as to form, together with the symbols transmitted by the first antenna, the entries of a 2 times 2 orthogonal matrix. This can be done in four different ways, resulting in four sets of 2 times 2 orthogonal matrices. To obtain a higher data rate, the union of two of them forms a super-orthogonal signal set. With 2 times 2 orthogonal matrices, we then label the state transitions of a trellis diagram describing the operation of the encoder. We perform simulations using a model that takes into account the Doppler effect as well as the effect of spatial antenna correlation at both the base station (BS) and at the mobile station (MS). The frame error rate (FER) and the bit error rate (BER) performance results show an excellent behaviour of our proposed super-orthogonal ST trellis code, which clearly outperforms all known simple ST trellis codes of same spectral efficiency using 16QAM or 16PSK [J346]

"A new approach for synthesizing the range profile of moving targets via stepped-frequency

waveforms"

In radar target imaging, motion induces a range-Doppler coupling effect, which results in distortion in synthesizing a range profile for a moving target. To eliminate or suppress the distortion of the synthetic range profile, conventional technology such as motion compensation requires velocity estimation. Unfortunately, for a high-speed moving target, it is difficult to achieve real-time accurate estimation of the velocity of the target. Based on phase cancellation, a new technology is proposed to achieve a motion target range profile via stepped-frequency waveform. The new technology does not need the estimation of the velocity. Hence, its computational cost can be minimized. It is also easier to use. The simulation result confirms the effect of the new technology [J347]

"Electromagnetic scattering from vibrating penetrable objects using a general class of time-varying sheet boundary conditions"

Calculation of electromagnetic (EM) scattering from vibrating penetrable cylinders of arbitrary cross-section is presented using a general class of time-varying sheet boundary conditions (SBCs) in conjunction with the method of moments (MoM). Sheet impedance and admittance expressions are first derived from the exact scattering solution for a penetrable circular cylinder with perturbed radius. Then, using the SBCs, integral equations are derived and solved numerically so that vibrating cylinders with arbitrary cross-section can be treated. Cylinder vibrations are assumed to be non-relativistic, allowing a simplified calculation of the scattered Doppler spectrum. A critical factor in the calculation of the potentially small Doppler components is that the time-varying nature of the cylinder boundary, contained within the sheet impedance and admittance expressions, can be isolated from the unperturbed terms in the scattered field. Comparison with exact and analytical perturbation solutions are presented to demonstrate the accuracy of the numerical solution. [J348]

"Performance of correlation-based frequency estimation methods in the presence of multiplicative noise"

This paper provides a comprehensive performance evaluation of a correlation-based frequency estimator under different fading channel conditions. The efficiency of the estimator in terms of the Cramer-Rao lower bound (CRB) is investigated for different fading conditions, i.e., slow fading, fast fading, Rayleigh fading, and Ricean fading. The asymptotic CRB, which provides an insight to the frequency estimation in fading channels, has been evaluated via a frequency-domain approach. The optimal correlation lag value suitable for frequency estimation under different fading conditions is determined, and closed-form expressions for the variance of the estimates are provided. For proper implementation of the estimator, the Doppler spread of the signal is also estimated. It is shown that using the Doppler spread information, frequency estimation accuracy at low signal-to-noise ratios can be improved using multiple lags of correlations [J349]

"Analysis and optimization of pilot symbol-assisted Rake receivers for DS-CDMA systems"

The effect of imperfect channel estimation (CE) on the performance of pilot-symbol-assisted modulation (PSAM) and MRC Rake reception over time- or frequency-selective fading channels with either a uniform power delay profile (UPDP) or a nonuniform power delay profile (NPDP) is investigated. For time-selective channels, a Wiener filter or linear minimum mean square error (LMMSE) filter for CE is considered, and a closed-form asymptotic expression for the mean square error (MSE) when the number of pilots used for CE approaches infinity is derived. In high signal-to-noise ratio (SNR), the MSE becomes independent of the channel Doppler spectrum. A characteristic function method is used to derive new closed-form expressions for the bit error rate (BER) of Rake receivers in UPDP and NPDP channels. The results are extended to two-dimensional (2-D) Rake receivers. The pilot-symbol spacing and pilot-to-data power ratio are optimized by minimizing the BER. For UPDP channels, elegant results are obtained in the asymptotic case. Furthermore, robust spacing design criteria are derived for the maximum Doppler frequency [J350]

"Multiple-access interference suppression for MC-CDMA by frequency-domain oversampling"

A technique for interference suppression in multicarrier code-division multiple-access (MC-CDMA) systems is proposed which exploits the structural differences in signals that arrive at the receiver with Doppler shifts or carrier offsets. Oversampling the received signal in the frequency domain and properly combining the samples provides the interference suppression. Frequency-domain oversampling is accomplished by using a time extension of the conventional MC-CDMA signal or unconsumed portions of the cyclic prefix. Furthermore, a receiver structure is introduced that despreads and combines groups of samples so that a linear minimum mean-squared error solution for combining the groups is easily found. This combining scheme increases the signal-to-interference ratio experienced by the desired user in the MC-CDMA system. In addition, the receiver performs well in severe near-far scenarios when there is sufficient frequency separation between the signals of the

desired user and an interferer. Numerical results show that the proposed receiver significantly outperforms the conventional MC-CDMA receiver in many channel realizations. [J351]

"Linear antenna arrays with bidirectional phase center motion"

The theoretical and experimental studies of linear antenna arrays with bidirectional phase center motion (BPCM) is presented. BPCM is achieved by exciting only part of the linear array elements and sweeping the excited part from one end to the other and back. The sidelobes of the linear arrays with BPCM experience both upper and lower Doppler frequency shift effect in turn, as compared to linear arrays with unidirectional phase center motion (UPCM). Numerical results show that linear arrays with BPCM are also capable of synthesizing low/ultralow sidelobes, but with a much lower excitation dynamic range ratio as compared to that in conventional arrays. In addition, some characteristics, such as passband bandwidth or sideband levels, are better than those of arrays with UPCM or time modulated variable aperture size arrays. An L-band 16-element printed dipole linear array with BPCM was designed. Experimental results show that a -35 dB relative sidelobe level (SLL) can be achieved. [J352]

"Laser Doppler velocimetry based on the photoacoustic effect in a C O 2 laser"

We report a simple laser Doppler velocimeter in which the photoacoustic effect was used to measure the rotation wheel speed. A Doppler signal, caused by mixing a returning wave with an originally existing wave inside the CO2laser cavity, was detected using a microphone in the laser tube. Frequency of the microphone output was in proportion to the rotation speed of a wheel and is dependent on the cosine of the angle between the direction of the laser beam and tangent of wheel velocity. A Doppler-shifted frequency as high as 34kHzwas detected using this method. A frequency response of a few megahertz is expected from the laser Doppler velocimeter based on the photoacoustic effect in a CO2laser by using a wider bandwidth microphone. [J353]

"Doppler writing and linewidth control for scanning beam interference lithography"

Scanning beam interference lithography (SBIL) is a technique which is used to create large-area periodic patterns with high phase accuracy. This is accomplished by combining interference lithography and an X-Yscanning stage. We previously reported parallel scan mode in which the stage scans in a direction parallel to the interference fringes. Here we present a method called Doppler scanning. In this mode, the stage is scanned perpendicular to the interference fringes. In order to obtain high-contrast latent gratings in the exposed photoresist, several parameters must be controlled. These parameters include vibration, fringe period error, time delay (for Doppler writing), dose, beam overlap, and polarization. In this article we present results of how the time delay, fringe period error, and exposure dose effect the contrast and linewidth of our latent grating images. Furthermore, SBIL has a unique ability to read gratings in a metrology mode configuration. This article also describes how Doppler metrology mode allows us to measure the time delay of our system. [J354]

"Photodissociation dynamics in "hyper-rovibronic" detail: Exploring the potential of millimeter/submillimeter-wave spectroscopy in molecular reaction dynamics experiments"

Over the years, many techniques for studying molecular reaction dynamics have been developed and fine-tuned to probe chemical dynamics at an ever-increasing level of detail. Unfortunately, this progress has frequently come at the price of high experimental cost and great complexity. In this regard experiments employing direct absorption have a distinct advantage in that they are comparatively simple in setup and they probe nascent product distributions directly. Even though the low product number densities in molecular-beam experiments put severe constraints on the noise and sensitivity requirements of detectors, Nesbitt and co-workers [J. Chem. Phys. 86, 3151 (1987); Rev. Sci. Instrum. 58, 807 (1987); J. Chem. Phys. 85, 4890 (1986); J. Chem. Phys. 107, 5661 (1997); Chem. Phys. Lett. 258, 207 (1996)] have demonstrated the use of direct infrared absorption in a variety of molecular reaction dynamics studies. In analogous experiments, this article explores the use of millimeter- and submillimeter-wavelength radiation in direct absorption experiments in a molecular beam. The comparatively simple and inexpensive setup demonstrates the utility of combining new commercial solid-state millimeter/submillimeter-wavelength sources with hot-electron bolometer detectors to directly probe parent and product hyperfine rovibronic levels and their Doppler-resolved velocity distributions in a molecular beam. For example, in open-shell products with nuclear spin, the ultrahigh energy resolution of the rotational spectroscopy easily resolves nuclear quadrupole hyperfine structure and lambda doublets in both ground and excited spin-orbit states as well as in ground and excited vibrational levels. Two molecular beam examples are given: (1) detection of "hyper-rovibronic" structure in ClO (2Pi Omega =3/2,1/2, nu =0-8, J=112 13;712, Lambda ,F) following the mode-specific photodissociation of OClO (A2A2←X2B1, nu 1=14-15), and (2) coherent transient absorption of HCN following the 266 nm photodissociation of sym-triazine/argon clusters. [J355]

"An ultrahigh vacuum dynamic force microscope for high resonance frequency cantilevers"

We present the design of an ultrahigh vacuum dynamic force microscope incorporating a heterodyne Doppler interferometer and a superheterodyne circuit with an intermediate frequency of 10.7MHz. The method allowed the use of a low-noise narrow-band analog phase-locked loop with a voltage controlled crystal oscillator for demodulating the frequency shifts caused by the interaction force gradients between the tip and the sample at the intermediate frequency. The system could be used for a conventional cantilever operating in its fundamental and higher modes, as well as for small or stiff cantilevers with high resonance frequency up to 100MHz. A preliminary measurement was demonstrated by the observation of the Si(111)-7Ч7reconstructed surface with the second resonance of 1.6MHzwith subangstrom amplitudes. [J356]

"Optically generated arbitrary waveforms for radar applications"

A fibred optoelectronic arbitrary waveform generator for radar calibration purposes is proposed. The ability to generate radar arbitrary waveforms composed of 700 Doppler frequency components from 12 to 14 GHz with 20 dB spurious free dynamic range is demonstrated. [J357]

"Effects of platform rotation on STAP performance"

The effects of platform rotation, and in particular antenna rotation, on the performance of space-time adaptive processing (STAP) in clutter limited, forward looking airborne radar applications are considered. It is shown that there are two principal mechanisms. One involves the change of shape of the clutter surface in angle-Doppler space as the antenna rotates. STAP appears much more resilient to roll than yaw when this mechanism is dominant, although the problems of yaw can be alleviated by the application of motion compensated phase delay steering. The other mechanism involves the presence of discontinuous sharp transitions across a STAP data vector, for which one possible cause is non-ideal motion compensated steering of the antenna. These discontinuities effectively increase the bandwidth and can result in significant performance deterioration [J358]

"Analysis and characterization of PLL-based retrodirective array"

In this paper, we present a new phase-locked loop (PLL) architecture that is capable of providing phase conjugation as required for retrodirective array action. An analysis is performed on the architecture, which shows that the presence of nonlinear mixing products gives rise to an additional and substantially larger RMS noise-induced phase-error component than is suggested by analysis based on ideal mixer properties. In addition, the analysis allows us to quantify the effect that a Doppler shifted signal has on phase-conjugation error. For the purpose of demonstration, we have constructed and characterized a six-element array operating using commercially available components at 1 GHz. Near-perfect retrodirective action is presented over a 360deg azimuth sweep, with 16-dB array gain. Due to the inherent isolation between input and output signals, and programmable retransmit frequency, the PLL approach introduced in this paper offers considerable practical advantage when used within retrodirective antenna arrays, as compared to the classical mixer-based approach where mixer losses and RF-to-IF frequency isolation are major issues [J359]

"Improvement of loading/unloading performance using control input position and considering disk vibration characteristics"

Loading/unloading (L/UL) dynamic characteristics are affected by various operating parameters, such as L/UL speed, disk speed, disk vibration, and so on. The effects of these parameters on L/UL performance are investigated experimentally using an acoustic emission (AE) sensor, an in-plane laser Doppler vibrometer (LDV), and a vertical LDV. The experimental data shows that during the loading of the slider, the contact probability is lower for low L/UL speeds. The frequencies of slider-disk contact are lower for low disk rpm during the loading process, whereas in the unloading process the contact probability is lower for high disk rpm. The effects of disk vibration on the L/UL process are also studied, and we have found that the relative gap and slider-disk velocity between the disk and ramp affect the contact events in the L/UL process. During 1000 unloading cycles, most noncontact events occurred near the region of the maximum ramp gap during the loading process. During unloading, most of the contacts between the slider and disk occurred at the minimum relative speed. Slider-disk contact rarely occurred at the maximum relative unloading speed. The noncontact region tends to expand with higher disk speeds during the unloading process. This paper proposes a method to control the unloading input position to improve L/UL performance. By controlling the unloading instant based on the disk vibration characteristics, we can significantly reduce the number of slider-disk contacts. [J360]

"Effect of red cell clustering and anisotropy on ultrasound blood backscatter: a Monte Carlo study"

When flowing at a low shear rate, blood appears hyperechogenic on ultrasound B-scans. The formation of red

blood cell (RBC) aggregates that also alters blood viscosity is the microscopic mechanism explaining this acoustical phenomenon. In this study, Monte Carlo simulations were performed to predict how RBC clustering increases ultrasound scattering by blood. A bidimensional Gibbs-Markov random point process parameterized by the adhesion energy epsi and an anisotropy index nu was used to describe RBC positions for a hematocrit H=40%. The frequency dependence of the backscattering coefficient chi(f) was computed using Born approximation. The backscattering coefficient chi0at 5 MHz and the spectral slopes and nxand ny(chipropf(nx) or f(ny)) measured, respectively, when the insonification is parallel and perpendicular with the RBC cluster axis were then extracted. Under isotropic conditions, chi0increased up to 7 dB with epsi and nx=n ydecreased from 4.2 to 3.4. Under anisotropic conditions, the backscattering was stronger perpendicularly to aggregate axis, resulting in nx<ny. The anisotropy in scattering appeared more pronounced when epsi or nu increased. These two dimensional results generally predict that low-frequency blood backscatter is related to cluster dimension, and higher-frequency properties are affected by finer morphological features as anisotropy. This numerically establishes that ultrasound backscatter spectroscopy on a large frequency range is pertinent to characterize in situ hemorheology [J361]

"Coherent array imaging using phased subarrays. Part II: simulations and experimental results"

For pt.I, see ibid., vol.52, no.1, p.37-50 (2005). The basic principles and theory of phased subarray (PSA) imaging provides the flexibility of reducing the number of front-end hardware channels between that of classical synthetic aperture (CSA) imaging-which uses only one element per firing event-and full-phased array (FPA) imaging-which uses all elements for each firing. The performance of PSA generally ranges between that obtained by CSA and FPA using the same array, and depends on the amount of hardware complexity reduction. For the work described in this paper, we performed FPA, CSA, and PSA imaging of a resolution phantom using both simulated and experimental data from a 3-MHz, 3.2-cm, 128-element capacitive micromachined ultrasound transducer (CMUT) array. The simulated system point responses in the spatial and frequency domains are presented as a means of studying the effects of signal bandwidth, reconstruction filter size, and subsampling rate on the PSA system performance. The PSA and FPA sector-scanned images were reconstructed using the wideband experimental data with 80% fractional bandwidth, with seven 32-element subarrays used for PSA imaging. The measurements on the experimental sector images indicate that, at the transmit focal zone, the PSA method provides a 10% improvement in the 6-dB lateral resolution, and the axial point resolution of PSA imaging is identical to that of FPA imaging. The signal-to-noise ratio (SNR) of PSA image was 58.3 dB, 4.9 dB below that of the FPA image, and the contrast-to-noise ratio (CNR) is reduced by 10%. The simulated and experimental test results presented in this paper validate theoretical expectations and illustrate the flexibility of PSA imaging as a way to exchange SNR and frame rate for simplified front-end hardware [J362]

"Daytime interference ing of OSMAR"

In order to cancel the daytime interference of Ocean State Monitoring and Analyzing Radar, which appears in some consecutive days, we analyze the interference characteristic. Based on the characteristic the sidelobe cancellation technique and the orthogonal expansion method are proposed to cancel the interference. Both methods increase the sea-echo-to-interference ratio, but the latter achieves better effect in the far distance, which confirms the orthogonal expansion is the best method to remove the interference. [J363]

"Robust adaptive MMSE/DFE multiuser detection in multipath fading channel with impulse noise"

The direct-sequence code-division multiple-access (DS/CDMA) technique is extensively used for cellular, personal, and mobile radio communication systems. However, the conventional channel estimators cannot provide accurate channel information for multiuser detection in the presence of impulsive noise and Doppler spread, especially in the time-varying fading channel. We propose a linear-trend tracking method for estimating the impulse response of the time-varying channel via a robust Kalman filtering with a scheme that can automatically adjust the variance of the driving noise. The proposed method need not identify the parameters of the channel model and is insensitive to the speed of channel variation. Following channel estimation, a robust multiuser detection algorithm is developed via a Kalman-based decision feedback equalization (DFE). A nonlinear limitation function is incorporated to mitigate the effects of channel estimation error and impulsive noise and to prevent severe error propagation. Simulation results conclude that the performance of the DS/CDMA system is improved by using the proposed receiver. [J364]

"Potential to estimate the canting angle of tilted structures in clouds from microwave radiances around 183 GHz"

The effects of cloud structures on microwave radiances at frequencies from 89-190 GHz are investigated by simulations using the Goddard cumulus ensemble model data as input for a radiative transfer model. It was

found that the brightness temperatures at these frequencies have different sensitivities to clouds with a tilted structure. The different sensitivities to altitude and amount of hydrometeors allow the estimation of the canting angle and tilt direction of tilted clouds using brightness temperatures at the water vapor channels at 183.3 ± 1 and 183.3 ± 7 GHz. The estimated canting angle and tilt direction are in agreement with the model situation. This method provides a potential to estimate tilted convective structures from microwave radiometric observations at 183.3 ± 1 and 183.3 ± 7 GHz. It is applied to a tilted storm observed from the National Aeronautics and Space Administration's ER-2 aircraft flying at about 20 km on August 26, 1998 during the third Convection and Moisture Experiment using the observed downlooking brightness temperatures at the water vapor channels of a Millimeter-wave Imaging Radiometer. The estimated results are in good agreement with the realistic storm situation obtained from the simultaneous observations of the ER-2 Doppler radar. This method also provides information about the vertical displacement of cloud structure and thereby to estimate the accurate location of surface rainfall. This is important when validating precipitation retrieval based on observations of the ice scattering above surface rainfall against surface rain observations using the microwave frequencies sensitive to high altitudes. [J365]

"The impact of combined channel mismatch effects in time-interleaved ADCs"

A time-interleaved multichannel analog-to-digital converter (ADC) achieves high sampling rates with the drawback of additional distortions caused by channel mismatches. In this paper, we consider the dependency of the signal-to-noise-and-distortion ratio (SINAD) on the combination of several different channel mismatch effects. By using either explicitly given mismatch parameters or given parameter distributions, we derive closed-form equations for calculating the explicit or the expected SINAD for an arbitrary number of channels. Furthermore, we extend the explicit SINAD by the impact of timing jitter. We clarify how channel mismatches interact and perform a worst case analysis of the explicit SINAD for individual mismatch errors. We also show that equations describing the expected SINAD of individual mismatch errors are special cases of our general formulation. We indicate how to use the expected SINAD for finding efficient optimization priorities and demonstrate the importance of worst case analyses. [J366]

"Estimation of gravity wave momentum flux with spectroscopic imaging"

Atmospheric gravity waves play a significant role in the dynamics and thermal balance of the upper atmosphere. In this paper, we present a novel technique for automated and robust calculation of momentum flux of high-frequency quasi-monochromatic wave components from spectroscopic imaging and horizontal radar wind measurements. Our approach uses the two-dimensional (2-D) cross periodogram of two consecutive Doppler-shifted time-differenced (TD) images to identify wave components and estimate intrinsic wave parameters. Besides estimating the average perturbation of dominant waves in the whole field of view, this technique applies 2-D short-space Fourier transform to the TD images to identify localized wave events. With the wave parameters acquired, the momentum flux carried by all vertically propagating wave components is calculated using an analytical model relating the measured intensity perturbation to the wave amplitude. This model is tested by comparing wave perturbation amplitudes inferred from spectroscopic images with those from sodium lidar temperature measurements. The proposed technique enables characterization of the variations in the direction and strength of gravity waves with high temporal resolution for each clear data-taking night. The nightly results provide statistical information for investigating seasonal and geographical variations in momentum flux of gravity waves. [J367]

"Combined ultrasound and optoacoustic system for real-time high-contrast vascular imaging in vivo"

In optoacoustic imaging, short laser pulses irradiate highly scattering human tissue and adiabatically heat embedded absorbing structures, such as blood vessels, to generate ultrasound transients by means of the thermoelastic effect. We present an optoacoustic vascular imaging system that records these transients on the skin surface with an ultrasound transducer array and displays the images online. With a single laser pulse a complete optoacoustic B-mode image can be acquired. The optoacoustic system exploits the high intrinsic optical contrast of blood and provides high-contrast images without the need for contrast agents. The high spatial resolution of the system is determined by the acoustic propagation and is limited to the submillimeter range by our 7.5-MHz linear array transducer. A Q-switched alexandrite laser emitting short near-infrared laser pulses at a wavelength of 760 nm allows an imaging depth of a few centimeters. The system provides real-time images at frame-rates of 7.5 Hz and optionally displays the classically generated ultrasound image alongside the optoacoustic image. The functionality of the system was demonstrated in vivo on human finger, arm and leg. The proposed system combines the merits and most compelling features of optics and ultrasound in a single high-contrast vascular imaging device. [J368]

"Symbol error probability of two-dimensional signaling in Ricean fading with imperfect channel estimation"

In this paper, a general analytical framework is developed for calculating the symbol error rate of two-dimensional (2-D) signaling in Ricean fading with imperfect channel estimation. We show that in the presence of channel estimation errors, the symbol error rate of arbitrary 2-D signaling in Ricean fading can be expressed as a two-fold proper integral with finite integration limits, which is suitable for numerical evaluation. This new analysis is applicable to any channel estimation scheme where the estimated and the actual channel gains are jointly complex-Gaussian. System parameters related to specific channel estimation schemes are optimized and the effect of Doppler frequency shift in the channel line-of-sight component on the error performance is investigated using our analysis. [J369]

"Optimization of waveform and detection threshold for range and range-rate tracking in clutter"

We address an optimization problem to obtain the combined sequence of waveform parameters (pulse amplitudes and lengths, and FM sweep rates) and detection thresholds for optimal range and range-rate tracking in clutter. The optimal combined sequence minimizes a tracking performance index under a set of parameter constraints. The performance index includes the probability of track loss and a function of estimation error covariances. The track loss probability and the error covariances are predicted using a hybrid conditional average algorithm. The effect of the false alarms and clutter interference is taken into account in the prediction. A measurement model in explicit form is also presented which is developed based on the resolution cell in the delay-Doppler plane for a single Gaussian pulse. Numerical experiments were performed to solve the optimization problem for several examples. [J370]

"Guest Editorial"

{no data available} [J371]

"SNR-independent methods for estimating maximum Doppler frequency"

In this letter, we propose two maximum Doppler frequency estimators that are based on the level crossing rate (LCR) and the covariance function (COV). To eliminate the effect of additive noise, we analyze the conditions for the estimators independent of the signal-to-noise ratio (SNR) and implement the conditions with a simple downsampling process. The proposed methods achieve good SNR-independent performance. [J372]

"Pilot-free dynamic phase and amplitude estimations for wireless ICI self-cancellation coded OFDM systems"

OFDM has the advantage over the conventional single-carrier modulation schemes in the presence of frequency-selective fadings. Nevertheless, intercarrier-interference (ICI) due to Doppler frequency drift, phase offset, local oscillator frequency drift, and sampling clock offset will be a severe problem in the wireless OFDM systems. Previous ICI self-cancellation coding schemes can greatly reduce the ICI, but they are very sensitive to the phase ambiguity, which is due to the composite effect of the phase offset, the multipath fading and the local oscillator frequency drift. In this paper, a novel receiver which combines the current ICI self-cancellation coding techniques with a new pilot-free joint phase/amplitude estimation and symbol detection scheme is proposed. Based on the energy modulation or the irregular symbol constellation, our new technique does not have any requirement of pilot symbols and it can operate on all kinds of phase error ranges. The proposed scheme is promising in comparison with other existing methods at different noise levels through OFDM simulations. [J373]

"A new positioning system using television synchronization signals"

The technique discussed herein may be used to position a range of wireless devices that require location information when in inclement urban conditions, including PDA's, laptops, cellular phones, asset-tracking devices and radios for emergency response personnel. We make use of synchronization signals that are part of the standard for Television set forth by the Advanced Television Systems Committee. Consequently, the technique described herein requires no changes to the television broadcast stations. The signal can accommodate robust indoor positioning where the Global Positioning System (GPS) fails, since the television synchronization signals typically have a power advantage over GPS of more than 40 dB. In addition, the effects of multipath are substantially mitigated since the signals have a bandwidth of roughly 6 MHz, and substantially superior geometry for triangulating lateral position to that which GPS can typically provide in inclement environments. A wide range of VHF and UHF frequencies have been allocated to television stations; consequently, there is redundancy built into the system to protect against deep fades on particular channels. In addition, unlike GPS, the synch signals

are not affected by transmitter Doppler, ionospheric propagation delays, or data that is modulated onto the signals. In overview, the technology exploits the considerable Digital TV infrastructure to achieve more reliable, accurate and rapid positioning than can be achieved with existing technologies. [J374]

"Ambiguity-free Doppler centroid estimation technique for airborne SAR using the Radon transform"

In synthetic aperture radar (SAR) signal processing, the Doppler centroid estimation technique, called the "clutter-lock", is important because it is related to the signal-to-noise ratio, geometric distortion, and radiometric error of the final SAR image. Conventional algorithms have either ambiguity problems or somewhat high computational load. Using the fact that the Doppler centroid and the squint angle are directly related, we propose an ambiguity-free Doppler centroid estimation technique using Radon transform, named geometry-based Doppler estimator. The proposed algorithm is computationally efficient and shows good performance of estimating the absolute Doppler centroid. [J375]

"Vacancy-type defects in Si-doped InN grown by plasma-assisted molecular-beam epitaxy probed using monoenergetic positron beams"

High-quality InN layers grown on sapphire substrates by plasma-assisted molecular-beam epitaxy were characterized using monoenergetic positron beams. The carrier concentrations of the films were controlled by Si doping (2.1Ч1018to1.4Ч1019cm-3), and the highest obtained Hall mobility was 1300cm2V-1s-1. The Doppler broadening spectra of the annihilation radiation and the lifetime spectra of positrons were measured as a function of the incident positron energy for undoped and Si-doped InN films. The line-shape parameter Sincreased with increasing carrier concentration, suggesting the introduction of vacancy-type defects by a Fermi-level effect. The major defect species were varied with carrier concentration, and its species were identified as In vacancies (VIn)or their related defects. [J376]

"Positron beam studies of argon-irradiated polycrystal alpha -Zr"

Doppler broadening spectroscopy was performed using a variable-energy positron beam to investigate the effect of defects induced by 150-keVAr-ion-irradiated alpha -Zrbulk material. Sparameter in the damaged layer of the as-irradiated sample induced by ion irradiation increased with the increasing implantation dose. Isochronal annealing between 350 and 800°Cin vacuum studies was carried out to investigate the thermal stability of defects in the oxide surface and damaged layer for low-dose (1Ч1014cm2)and high-dose (1Ч1016cm2)irradiated samples. The results of S-Wplot measured at different annealing temperatures showed that the positron-trapping center had changed. The Ar-decorated voids or vacancies, which formed in high-dose implantation samples by Ar ions combining with open-volume defects, are stable and do not recover until at high annealing temperatures. Comparing the annealing behavior of the high-dose and low-dose implantation samples show that the recovery process of open-volume defects such as vacancies and voids will be delayed by the excess Ar concentration. [J377]

"Performance of a VSF-OFCDM system using a symbol relocated scheme during retransmission"

A symbol-relocated (SR) scheme has been proposed for variable spreading factor orthogonal frequency code-division multiplex systems to achieve frequency diversity during retransmission. The performance has been evaluated for two combining schemes of hybrid auto repeat request, namely chase combining and incremental redundancy. The results show that the proposed SR scheme achieves significant improvement in terms of system throughput over conventional schemes. This effect is more significant for chase combining because the rotated mechanism is more effective when the same packet is transmitted during the retransmission. It is also found that the SR scheme is not sensitive to Doppler frequency variation, which makes it an attractive candidate for fast-fading channels. Further investigation also suggests the suitability of an SR scheme for smaller spreading factors (in the frequency domain) and larger coding rates. [J378]

"Rapid slot synchronization in the presence of large frequency offset and Doppler spread in WCDMA systems"

Slot synchronization is the most challenging step for rapid cell search in intercell asynchronous code division multiple access systems such as wide-band code division multiple access (WCDMA). For rapid cell search, it is desirable to design the receiver robust to initial frequency offset and Doppler spread. In this letter, we consider combining schemes for rapid slot synchronization of WCDMA signals in such channel impairments. We propose an inner-slot differential combining scheme that exploits partial correlation of slot synchronization code, making the receiver tolerable to a large amount of initial frequency offset and Doppler spread. Unlike conventional

differential combining schemes, the proposed scheme is also applicable to the use of transmit antenna diversity. The detection performance of the proposed combining scheme is analyzed with the use of transmit antenna diversity. Finally, the analytic results are verified by computer simulation. [J379]

"Data-aided channel estimation for wideband CDMA"

The effect of channel estimation error on the performance of a wideband code division multiple access link using a pilot channel multiplexed with the data channel is analyzed. The gain achievable by improving the channel estimation algorithm is studied. Analysis and simulation results are presented for a data-aided channel estimation scheme that effectively extends the duration of the pilot signal. Using the maximum likelihood detection principle, it is shown that making tentative minimum mean-squared error decisions on the data bits using estimates obtained from the pilot channel can extend the number of samples used in the channel estimation, thus improving the channel estimate quality. Simulations show that a gain of up to 1.5 dB in block-error rate performance is achievable using the proposed channel estimation scheme for both Convolutional and Turbo codes. It is shown that the performance gain depends on the information bit rate, the channel characteristics, including the Doppler frequency, and the multipath fading channel power delay profile. Simulation results also show that for weak paths, data-aided channel estimation benefits significantly from diversity combining. [J380]

"Generalized approach to resolution analysis in BSAR"

Bistatic synthetic aperture radars (BSARs) have been the focus of increasing research activity over the last decade. The generalized ambiguity function (GAF) of bistatic SAR is introduced here. First, the GAF for BSAR is represented in the delay-Doppler domain, and is then expanded to the spatial (coordinates) domain. From the GAF, comprehensive knowledge regarding the resolution of BSAR can be extracted, including the range and azimuth resolutions, as well as the area of a resolution cell of BSAR. These general results are also applied to the performance analysis of several particular BSAR geometries, including the space-surface-BSAR (SS-BSAR) system, to demonstrate the potential ability of this newly introduced system. [J381]

"Resonant vibration investigations for piezoceramic disks and annuli by using the equivalent constant method"

This paper presents the equivalent constant method to investigate the transverse vibration of piezoceramic disks and annuli. By comparing the characteristic equations of resonant frequencies between isotropic and piezoceramic disks, the named equivalent Poisson's ratio v~ is derived, then the transverse vibration characteristic equation can be expressed as a single formulation for these two materials. To verify this method, characteristic equations of transverse vibration for piezoceramic disks and annuli with many different boundary conditions are discussed and calculated for resonant frequencies. Numerical calculations based on the finite-element method (FEM) also are performed, and the results agree rather well with the theoretical predictions. With the aid of the relations between frequency parameter and equivalent Poisson's ratio in explicit form, the other application of equivalent Poisson's ratio is the inverse evaluation of material constants. The laser Doppler vibrometer (LDV) and impedance analyzer are used to experimentally obtain the resonant frequencies of transverse and radial extensional vibrations, respectively. By the experimental results for the traction-free piezoceramic disk, the planar Poisson's ratio vpand planar electromechanical coupling coefficient kpare determined. [J382]

"Probability hypothesis density-based multitarget tracking with bistatic range and Doppler observations"

R.P.S. Mahler's probability hypothesis density (PHD) provides a promising framework for the passive coherent location of targets observed via multiple bistatic radar measurements. A particle filter implementation of the Bayesian PHD filter is applied to target tracking using both range and Doppler measurements from a simple non-directional receiver that exploits non-cooperative FM radio transmitters as its 'illuminators of opportunity'. Signal-to-noise ratios, probabilities of detection and false alarm and bistatic range and Doppler variances are incorporated into a realistic two-target scenario. Bistatic range cells are used in calculating the birth particle proposal density. The tracking results are compared to those obtained when the same tracker is used with range-only measurements. This is done for two different probabilities of false alarm. The PHD particle filter handles ghost targets well and has improved tracking performance when incorporating Doppler measurements along with the range measurements. This improved tracking performance, however, comes at the cost of requiring more particles and additional computation. [J383]

"Passive coherent location radar systems. Part 2: waveform properties"

Resolution and ambiguity in both range and Doppler are parameters of fundamental importance in the design and subsequent performance of any radar system. In this paper, practical measurements of transmitted waveforms are reported and used to illustrate their effects on the resulting system design and performance. In particular, the 'self-ambiguity' which enables the limits on range and Doppler resolution to be evaluated is computed. The bistatic form of the ambiguity function is subsequently presented and used to illustrate how these best case parameters vary as a function of transmitter, receiver and target locations. Understanding the forms that these functions can take and subsequently the implications for system performance is most important if this type of radar is to be used effectively. It is shown that the radar designer does in fact have some limited freedoms to improve system performance. Finally, the implications of transmitter waveform and bistatic geometry on target detection, location and imaging are discussed. [J384]

"Maximum likelihood angle-frequency estimation in partially known correlated noise for low-elevation targets"

In radar applications, the received echo signals reach the array elements via a multiplicity of paths despite the fact that there exists only one target. We address the problem of joint direction of arrival and Doppler frequency estimation using a sensor array in partially known additive noise. We consider a specular reflection model with a radar cross section fluctuating from one pulse repetition interval to another. The proposed model allows the estimation of more paths than sensors. Two approximate maximum likelihood algorithms are proposed. The first approach uses a linear expansion of the noise covariance matrix, whereas the second employs a combination of oblique projections and a zero-forcing solution to alleviate the effect of noise. In contrast to other classical methods, the two approaches are more robust to spatially correlated noise, and they employ more compact cost functions that reduce the dimension of the optimization search. Numerical simulations are provided to assess the basic performance of the two approaches, which are compared to the Cramer'r-Rao bound. [J385]

"Joint time-scale and TDOA estimation: analysis and fast approximation"

Relative motion (rm) between a signal source and a receiver causes a time scaling of the signal arriving at the receiver. When estimating the time-difference-of-arrival (TDOA) of a signal at two receivers, time scaling, when not properly accounted for, can introduce a bias that could dominate the estimation errors. Segmentization processing cannot reduce this bias. Following the derivation of the formulae for bias and mean-square errors of TDOA estimation under rm, this paper moves on to the joint estimation of TDOA and time scale. It proposes an iterative search for the maximization of the cross-ambiguity function (CAF), which is also the maximum likelihood function for additive Gaussian bandlimited white noise disturbance. In addition, a quadratic Lagrange interpolator is also proposed to obtain the initial parameter values for the iterative search, which can increase the chance of converging to the global minimum solution. It is necessary to time scale a digital sequence by a noninteger in the maximization process. For an N-point sequence, this operation, which first interpolates the samples by sinc functions and then resamples, is in the order O(N2). Noting that the magnitude of the sinc function decreases rapidly from its peak, this paper uses a fast approximation (FA) method that applies only five sinc coefficients for the interpolation, reducing the computation to O(N). Simulation results have corroborated that the maximization of the CAF does provide estimates that reach the Cramer-Rao lower bound and that the degradation in accuracy is negligible when FA is applied. [J386]

"Theoretical, numerical, and experimental investigation on resonant vibrations of piezoceramic annular disks"

In this study, vibration characteristics of thin piezoceramic annular disks with stress-free boundary conditions are investigated by theoretical analysis, numerical simulation, and experimental measurement. The non-axisymmetric, out-of-plane (transverse), and axisymmetric in-plane (tangential and radial extensional) vibration modes are discussed in detail in terms of resonant frequencies, mode shapes, and electrical currents. Two optical techniques, amplitude-fluctuation electronic speckle pattern interferometry (AF-ESPI) and laser Doppler vibrometer (LDV), as well as the electrical impedance measurement are used to validate the analytical results. Both theoretical and experimental results indicate that the transverse and tangential vibration modes cannot be determined by the impedance analysis; hence, only resonant frequencies of extensional vibration modes are presented from the impedance analyzer. The LDV system is used to measure the resonant frequencies of transverse vibrations. However, both the transverse and extensional vibration modes and resonant frequencies of piezoceramic annular disks are obtained by the AF-ESPI method, and the interferometric fringes are produced instantly by a video recording system. Numerical results obtained by finite-element calculations are compared with those from theoretical analysis and experimental measurements. It is shown that the theoretical predictions of resonant frequencies and the corresponding mode shapes agree well with the experimental results. Good agreement between the predicted and measured electrical impedance also is found. The dependence of resonant frequencies and dynamic electromechanical coupling coefficients on the inner-to-outer radius ratio also

is analyzed and discussed in this study. [J387]

"Time-resolved dynamics of resonant and nonresonant broadband picosecond coherent anti-Stokes Raman scattering signals"

The time-resolved dynamics of resonant and nonresonant broadband picosecond coherent anti-Stokes Raman scattering (CARS) signals in gas-phase media are investigated. For 135pspump and probe beams and 106psStokes beams, the magnitude of the nonresonant signals are decreased by more than three orders of magnitude when the probe beam is delayed by 110ps, whereas the resonant nitrogen CARS signal is reduced only by a factor of 3. Investigation of these time dynamics is important for understanding the optimal time delay for nonresonant background suppression as well as for understanding the collisional and Doppler dependence of the resonant CARS signals. [J388]

"Progress in medical ultrasound exposimetry"

Biomedical applications of ultrasound have experienced tremendous growth over the past 50 years. Early work in thermal therapy and surgery soon was followed by diagnostic imaging and Doppler. Because patient safety was an important issue from the beginning, the study of methods for measuring exposure levels, and their relationship to possible biological effects, paralleled the growth of the various therapeutic and diagnostic techniques. The diverse conditions of use have presented a range of exposure measurement challenges, and the sensors and techniques used to evaluate ultrasound fields have had to evolve as new or expanded clinical applications have emerged. In this paper some of the more notable of these developments are presented and discussed. Topics covered include devices and techniques, methods of calibration, progress in standardization, and current problem areas, including the effects of nonlinear propagation. Some early methods are described, but emphasis is given to more recent work applicable to present and future uses of ultrasound in medicine and biology. [J389]

"Different effects of microbubble destruction and translation in Doppler measurements"

In flow measurements in which microbubbles are involved, the amplitude and phase of the received echo signal are noticeably influenced by the transmitted ultrasound intensity. Previous studies have shown that, when such intensity is progressively increased, the Doppler spectrum is accordingly distorted, i.e., it is asymmetrically broadened toward the negative frequency side. Such deformation has been attributed to radiation force, which pushes the microbubbles into the sound propagation direction, thus yielding additional phase delays in the received echoes. However, the possible contribution of microbubble destruction to this spectral deformation has not been considered yet. In this paper, this issue is investigated by analyzing the experimental spectra produced by two different types of microbubbles suspended in a moving fluid and insonified in pulsed wave (PW) mode at programmable pulse repetition frequency (PRF) and pressure. Conditions are created in which either the radiation force or the destruction mechanism is expected to be dominant. Effects produced by the two phenomena on the Doppler spectrum are shown to be different. When the PRF is low (2 kHz), so that, according to theoretical simulations, the radiation force effect is negligible, a 26 dB noise floor increase is observed for a 13 dB pressure increment. For a higher PRF (16 kHz), the same pressure increase not only affects the noise floor, but also causes the bubbles to deviate from their original streamlines, yielding a Doppler bandwidth increase by a factor of 5. It is concluded that asymmetrical spectral broadening is mainly due to radiation force, and microbubble destruction mainly results in an increased noise floor without affecting the spectral shape. [J390]

"Adaptive Hybrid Beamformer for Mobile Reception of ATSC DTV"

An adaptive hybrid beamformer is proposed to improve the reception performance of the advanced television system committee (ATSC) digital television (DTV) in a mobile environment. Dynamic multipaths and Doppler shifts severely degrade the reception performance of the ATSC DTV receiver. Accordingly, a hybrid beamformer, called a Capon and least mean square (CLMS) beamformer, is presented that uses direction of arrival (DOA) information and the least mean square (LMS) beamforming algorithm. The proposed CLMS algorithm efficiently removes dynamic multipaths and compensates for the phase distortion caused by Doppler shifts in mobile receivers. When the CLMS beamformer has an insufficient degree of freedom (DOF), the subsequent use of an equalizer removes any residual multipath effects, thereby significantly improving the performance of DTV receivers. The performances of the proposed CLMS, Capon, and LMS beamformers are compared based on computer simulations. In addition, the overall performance of the CLMS beamformer followed by an equalizer is also considered. [J391]

"IWRAP: the Imaging Wind and Rain Airborne Profiler for remote sensing of the ocean and the

atmospheric boundary layer within tropical cyclones"

The Imaging Wind and Rain Airborne Profiler (IWRAP) is the first high-resolution dual-band airborne Doppler radar designed to study the inner core of tropical cyclones (TCs). IWRAP is operated from a National Oceanic and Atmospheric Administration WP-3D aircraft during missions through TCs and severe ocean storms. The system is designed to provide high-resolution dual-polarized C- and Ku-band reflectivity and Doppler velocity profiles of the atmospheric boundary layer (ABL) within the inner core precipitation bands of TCs and to study the effects precipitation has on ocean wind scatterometry as it applies to TCs. IWRAP implements a very unique measurement strategy; it profiles simultaneously at four separate incidence angles (approximately 30°, 35°, 40°, and 50°) while conically scanning at 60 rpm. A summary of the principles of operation and the design of the instrument is given, followed by examples of IWRAP's unique imaging capability. To our knowledge, these examples include the highest resolution measurements of the ABL winds in a hurricane ever obtained. [J392]

"Mm wavelengths complex Doppler analysis using dark field illumination"

Experimental results that indicate that at least two fundamental modes of Doppler generation are present when a rotating steel cylinder is broadside illuminated by radar. Improvised bistatic measurements at 77GHz are discussed and second order Doppler effects studied. Complex Doppler returns, consisting of two or more Doppler contributions, are decomposed and studied using empirical methods. In particular, ground illumination techniques are used to study Doppler in the shadow region of a cylinder of circumference 81 wavelengths. It is concluded that the complex Doppler response from the spinning cylinder consists of both direct (first order) and delayed (second order) Doppler components. Further measurements are proposed to study the delayed Doppler effect further. [J393]

"Time-Variant Channel Estimation Using Discrete Prolate Spheroidal Sequences"

We propose and analyze a low-complexity channel estimator for a multiuser multicarrier code division multiple access (MC-CDMA) downlink in a time-variant frequency-selective channel. MC-CDMA is based on orthogonal frequency division multiplexing (OFDM). The time-variant channel is estimated individually for every flat-fading subcarrier, assuming small intercarrier interference. The temporal variation of every subcarrier over the duration of a data block is upper bounded by the Doppler bandwidth determined by the maximum velocity of the users. Slepian showed that time-limited snapshots of bandlimited sequences span a low-dimensional subspace. This subspace is also spanned by discrete prolate spheroidal (DPS) sequences. We expand the time-variant subcarrier coefficients in terms of orthogonal DPS sequences we call Slepian basis expansion. This enables a time-variant channel description that avoids the frequency leakage effect of the Fourier basis expansion. The square bias of the Slepian basis expansion per subcarrier is three magnitudes smaller than the square bias of the Fourier basis expansion. We show simulation results for a fully loaded MC-CDMA downlink with classic linear minimum mean square error multiuser detection. The users are moving with 19.4 m/s. Using the Slepian basis expansion channel estimator and a pilot ratio of only 2%, we achieve a bit error rate performance as with perfect channel knowledge. [J394]

"Optimal pilot placement for frequency offset estimation and data detection in burst transmission systems"

In this letter, we address the problem of pilot design for carrier frequency offset (CFO) and data detection in digital burst transmission systems. We consider a quasistatic flat-fading channel. We find that placing half of the pilot symbols at the beginning of the burst and the other half at the end of the burst is optimal for both CFO estimation and data detection. Our findings are based on the Cramer-Rao bound and on empirical evaluations of the bit error rate for different pilot designs. The equal-preamble-postamble pilot design is shown to provide a significant gain in performance over the conventional preamble-only pilot design. [J395]

"Robust Doppler spread estimation in nonisotropic fading channels"

A new parametric approach is proposed for the estimation of the maximum Doppler frequency, or equivalently the mobile speed, in narrowband mobile radio channels. In this work, simple and efficient Doppler-frequency estimators are formulated based on using a small number of samples of the channel autocorrelation function. Unlike previous approaches, the chosen parameterization is shown to be robust in a microcellular propagation environment, which may be characterized by nonisotropic scattering and/or a specular component of unknown strength. Simulation results are described to illustrate the effects of additive noise and the finite data-record performance. [J396]

"Radar detection in clutter"

Clutter is defined as any unwanted radar return. The presence of clutter in a range/Doppler cell complicates the detection of a target return signal in that cell. In order to quantify the effect of clutter on the probability of detection, we must first specify sets of models suitable for representing the clutter and target. The simplest and most common model for clutter is based on the gamma density. We include two additional models, the NCG and NCGG clutter models for low grazing angles. They are motivated by physical arguments, the latter of which can accommodate the well-known phenomenon of speckle. Using one of these models for clutter together with one of several models for targets, we determine, in a range/Doppler cell, expressions for probabilities of detection of a target in the presence of clutter. It is important to control the probability of false alarms. The presence of clutter in a cell necessitates an increase in the detection threshold setting in order to control false alarms, thus lowering the probability of detection. If the clutter level is unknown, then we need to take measurements of the clutter and use it to adjust the threshold. The more clutter samples we take, the better the estimate of the clutter level and the less is the resulting detection loss. Using the expressions for the probability of detection in clutter, we can quantify the detection loss for a pair of commonly used constant false-alarm rate (CFAR) techniques and investigate how the loss varies with different parameter values, especially with regard to the number of clutter samples taken to estimate the clutter level. [J397]

"Effect of Doppler spread in OFDM-based UWB systems"

Orthogonal frequency division multiplexing (OFDM) can be used in ultrawideband (UWB) communications to deal with delay spread of UWB channels. Relative motion between transmitter, receiver, and scattering environment induces Doppler spread. Since Doppler shift is proportional to subcarrier frequency, the time-selective fading is subcarrier dependent. In a narrowband (NB) system, this dependence is negligible, and all subcarriers are subjected to the same time-selective fading. However, in a UWB system, different subcarriers will experience different fading. In this paper, intercarrier interference (ICI) caused by the relative motion between transmitter and receiver in OFDM-based UWB communications is investigated. An exact expression as well as bounds is derived for the degradation of performance measured by signal-to-interference ratio (SIR). A design example is given to illustrate the concepts developed in the paper. [J398]

"Doppler and frequency-offset synchronization in wideband OFDM"

When the orthogonal frequency-division multiplexing (OFDM) signal is appreciably wideband, as in underwater communications, a single Doppler-shift parameter is inadequate to model the Doppler effect, and a rate parameter is required as well. Such a model also accommodates nonsynchronized sampling of the received signal. We establish conditions for the identifiability of the Doppler parameters, and show how they affect the placement of subcarriers (NSC). We derive the maximum-likelihood (ML) estimator and the corresponding conditional Cramer'r-Rao lower bound. We show that the vector formulation is amenable to estimation of signal parameters via rotational invariance techniques (ESPRIT) analysis, leading to a suboptimal but closed-form estimator. If the rate parameter is left uncompensated, we establish that the effective SNR is drastically reduced, which further leads to an increased bit error rate (BER). The ML estimator is demonstrated by numerical simulations that show that the performance of the estimator approaches the Cramer'r-Rao lower bound in the moderate-to-high SNR regions. [J399]

"Direct conversion receiver for radio communication systems"

Direct conversion receiver (DCR) architecture, which has introduced the zero intermediate frequency (IF) approach, supports efficient wireless handset designs with a high level of integration. Transmission over wireless channels is subject to time dispersion due to multipath propagation and frequency dispersion due to Doppler effect, the design of wireless receivers are tremendously important in supporting reliable communication links. With wireless technology growing, the choice of optimal wireless receiver architecture that supports monolithic integration without performance degradation becomes an important dimension in modern handset design. The increasing demand for mobile terminals with smaller physical dimensions has led to the investigation of DCR, which supports single chip and multinode designs. Since DCR is a promising architecture for fourth generation mobile terminals, it is important to note that implementation of a certain dc offset technique does not compromise the benefits of low complexity receiver design. [J400]

"Capacity analysis for finite-state Markov mapping of flat-fading channels"

In this paper, time-varying flat-fading channels are modeled as first-order finite-state Markov channels (FSMC). The effect of this modeling on the channel information capacity is addressed. The approximation accuracy of the first-order memory assumption in the Markov model is validated by comparing the FSMC capacity with the channel capacity assuming perfect state information at the receiver side. The results indicate that the first-order Markovian assumption is accurate for normalized Doppler frequencies fdT ≲ 0.01, in amplitude-only

quantization of the channel gain for noncoherent binary signaling. In phase-only and joint phase and amplitude quantization of the channel gain for coherent binary signaling, the first-order Markovian assumption is accurate for fdT ≲ 0.001. Furthermore, the effect of channel quantization thresholds on the FSMC capacity is studied. In high signal-to-noise ratio (SNR) conditions, nonuniform two-level amplitude quantization scheme outperforms equiprobable quantization method by 0.8-1.5 dB. [J401]

"Absolute calibration of C-band weather radars using differential propagation phase in rain"

Described is a method for calibrating C-band weather radars which have both polarisation and Doppler capabilities. Attenuation corrections for both co-polar and differential reflectivities are performed gate-to-gate progressively and the differential propagation phase is estimated from the corrected reflectivity profiles. Comparison with the measured differential propagation phase shows high sensitivity to the absolute calibration of the co-polar reflectivity. The method is implementable in almost real time for operational systems and is also capable of correcting for rain on radome effects at C-band. [J402]

"Truncated power control for improving TCP/IP performance over CDMA wireless links"

The issue of the performance degradation of transmission control protocol/Internet Protocol (TCP/IP) over wireless links due to the presence of noncongestion-related packet losses has been addressed with a physical layer approach. The effectiveness of automatic repeat request techniques in enhancing TCP/IP performance depends on the tradeoff between frame transmission delay and residual errors after retransmissions. The paper shows how a truncated power control can be effectively applied to improve that tradeoff so that a higher transmission reliability is provided without increasing the frame transmission delay through the radio link layer and without increasing the energy consumption. An analytical framework has been developed to show the feasibility and effectiveness of the proposed power control. The analytical results, which are carried out assuming a constant multiuser interference level, show that the proposed algorithm turns out to be very effective when the time variability of the channel is high, which-in case of constant interference level-means that the Doppler frequency is high. Simulations carried out in a variable interference scenario show that the proposed strategy is very effective in improving the end-to-end throughput of a TCP connection. Moreover, these improvements are higher when the traffic is more bursty, like in typical Internet data applications such as e-mail and web surfing. [J403]

"Moored fish cage dynamics in waves and currents"

Recent work in the area of open ocean aquaculture system dynamics has focused separately upon either the response of fish cages in waves or the steady drag response due to ocean currents. In reality, however, forcing on these open ocean structures is a nonlinear, multidirectional combination of both wave and current profiles. At the University of New Hampshire-operated Open Ocean Aquaculture site, data were collected from a wave measurement buoy and a downward-looking Acoustic Doppler Current Profiler to characterize the surface elevation and water velocity profiles during an extreme northeast storm event. In addition to waves and currents, fish cage motion response in heave, surge, and pitch was inferred from accelerometer measurements during the same storm. The environmental data sets obtained during the peak of the storm were processed, analyzed, and used as input to a dynamic finite-element model. Simulations were performed using three load case scenarios: 1) in both waves and currents; 2) in waves only; and 3) in currents only. Model motion response results in both the time and frequency domain were compared with data obtained in situ . In addition to the motion response tests, the wave and current forcing influencing the mooring line tension response was also investigated. Analysis shows that in this case, the currents do not severely influence the oscillatory motion response, but do cause the cage to tilt, layback, and sink. The wave and current interaction effect did, however, influence the anchor line loads with a portion being attributed to nonlinear effects. [J404]

"Detection and Processing of bistatically reflected GPS signals from low Earth orbit for the purpose of ocean remote sensing"

We will show that ocean-reflected signals from the global positioning system (GPS) navigation satellite constellation can be detected from a low-earth orbiting satellite and that these signals show rough correlation with independent measurements of the sea winds. We will present waveforms of ocean-reflected GPS signals that have been detected using the experiment onboard the United Kingdom's Disaster Monitoring Constellation satellite and describe the processing methods used to obtain their delay and Doppler power distributions. The GPS bistatic radar experiment has made several raw data collections, and reflected GPS signals have been found on all attempts. The down linked data from an experiment has undergone extensive processing, and ocean-scattered signals have been mapped across a wide range of delay and Doppler space revealing characteristics which are known to be related to geophysical parameters such as surface roughness and wind

speed. Here we will discuss the effects of integration time, reflection incidence angle and examine several delay-Doppler signal maps. The signals detected have been found to be in general agreement with an existing model (based on geometric optics) and with limited independent measurements of sea winds; a brief comparison is presented here. These results demonstrate that the concept of using bistatically reflected global navigation satellite systems signals from low earth orbit is a viable means of ocean remote sensing. [J405]

"Hydrodynamic implications of large offshore mussel farms"

Around 3000 Ha of New Zealand's coastal waters are presently allocated to mussel farming of the Greenshell mussel Perna canaliculus mainly in small inshore farms of 30 000 to 80 000 m2each. The farms are constructed from blocks of parallel moored long-lines, with loops of spat-impregnated line hanging vertically in the upper 10-15 m of the water column (provided sufficient water depth). When fully laden, the mussel loops can present a rough diameter of 0.20 m or more to the flow. Industry expansion is likely to be in the form of larger offshore farms. Some of the larger proposed farms will have more than 1000 km of mussel line. This presents a potentially significant drag to currents and waves. In this paper, observations are used from one of the first large offshore farms constructed in New Zealand, in conjunction with scaling estimates of energy loss, to investigate the effect of the farm on waves, currents, and stratification. The farm, consisting of 230 long-lines arranged into 20 blocks, measured 650 m Ч 2450 m. The hanging mussel loops at this site reached an average depth of 8 m, and water depth at midtide varied across the site from 10-12 m. Transects were taken through the farm using both conductivity, temperature, depth (CTD), and Acoustic Doppler Profiler (ADP) instruments. A second ADP was moored inside the farm providing velocity time series. The average current was reduced within the farm by 36%-63%. The moored ADP detected an undercurrent beneath the farm with velocities nearly twice that within the farm. Sharp changes in stratification coincide with the start of fully stocked mussel long-lines. Furthermore, other than at the very upstream end of the farm, stratification appears to have prevented significant vertical mixing between the fluid within the farm and that flowing under the farm. Wave energy was low during the 7-d deployment, with significant wave heights peaking at 0.25 m. The attenuation of transitional waves through the farm is examined by comparing simultaneous pressure sensor measurements from offshore and inshore of the farm. The observations show that wave energy attenuation was frequency dependent. Observed wave energy attenuation across the 650 m wide farm was approximately 5%, 10%, and 17% at wave frequenci- es of 0.1, 0.2, and 0.25 Hz, respectively. [J406]

"Ionospheric decontamination and sea clutter suppression for HF skywave Radars"

In this paper, a cascaded correction and suppression method of reducing ionospheric phase path contamination and sea clutter to enable detection of targets travelling at speeds near the Bragg Doppler is addressed. The Hankel rank reduction (HRR) technique based on singular value decomposition (SVD) has been used to estimate the ionospheric phase distortion and suppress the sea clutter. Simulation results show that such a technique is helpful for the worse conditions when the target masking effect happens even after ionospheric phase decontamination. Finally, an attempt to combine another phase decontamination algorithm based on the piecewise polynomial phase modeling with the clutter cancellation stage for faster phase fluctuation is discussed briefly and some results are given. [J407]

"Transcranial ultrasound focus reconstruction with phase and amplitude correction"

Therapeutic and diagnostic ultrasound procedures performed noninvasively through the skull require a reliable method for maintaining acoustic focus integrity after transmission through layered bone structures. This study used a multiple-element, phased-array transducer to reconstruct ultrasound foci through the human skull by amplitude and phase correction. It was previously demonstrated that adaptive phase correction using a multiple-element, focused transducer array yields a significant correction to an acoustic field that has been distorted by the heterogeneities of the skull bone. The introduction of amplitude correction, in a regime in which acoustic pressures from individual transducer array elements are adjusted to be normalized at the focus, has demonstrated a 6% (-0.27 dB) average decrease in acoustic sidelobe acoustic intensity relative to the focal intensity and a 2% (-0.09 dB) average decrease in the full-width-at-half-maximum (FWHM) of the acoustic intensity profile at the focus. These improvements come at the expense of significant ultrasound intensity loss-as much as 30% lower (-1.55 dB)-at the focus because the amplitude correction method requires that, at constant power, a larger proportion of energy is absorbed or reflected by regions of the skull that transmit less energy. In contrast, a second correction method that distributes pressure amplitudes such that the sections of the skull which transmit more ultrasound energy are exposed with higher ultrasound intensities has demonstrated an average sidelobe intensity decrease of 3% (-0.13 dB) with no change in the FWHM at the focus. On average, there was a 2% (0.09 dB) increase in the acoustic intensity at the focus for this inverse amplitude correction method. These results indicate that amplitude correction according to the transmission properties of various segments of the skull have a clear effect on ultrasound energy throughput into a target site within the brain

parenchyma. [J408]

"Improved ultra-low range sidelobe pulse compression waveform design"

A continuous nonlinear FM waveform design capable of achieving range sidelobe levels of better than -70 dB, suitable for use with a satellite-borne precipitation radar, is presented. The waveform shows good Doppler tolerance. It is shown that slowly-varying phase and amplitude errors in the transmitter and receiver have relatively little effect, but rapidly-varying errors result in paired echo sidelobes, the level of which can be significant. A closed-loop calibration system will undoubtedly be required to remove such errors. [J409]

"Stochastic voltage model and experimental measurement of ocean-scattered GPS signal statistics"

Information about the roughness of the ocean surface and related geophysical parameters, such as wind speed, is present in the shape of the code-correlation waveform of forward-scattered Global Positioning System (GPS) signals. A model is developed for the statistics of this waveform to be used in designing retrieval algorithms and predicting their accuracy in the estimation of geophysical parameters. One potential application of this model is to assess the feasibility of bistatic GPS measurements from satellite orbits. Time and frequency domain models for the complex "voltage" correlation waveform are developed and compared against experimental results. The voltage model can be applied to determine the upper limit for predetection integration time. The resulting temporal and spatial correlation function has a form similar to the van Cittert-Zernike theorem in that it can be expressed in terms of two-dimensional Fourier transform. The fast Fourier transform is, thus, used for efficient computation. Waveforms were generated from measurements of reflected GPS signals recorded in 1999 from an airborne receiver at an altitude of 3200 m during a flight near Puerto Rico. Complex voltage correlations were produced using the coarse-acquisition code with a 1-ms integration time over a range of code delay "bins". The Doppler compensation frequency was set equal to the Doppler frequency obtained by tracking the direct line-of-sight GPS signal. The resulting spectra and derived correlation times of the voltage signal time series in each delay bin were compared with the predictions of the model. The model agreed well with the experimental data, near the specular point, showing correlation times between 4-6 ms. [J410]

"Thick silicon strip detector Compton imager"

We present results obtained with double-sided, thick (2 mm) silicon strip detectors used as a Compton imager. Reconstructed images and spectra from 137Cs and 60Co gamma-ray sources have been produced at room temperature using the multiple Compton technique. Multiple Compton interactions allow the energy and Compton scattering angle to be reconstructed without having to absorb the energy of the incident gamma ray completely. This extends our work on multiple Compton imagers using germanium strip detectors to silicon detectors that operate at higher temperatures. The energy resolution of the detectors for 60 keV gamma rays is 3-4 keV at room temperature and 2.1 keV at -20°C. Simulations of the imager have been performed in GEANT4, including Doppler broadening and accidental coincidences, and show agreement with the measured data. Reconstructing the energy spectrum for 662 keV gamma rays that did not deposit their full energy in the instrument shows a peak at 662 keV with a full-width at half-maximum (FWHM) of 27.6 keV. The reconstructed image of the source shows an angular resolution of 3.3° FWHM. [J411]

"Polyphase code design for Orthogonal Netted Radar systems"

Orthogonal netted radar systems (ONRS) can fundamentally improve radar performance by using a group of specially designed orthogonal signals. A novel hybrid algorithm is proposed to numerically optimize such orthogonal polyphase code sets. The proposed algorithm integrates a statistical simulated annealing algorithm with the traditional iterative code selection method and is demonstrated to be effective for the design of polyphase signals used in ONRS. Some of the design results are presented and discussed. The effect of Doppler frequency shift on the performance of the designed signals is also investigated. [J412]

"Steady-motion-based Dopplerlet transform: application to the estimation of range and speed of a moving sound source"

New results on the recently introduced steady-motion-based Dopplerlet transform is presented and an estimation scheme for both range and speed of moving sound source using Dopplerlet transform is considered. First, we derive the real, discrete, and real discrete Dopplerlet transforms from their complex counterpart. Second, we reformulate some of the existing integral transformations within the framework of the Dopplerlet transform. Finally, we provide the application results. Experimental results with real underwater acoustic data and land acoustic data, as well as Monte Carlo simulation results with computer-generated data, have confirmed the

veracity and practical usefulness of the estimation scheme advocated. [J413]

"A brief intro to metamaterials"

Metamaterials are new artificial materials with unusual electromagnetic properties that are not found in naturally occurring materials. All "natural" materials such as glass, diamond and such have positive electrical permittivity, magnetic permeability and an index of refraction. In these new artificially fabricated materials-termed as negative index materials (NIM) or double negative (ONG) media or left handed (LH) materials or backward wave (BW) media-all these material parameters are negative. With these unusual material parameters, new kinds of miniaturized antennas and microwave components/devices can be created for the wireless communications and the defense industries. The electrical permittivity and the magnetic permeability are the main determinants of a material's response to electromagnetic (EM) waves. In metamaterials, both these material parameters are negative. Correspondingly, the refractive index of the metamaterials is also negative. Another strange property of metamaterials is its reverse Doppler effect. [J414]

"Investigation of the variability of Doppler spectra with radar frequency and grazing angle"

The effect of varying grazing angle on the Doppler spectra of radar backscatter from wind waves has been investigated in a laboratory wave tank. Five different radar frequencies were used and six different wind conditions, for a range of grazing angles between 3° and 24°. The results show linear relationships between the velocity of the dominant scattering components and the grazing angle. This effect is hard to reconcile with a scattering mechanism based on Bragg resonance. Data from a cliff-top radar were also examined. [J415]

"On the development of a multifunction millimeter-wave sensor for displacement sensing and low-velocity measurement"

A new multifunction millimeter-wave sensor operating at 35.6 GHz has been developed and demonstrated for measurement of displacement and low velocity. The sensor was realized using microwave integrated circuits and monolithic microwave integrated circuits. Measured displacement results show unprecedented resolution of only 10 μm, which is approximately equivalent to λ0/840 in terms of free-space wavelength λ0, and maximum error of only 27 μm. A polynomial curve-fitting method was also developed for correcting the error. Results indicate that multiple reflections dominate the displacement measurement error. The sensor was able to measure speed as low as 27.7 mm/s, corresponding to 6.6 Hz in Doppler frequency, with an estimated velocity resolution of 2.7 mm/s. A digital quadrature mixer (DQM) was configured as a phase-detecting processor, employing a quadrature sampling signal-processing technique, to overcome the nonlinear phase response problem of a conventional analog quadrature mixer. The DQM also enables low Doppler frequency to be measured with high resolution. The Doppler frequency was determined by applying linear regression on the phase sampled within only fractions of the period of the Doppler frequency. Short-term stability of the microwave signal source was also considered to predict its effect on measurement accuracy. [J416]

"Doppler-channel blind identification for noncircular transmissions in multiple-access systems"

The problem of blindly estimating the parameters of a Doppler channel for noncircular transmissions in multiple-access communication systems is addressed. A nondata-aided algorithm based on the cyclostationarity features of the received signal is proposed to estimate amplitude, phase, time delay, and frequency shift of each user. Under mild assumptions on the disturbance and user signals, the proposed method provides estimates of the unknown parameters that are mean-square consistent. Moreover, the proposed algorithm is asymptotically near-far resistant, and is not based on the usual assumption of white and/or Gaussian noise. [J417]

"Variable-rate noncoherent M-FSK modulation for power limited systems over Nakagami-fading channels"

We propose a variable-rate and fixed-power noncoherent M-ary frequency shift keying (NC-MFSK) modulation scheme for power limited systems over Nakagami-fading channels. We first address the system performance from the average link spectral efficiency, the average bit-error rate (BER), and the probability of outage perspectives assuming that perfect channel estimates are available at the transmitter within a permissible delay. We compare the proposed system with two versions of the noncoherent binary FSK (NC-BFSK) scheme. The former is the fixed or the blind one, which has no feedback information, and the latter is a kind of an adaptive one wherein a feedback channel is provided to inform the transmitter whether to transmit or not. Our results show that the proposed adaptive MFSK scheme exhibits the following gains: up to a 9- and 37-dB power gain from the average spectral efficiency perspective compared to those for the adaptive and fixed NC-BFSK schemes, respectively, at very low values of the received carrier-to-noise ratio and improvements of about four

orders and one order of magnitude from the average BER and probability of outage perspectives, respectively, compared to those of the fixed NC-BFSK scheme. We then study the system performance in the case of outdated estimates. It is shown that only the average BER gets affected by outdated estimates. Our analysis shows that the system is insensitive to normalized delays fdт up to 10-2where fdis the doppler frequency and т is the time delay. We also propose an adaptive switching thresholds scheme to better mitigate the effect of the feedback delay. [J418]

"An integrated framework for MC-CDMA reception in the presence of frequency offsets, phase noise, and fast fading"

The combination of code-division multiple-access and multicarrier (MC) modulation has been proposed to develop high data-rate wireless communication systems. Due to the longer symbol duration in comparison with single-carrier systems, MC systems are more sensitive to various imperfections, including phase noise and frequency offsets due to local oscillators and Doppler spreading due to motion that results in temporal channel variations. The performance of current systems is significantly limited by these imperfections because they disperse the transmitted power in a particular subcarrier into adjacent subcarriers, thereby causing interference between the subcarriers at the receiver. We consider a single-user communication system and use a canonical model for the received signal that efficiently captures the effects of all impairments. The model uses Fourier basis functions that are fixed for all imperfections while the expansion coefficients depend on imperfections. Using the model, we introduce a receiver structure that implements the matched filter (MF), and hence, optimal. The MF is implemented through a Rake receiver in the frequency domain. The receiver fully compensates for frequency offsets as well as phase noise, thereby eliminating the performance loss due to these factors. Furthermore, in contrast to existing designs, it delivers improved performance under fast fading by exploiting Doppler diversity. Finally, the same integrated receiver structure works for all imperfections eliminating the need for devising a separate correction technique for each. [J419]

"Intercarrier interference suppression and channel estimation for OFDM systems in time-varying frequency-selective fading channels"

In orthogonal frequency division multiplexing (OFDM) systems, channel variations within an OFDM block destroy orthogonality between subcarriers, resulting in intercarrier interference (ICI), which increases an error floor in proportional to normalized Doppler frequency. To mitigate the effects of channel variations, many schemes have been proposed, but they are computationally complex or at the price of sacrificing spectral efficiency. In this paper, we first provide an ICI analysis in both time- and frequency-domain while existing literatures analyze the ICI effects mainly in the frequency domain. Based on this analysis, we then propose a novel ICI suppression technique, which uses iterative ICI cancellation in time domain and has a computational complexity that is linear in the OFDM symbol length. Channel estimation in rapidly time-varying scenarios is critical for ICI suppression and coherent demodulation. We also propose a scheme for estimating the channel parameters varying within an OFDM block. Along with the channel estimation scheme, we investigate the issue of optimum pilot tone placement. Theoretical analysis and simulation results show that the proposed ICI suppression method and channel estimation scheme have low computational complexity and good performance for most Doppler frequency of practical importance. [J420]

"Model-based reconstructive elasticity imaging of deep venous thrombosis"

Deep venous thrombosis (DVT) and its sequela, pulmonary embolism, is a significant clinical problem. Once detected, DVT treatment is based on the age of the clot. There are no good noninvasive methods, however, to determine clot age. Previously, we demonstrated that imaging internal mechanical strains call identify and possibly age thrombus in a deep vein. In this study the deformation geometry for DVT elasticity imaging and its effect on Young's modulus estimates is addressed. A model-based reconstruction method is presented to estimate elasticity in which the clot-containing vessel is modeled as a layered cylinder. Compared to all unconstrained approach in reconstructive elasticity imaging, the proposed model-based approach has several advantages: only one component of the strain tensor is used; the minimization procedure is very fast; the method is highly efficient because an analytic solution of the forward elastic problem is used; and the method is not very sensitive to the details of the external load pattern-a characteristic that is important for free-hand, external, surface-applied deformation. The approach was tested theoretically using a numerical model, and experimentally on both tissue-like phantoms and all animal model of DVT. Results Suggest that elasticity reconstruction may prove to be a practical adjunct to triplex scanning to detect, diagnose, and stage DVT. [J421]

"Model of independent Rayleigh faders"

The Jakes (1974) fading model is widely accepted for the simulation of wireless communication channels, but it

is very difficult to create a multiple uncorrelated fading waveform. Dent et al. (1993) proposed a modified version of the Jakes model, but it does not solve the problem very well. Li and Huang (2002) also proposed a new model, which overcomes the undesired properties. But its computational complexity is twice as great as that of the Jakes and Dent models. A novel model is proposed. Its correlation properties are as good as those of the Li and Huang model, yet computational complexity is reduced by a half. [J422]

"Theoretical accuracy of Doppler navigation sonars and acoustic Doppler current profilers"

This paper addresses the problem of Doppler shift estimation in Doppler sonar systems. The analysis focuses on the single-beam geometry formed by a circular planar array and considers both narrow-band (or so-called incoherent) and wide-band (or coherent) Doppler sonars, transmitting, respectively, one long continuous-wave pulse and a train of short continuous-wave pulses. The correlation function of the reverberation signal at the beam output is derived for volume reverberation. Directive transmission or reception and a combination of both is considered. Estimation theory is applied to derive the Cramer-Rao bound of the Doppler parameter estimate. The effect of pulse duration, sonar geometry, beamwidth, and signal-to-noise ratio are discussed. The accuracy of coherent and incoherent systems is compared for a specific case. [J423]

"Propagation modeling of MIMO multipolarized fixed wireless channels"

This paper addresses the extension of a stochastic geometry-based scattering model to multipolarized transmissions. The initial approach is based on a geometrical distribution of obstacles derived from known power-delay profiles. Each scattering process is statistically described by a matrix reflection coefficient corresponding to dual-polarization states. Ultimately, the model allows us to simulate the effects of the range on K-factor, delay-spread, Doppler spectrum, channel correlations and capacity, branch power ratio, and cross-polar discrimination. Simulation results are compared with existing measurements at 2.5 GHz. The proposed model is then used to investigate various dual-polarization 2 Ч 2 multiple-input-multiple-output (MIMO) schemes such as 0°/90° or ±45°, as well as to optimize the design of multipolarized MIMO schemes. [J424]

"Range correlation and I/Q performance benefits in single-chip silicon Doppler radars for noncontact cardiopulmonary monitoring"

Direct-conversion microwave Doppler-radar transceivers have been fully integrated in 0.25-µm silicon CMOS and BiCMOS technologies. These chips, operating at 1.6 and 2.4 GHz, have detected movement due to heartbeat and respiration 50 cm from the subject, which may be useful in infant and adult apnea monitoring. The range-correlation effect on residual phase noise is a critical factor when detecting small phase fluctuations with a high-phase-noise on-chip oscillator. Phase-noise reduction due to range correlation was experimentally evaluated, and the measured residual phase noise was within 5 dB of predicted values on average. In a direct-conversion receiver, the phase relationship between the received signal and the local oscillator has a significant effect on the demodulation sensitivity, and the points can be avoided with a quadrature (I/Q) receiver. In this paper, measurements that highlight the performance benefits of an I/Q receiver are presented. While the accuracy of the heart rate measured with the single-channel chip ranges from 40% to 100%, depending on positioning, the quadrature chip accuracy is always better than 80%. [J425]

"Joint phase/amplitude estimation and symbol detection for wireless ICI self-cancellation coded OFDM systems"

OFDM has been applied in the current wireless local-area networks and digital video broadcasting systems since it has the advantage over the conventional single-carrier modulation schemes when the frequency-selective fadings are present. Nevertheless, intercarrier-interference (ICI) due to Doppler frequency drift, phase offset, local oscillator frequency drift, and multipath fading will be a severe problem in OFDM systems. Previous ICI self-cancellation coding schemes can greatly reduce the ICI, but they are very sensitive to the phase ambiguity, which is due to the composite effect of the phase offset, the multipath fading and the local frequency drift. In this paper, the phase ambiguity and amplitude ambiguity problems in ICI self-cancellation coded OFDM receivers will be formulated and discussed. Then, a novel receiver which combines the current ICI self-cancellation coding techniques with a new expectation-maximization-based joint phase/amplitude estimation and symbol detection scheme is proposed. The outstanding performance of this proposed scheme is shown and compared with other existing methods at different noise levels through OFDM simulations. [J426]

"Channel capacity and second-order statistics in Weibull fading"

The second-order statistics and the channel capacity of the Weibull fading channel are studied. Exact closed-form expressions are derived for the average level crossing rate, the average fade duration, as well as the

average Shannon's channel capacity of the Weibull fading process. Numerical results are presented to illustrate the proposed mathematical analysis and to examine the effects of the fading severity on the concerned quantities. [J427]

"A practical millimeter-wave radar calibration target"

A simple rectangular-plate millimeter-wave radar calibration target gives RCS values ranging from hundreds to thousands of square meters. This enable tests over extended ranges and with equipment having modest output power. Precise mechanical alignment mechanisms and an optical sight are mandatory, due to the narrow beamwidth. Absorber collars provide an easy way of adjusting the actual RCS according to specific mission requirements, and effectively reduce edge-diffraction effects. The measured V-band calibration uncertainty was less than 0.5 dB, and the pointing resolution was better than 0.05°. [J428]

"Error-bound formulation for multichannel reception of M-DPSK and pilot-aided M-PSK over Rayleigh-fading channels with postdetection combining"

Upper bounds for symbol-error probability are developed for multichannel reception of M-ary phase-shift keying (M-PSK) over frequency-flat Rayleigh-fading channels. Differential coherent demodulation of differentially encoded M-PSK (M-DPSK), pilot-tone aided coherent demodulation of M-PSK (PTA M-CPSK) and pilot-symbol aided coherent demodulation of M-PSK (PSA M-CPSK) are considered in the formulation. The bounds enable the investigation of the effects of fading correlation and unequal average power level between channels using postdetection diversity reception with maximal-ratio combining. Error-performance degradation due to imperfect demodulation effects, such as Doppler spread in M-DPSK schemes, noisy reference signals in PTA M-CPSK, and PSA M-CPSK schemes can be taken into account in the formulation. Exact bit-error probabilities for both binary and quaternary phase-shift keying are also derived. [J429]

"Advanced AudioBIFS: virtual acoustics modeling in MPEG-4 scene description"

We present the virtual acoustics modeling framework that is a part of the MPEG-4 standard. A scene description language called the binary format for scenes (BIFS) is defined within MPEG-4 for making multimedia presentations that include various types of audio and visual data. BIFS also provides means for creating three-dimensional (3-D) virtual worlds or scenes, where visual and sound objects can be positioned and given temporal behavior. Local interaction between the user and the scene can be added to MPEG-4 applications. Typically the user can navigate in a 3-D scene so that it is viewed from different positions. In case that there are sound source objects in a scene, the sounds may be spatialized so that they are heard coming from the positions defined for them. A subset of BIFS, called the advanced AudioBIFS aims at enhanced modeling of 3-D sound environments. In this framework, sounds can be given positions, and also the virtual environment where they appear can be associated with acoustic properties that allow modeling of phenomena such as air absorption, Doppler effect, sound reflections, and reverberation. These features can be used for adding room acoustic effects to sound in the MPEG-4 terminal, and for creating immersive 3-D audiovisual scenes. [J430]

"Time-scale removal of "wall thump" in Doppler ultrasound signals: a simulation study"

A novel approach for blood and wall signal separation in Doppler ultrasound is proposed in the wavelet time-scale domain. The Doppler signals of different clutter-to-blood ratios from a femoral artery were simulated and used in the experiments. Compared with the conventional high-pass filtering and the signal separation in the spectrogram, the new method delivers improved performance for "wall thump" removal with minimal loss of low-flow signal. [J431]

"Flow-induced vibration reduction in HDD by using a spoiler"

To reduce the flow-induced vibration (FIV) of the head stack assembly (HSA) in the hard disk drive (HDD), we experimentally studied the spoiler, which is put between disks. This study was carried out using a laser doppler vibrometer (LDV) to measure the amplitude of the head slider vibration. We also measured the power consumption of the spindle motor. As parameters of the spoiler shape, the thickness and the length were selected. From the experimental result, these parameters effect significantly both the head's vibration and the power consumption. This result suggests that the flow rate reduction with the spoiler causes a reduction of the HSA's FIV, and the energy loss with the spoiler causes an increase of the power consumption. We defined the spoiler's FIV-reducing efficiency as a ratio of the amplitude reduction to the power consumption increase. The length change makes the peak value. This is caused by the fact that the FIV reduction becomes almost constant when the spoiler is longer than the carriage arm length inside disk region, although the spoiler length makes power consumption monotonically large. [J432]

"On the use of permanent symmetric scatterers for ship characterization"

The symmetric scattering characterization method (SSCM) has been recently introduced for high-resolution characterization of certain targets under coherent conditions. SSCM is based on the Poincarer' sphere representation, which supports a high-resolution decomposition of symmetric target scattering, as well as assessment and validation of the backscatter coherence. In this paper, the SSCM is investigated for ship characterization using Convair-580 polarimetric synthetic aperture radar (SAR) data. It is shown that the target Poincarer' parameters permit identification of dominant scatterers with a significant symmetric scattering component. The polarization orientation angle of these quasi-symmetric scatterers is used to derive an estimate of the ship's pitch angle, under certain conditions. The effect of SAR system focus setting errors and Doppler centroid mistracking on the SSCM performance is investigated. It is shown that the SSCM is sensitive to the system focus setting and Doppler centroid shift. The first-order effects of these errors can be removed prior to the application of the SSCM method. [J433]

"A discrete-time model for triply selective MIMO Rayleigh fading channels"

A statistical discrete-time model is proposed for simulating wideband multiple-input multiple-output (MIMO) fading channels which are triply selective due to angle spread, Doppler spread, and delay spread. The new discrete-time MIMO channel model includes the combined effects of the transmit filter, physical MIMO multipath channel fading, and receive filter, and it has the same sampling period as that of the MIMO receiver. This leads to very efficient simulation of physical continuous-time MIMO channels. A new method is also presented to efficiently generate the MIMO channel stochastic coefficients. The statistical accuracy of the discrete-time MIMO channel model is rigorously verified through theoretical analysis and extensive simulations in different conditions. The high computational efficiency of the discrete-time MIMO channel model is illustrated by comparing it to that of the continuous-time MIMO channel model. The new model is further employed to evaluate the channel capacity of MIMO systems in a triply selective Rayleigh fading environment. The simulation results reveal some interesting effects of spatial correlations, multipaths, and number of antennas on the MIMO channel capacity. [J434]

"Effects of discontinuous transmission on the performance of a WCDMA cellular system"

In this paper, we investigate some side effects of discontinuous transmission (DTX) on the performance of a wide-band code-division multiple-access (WCDMA) radio interface with signal-to-interference-ratio-based closed-loop power control. More precisely, we study how the DTX mechanism affects the transmission of some user signals. It is shown that the mobile terminals, when they turn on their data channels after some frames without any data to transmit, can cause a sudden increase of the interference level, leading, for some neighboring users, to a temporary performance degradation that lasts until the power control has completely reacted to this event. The main parameters that characterize the dynamics of the DTX mechanism are described and the tradeoffs in the choice of their values are evaluated; we also propose a suitable variation to the DTX mechanism that reduces the unwanted effects. For our investigation, a suitable simulation tool, which integrates the system-level and link-level analysis, has been developed, including most of the actual details and features of the WCDMA physical layer. [J435]

"Real-time tracking of time-varying velocity using a self-mixing laser diode"

A new method is proposed for estimating the time-varying velocity of a moving target with a low-cost laser sensor using optical feedback interferometry. A new algorithm is proposed to track velocity variations from real-time analysis of the output signal of a self-mixing laser diode. This signal is strongly corrupted by a multiplicative noise caused by the speckle effect, which occurs very often with noncooperative targets used in many industrial applications. The proposed signal processing method is based on a second order adaptive linear predictor filter, which enables us to track the digital instantaneous Doppler frequency, which is proportional to the velocity. A model of the laser diode output signal is proposed, and it is shown that the sensor and its associated algorithm have a global first-order lowpass transfer function with a cutoff frequency expressed as a function of the speckle perturbations, the signal to noise ratio and the mean Doppler frequency. Numerical as well as experimental results illustrate the properties of this sensor. [J436]

"Influence of oscillator variations on the observed frequency behavior in software-based navigation receivers"

This letter discusses the effects of oscillator behavior such as phase and frequency offsets on the observed frequency behavior in software-based receivers. Frequency errors introduced by the front-end oscillators and sample clocks cause the observed frequency to differ from the actual frequency. Frequency errors directly affect

the user velocity and position estimates in navigation receivers unless these errors are explicitly estimated and removed. This letter will show the derivation of a quantitative relationship between the observed frequency and the true frequency of the received signal in the presence of local oscillator and sample rate errors. [J437]

"Sonar echo ranging using signals with nonlinear time-frequency characteristics"

In this letter, we investigate the applicability of cetacean sounds and frequency-modulated (FM) signals with dispersive characteristics toward the problem of echo ranging of acoustic targets. We derive closed-form expressions of the ambiguity function range resolution profile for nonlinear FM (NFM) pulses with similar time-frequency characteristics as cetacean whistles. We demonstrate that by varying the signal parameters, we can obtain their ambiguity function with a narrow mainlobe and low sidelobes desirable for estimating the time delay and Doppler shift of the received echo. We further test our results by formulating a detection problem using NFM pulses. [J438]

"Washboard effect at head-disk interface"

This paper presents experimental investigations of the lubricant ripple formation when the slider flies on the track. We quantified the impact of ripple amplitude on slider flying height modulation (FHM). Comparisons were made between experimental observations and a previous modeling study where rippling was shown to be caused by slider-induced air shear modulation. We confirmed our model predictions and demonstrated conditions under which ripple formation is enhanced or reduced. [J439]

"Experimental measurement and numerical analysis on resonant characteristics of piezoelectric disks with partial electrode designs"

Three experimental techniques are used in this study to access the influence of the electrode arrangement on the resonant characteristics of piezoceramic disks. These methods, including the amplitude-fluctuation electronic speckle pattern interferometry (AF-ESPI), laser Doppler vibrometer-dynamic signal analyzer (LDV-DSA), and impedance analysis, are based on the measurement of full-field displacement, pointwise displacement, and electric impedance, respectively. In this Study, one full electrode design and three nonsymmetrical partial electrode designs of piezoelectric disks are investigated. Because the clear fringe patterns measured by the AF-ESPI method will be shown only at resonant frequencies, both the resonant frequencies and the corresponding vibration mode shapes are successfully obtained at the same time for out-of-plane and in-plane motions. The second experimental method is the impedance analysis, which is used to measure the resonant and antiresonant frequencies. In addition to these experimental methods, LDV-DSA is used to determine the resonant frequencies of the vibration mode with out-of-plane motion. From the experimental results, the dependence of electrode design on the vibration frequencies and mode shapes is addressed. Numerical computations based on the finite element method are presented, and the results are compared with the experimental measurements. The effect of different designs of electrode is more significant in the in-plane modes than that in the out-of-plane modes. [J440]

"Acoustic intensity for a long vessel with noncircular cross section"

The acoustic intensity distribution around and within long vessels of noncircular cross section was investigated for parameters typical of biomedical ultrasound and blood vessels. We have developed a collocation method for finding the acoustic field when a uniform plane wave is obliquely incident on a long, not necessarily cylindrical, impedance interface. Results are presented for vessels of noncircular cross section and for vessels with thick walls of nonuniform thickness. The intensity in the vicinity of the vessel, throughout the lumen, and in the wall, is calculated for intermediate length scales, i.e., vessel radius and wall thickness in the range 1 to 10 wavelengths. The intensity distribution is an interference pattern, with complicated regions of increased and decreased intensity. These results are compared with approximate intensity obtained using ray theory. Effects not predicted by ray theory and intensity variations that will be significant in any close ultrasonic investigation of these vessels are revealed. [J441]

"Detection of bacterial cells and antibodies using surface micromachined thin silicon cantilever resonators"

This article describes a surface micromachined cantilever beam-based resonator for biological sensing applications. The study used a novel microfabrication technique of merged epitaxial lateral overgrowth (MELO) and chemical mechanical polishing (CMP) to fabricate thin, low stress, single-crystal silicon cantilever beams. The vibration spectra of the cantilever beams, excited by thermal and ambient noise, was measured in air using a Dimension 3100 Series scanning probe microscope (SPM), and in certain cases, a Polytec MSV300 laser

Doppler vibrometer. The sensors were used to detect the mass of Listeria innocua bacteria by applying increasing concentration of bacteria suspension on the same cantilever beams and measuring the resonant frequency changes in air. Cantilever beams were also used to detect the mass of proteins such as Bovine Serum Albumin (BSA) and antibodies for Listeria that were attached to the cantilever's surfaces by physical adsorption; following which they were used to capture and detect the mass of the bacterial cells on the functionalized cantilever beam surfaces'. The effects of critical point drying of the proteins were evaluated and the results indicate that the functionality of the antibodies was not reduced once rehydrated after critical point drying. The developed biosensor is capable of rapid and ultrasensitive detection of bacteria and promises significant potential for the enhancement of microbiological research and diagnostics. [J442]

"Uniform field-induced strain in a/b -axes-oriented Bi 3.9 Pr 0.1 Ti 3 O 12 thick films on IrO 2 /Si substrates for lead-free piezoelectric microdevice applications"

We grew 1.5-mcm-thick Bi3.9Pr0.1Ti3O12(BPT) polycrystalline films with a/b-axes orientation on IrO2/Sisubstrates from chemical solutions and measured electric-field-induced strain Eby a double-beam laser doppler vibrometer and atomic-force microscopy (AFM). The results reflected uniform film growth and elimination of elastic deformation of the substrate, and the microscopic piezoelectric response in AFM measurements agreed well with the macroscopic response evaluated by laser vibrometer. A large longitudinal E=0.3%was observed at 400kV/cmand 10Hz, and the piezoelectric coefficient d33=dE/dE|0=60pm/Vwas calculated. X-ray diffraction analyses revealed that the (200)/(020)peak of BPT was comprised of 40% adomain and led to the reduced values of ferroelectric polarizations of 2Pr=35and Psat=23mu C/cm2. This suggests that applying an electric field did not cause fraction reconfiguration of a- and b-domains, and, therefore, the measured large strain was achieved without contribution from the 90°-domain-wall motion in a/b-axes-oriented BPT thick films. [J443]

"Vacancy-related defect distributions in 11 B -, 14 N -, and 27 Al -implanted 4H-SiC: Role of channeling"

The defect distributions in 11B-,14N-,and 27Al-implanted epitaxial 4H-SiC are studied using monoenergetic positron beams. At least three types of defects are needed to account for the Doppler broadening annihilation spectra and two of the defects are tentatively identified as VSi,and VSiVC.By comparing the defect profiles extracted from the annihilation spectra to the chemical profiles determined by secondary ion mass spectrometry, and to the primary defect profiles obtained from binary collision approximation simulations, it is concluded that the defects found at depths considerably deeper than the projected range of the implanted ions mainly originate from deeply channeled ions. copyright 2004 American Institute of Physics. [J444]

"Test of collinear spectroscopy for precise high-voltage determination"

Collinear spectroscopy holds promise for a precise determination of high dc voltages with an accuracy in the order of 10-6.For this purpose the velocity of ions, which are accelerated with the voltage to be measured, is determined by the analysis of the Doppler effect of their optical resonances. This article describes the construction and test of a prototype designed for measuring voltages from -20 up to -50 kV in collinear spectroscopy. In this way the feasibility of the method, its limitations, and the sources of uncertainty have been investigated experimentally. Thereby the frequencies of the two 3d 2D3/2,5/2→4p 2P3/2transitions of Ca II have been measured with high accuracy. copyright 2004 American Institute of Physics. [J445]

"Design aspects of a MSE diagnostic for ITER"

The motional Stark effect (MSE) diagnostic is unique in its ability to measure the current profile and will be essential in the International Thermonuclear Experimental Reactor (ITER) for detailed analysis of Advanced Tokamak and other types of discharges. However, design of a MSE diagnostic for ITER presents many unique challenges. Among these is optical analysis for the convoluted optical path, required for effective neutron shielding, that employs several reflective optics arranged to form a labyrinth. The geometry of the diagnostic has been laid out and the expected Doppler shifts and channel resolution calculated. A model of the optical train has also been developed based on the Mueller matrix formalism. Unfolding the pitch angle for this complicated geometry is not straightforward and possible methods are evaluated. The CORSICA code is used to model a variety of ITER discharges including start-up, Ip-ramp, and reverse shear. The code also incorporates a synthetic MSE diagnostic that can be used to evaluate different viewing locations and optimize channel locations for the above discharges. Simulation of the optical emission spectrum is also under way. [J446]

"Doppler backscattering system for measuring fluctuations and their perpendicular velocity on Tore Supra"

Backscattering of a microwave beam launched in oblique incidence makes possible measurement of density fluctuations close to the cut-off with a selected wave number k=-2ki, where kiis the beam wave vector at the reflection layer. On the system installed on Tore Supra, the incidence of the Gaussian beam is controlled thanks to a tiltable monostatic antenna. The microwave part of the system is based on a fluctuation reflectometer scheme with heterodyne detection, and the choice of a Vband (50-75GHz)microwave source and Omode polarization is appropriate for typical enhanced plasma regimes (n0=3-7Ч1019m-3). Both the scattering wave number k and the scattering localization r/acan be changed during a shot, owing to the steppable probing frequency and the motorized antenna (tilt angle 0-10°). The wave-number range k is 4-15 cm-1, with a wave-number resolution around 2cm-1, and the localization r/a 0.3-0.85. The Doppler effect also provides the perpendicular velocity profile for the same position range. Experiments confirm the diagnostic capabilities. [J447]

"A novel fiber optic sensor for multiple and simultaneous measurement of vibration velocity"

Simultaneous and multipoint assessment of vibration velocities is an important issue for the development of advanced noncontact vibrometers. In this article a novel fiber optic vibrometer is presented. The architecture of the sensor is based on a simple optical layout and it is characterized by multiple fiber optic interferometric sensors which are operated in the homodyne mode. Optical configuration and operation of the single-point version of the sensor, as well as the two-points measurement version, are described and typical measured signals with the operating range are shown. The sensor can easily be configured in order to perform a higher number of point measurements. Some details regarding signal acquisition and processing are also given and the ways in which Doppler demodulation is performed are discussed. Finally tests with sinusoidal target excitation in the range 0-1.8 kHz have been conducted. copyright 2004 American Institute of Physics. [J448]

"Porosity in low dielectric constant SiOCH films depth profiled by positron annihilation spectroscopy"

The 3gamma annihilation of orthopositronium and the Doppler broadening of the positron annihilation line have been measured by implanting low energy positrons in low dielectric constant (low-k) SiOCH films. The evolution and stability of film porosity with thermal treatments in the 400-900 °C temperature range has been studied. The films have been produced by plasma enhanced chemical vapor deposition and after annealing in N2atmospheres at 480 °C have been treated in N2+Heplasma. The minimum free volume of the pores in the as-produced samples has been estimated to correspond to that of a sphere with radius r=0.6 nm.The treatment in the N2plasma was found to seal the pores up to 45 nm depth. Both the composition of the films (as obtained by Rutherford backscattering spectroscopy and elastic recoil detection analysis) and the chemical environment of the pores probed by positrons were found to be very stable up to 600 °C thermal treatment. Above such a temperature a reduction of the hydrogen content accompanied by a change in the structure and in the chemical environment of the pores has been observed. In the samples thermal treated at 800-900 °C, the positronium formation is reduced by one-third respect with the as produced sample. In the annealed and as-produced films, a natural aging of 30 days in air was enough to contaminate the porosity, as pointed out by a strong reduction of the 3gamma annihilations. The effect of contamination and the distribution of the pores were completely recovered after a thermal treatment at 400 °C. Artificial aging of SiOCH films in controlled atmospheres of H2,O2,- H2Ohas shown that H2Ois the more efficient contaminant in reducing the effective volume of the pores. copyright 2004 American Institute of Physics. [J449]

"Targetmaspect-dependent RCS: the effect on assumed beam angle"

First Page of the Article [J450]

"Multistep closed-loop power control using linear receivers for DS-CDMA systems"

A closed-loop power control strategy, which includes both power control and power allocation functions, for a code-division multiple-access system is proposed. The target power level for a minimum mean squared error (MMSE) or a matched filter (MF) linear receiver is iteratively computed, and the power control command (PCC) is generated by comparing the received power with the generated target power. The PCC history and the channel fade slope information, which contains the Doppler effect, are used to generate variable stepsizes for regulating the transmit power level. Closed-loop power control is based on a criterion that minimizes the average transmit power and the standard deviation of the received power/signal-to-interference ratio. The power control strategy also tends to reduce the bit error rate. Simulation results demonstrate the effectiveness of the proposed power control algorithm. The results also indicate that the tracking ability of the MMSE and MF receiver is essentially similar, except that the average transmit power is lower with the MMSE receiver but is more complex to implement. [J451]

"Target-aspect-dependent RCS: the effect on assumed beam angle"

Traffic speed enforcement is becoming more reliant on automated speed-detection devices, particularly the use of photographically linked slant radar devices. We have conducted an analysis of whether target-aspect-dependent radar cross section (RCS) could have an effect on the accuracy of speed measurements. It was found that there is the potential for a 2.5% error (for a radar aligned at 22° to the road, with a -3 dB beamwidth of 5°) in the speed measured by the radar devices. This is because of the interference between the RCS and the radar beam pattern, if only the main lobe is considered. There are cases, however, when the interference between the RCS and the radar beam patterns are such that the strongest return occurs in the first sidelobe. In these cases, the potential speed error is about 7%. This would be unlikely to occur in practice, however, because of the inverse fourth-power relationship with range. We have not included the details of RCS sidelobe returns in the analysis. [J452]

"Doppler measurements of smooth and rough surface high frequency scattering from spinning steel cylinders"

Preliminary measurement results gathered using a fully coherent 77GHz phase coded pulse Doppler polarimetric radar and investigating the electromagnetic signatures of electrically large spinning steel cylinders are presented. New and novel results showing the Doppler contributions due to dynamic rough and smooth surface scattering effects are discussed and analysed. In the latter case, significant sideband conversion occurs together with a rapid fall off in the power density spectrum. Future work is proposed and discussed. A fuller analysis of these preliminary results and further results was presented. [J453]

"Stress effects in sol-gel derived ferroelectric thin films"

Residual stress development during processing of sol-gel derived ferroelectric thin films influences electromechanical properties and performance. The present work investigates the effects of stress on field-induced polarization switching in ferroelectric Pb(Zr0.52Ti0.48)O3(PZT) (52/48) thin films. Film response is measured as a function of externally applied mechanical stress using a double-beam laser-Doppler heterodyne interferometer. This apparatus successfully eliminates any displacement contribution from flexural vibration of the substrate and enables measurement of the strain-electric field hysteresis loops as a function of applied stress. The field-induced strain in the PZT film increases with increasing compressive stress, while the opposite trend is observed for applied tensile stress. The dependence of electromechanical response on the external stress is attributed to the initial tensile residual stress state in the film. Tensile stress creates an in-plane clamping effect on the domains in the film, hindering polarization switching. The application of a compressive stress reduces tensile residual stress in the film and the constraint on the domains, leading to higher field-induced strains. Applied tensile stress amplifies the clamping effect, leading to lower field-induced strains. copyright 2004 American Institute of Physics. [J454]

"High-pressure phase transition of mullite under shock compression"

Hugoniot measurements have been performed on mullite polycrystals in the pressure range up to 80GPaby using a two-stage light-gas gun and a Doppler laser interferometer. The Hugoniot elastic limit is determined to be 16.1±2.2GPa. The Hugoniot data show that the phase transition occurs at 30.4±3.6GPa. Comparison of the Hugoniot data with calculated theoretical Hugoniots suggests that the high-pressure phase transition of mullite is its disproportionation to corundum and stishovite. The mixed phase region is between 30 and 70GPa. It is indicated that this phase transition is very sluggish. [J455]

"Phase-resolved optical Doppler tomography for imaging flow dynamics in microfluidic channels"

Phase-resolved optical Doppler tomography (ODT), an imaging technique based on low coherence interferometry, is presented as a tool to perform high-resolution cross-sectional imaging of fluidic flow in microchannels with high velocity sensitivity. To demonstrate ODT as a tool, electro-osmotic flow (EOF) was investigated, observing cross-sectional images of bidirectional flow within a microfluidic channel and pulsating flow when driven by a pulsed electrical field. ODT demonstrates great promise as a tool for studying the effects of microchannel surface modifications on biological sample flow and optimizing microfluidic device design. [J456]

"Cyclic and radial variation of the Doppler power from porcine whole blood"

The Doppler power from porcine blood was observed in a mock flow loop to have cyclic and radial variation during a pulsatile cycle. It was found to decrease with shear rate under steady flow, except near the center of the tube at which other mechanisms such as the effects of radial distribution on the rouleaux might be involved. Under pulsatile flow, the timing of the peak of the Doppler power measured at the center of the tube became

closer to the peak systole from 20 to 60 beats/minute (BPM), and the power and velocity peaks coincided at 60 BPM. The overall radial variation of the Doppler power during a whole pulsatile cycle was prominent due to the increase of shear rate from the center to 4.5 mm radial position within a tube of 6.35 mm radius. The cyclic variation of the Doppler power varied with the radial position, being relatively large at the center, reaching a minimum at an intermediate radial Position, and increasing again near the wall. The peak of the Doppler power occurred at early systole near the tube wall and lagged the flow closer to the center. The "black hole" phenomenon was observed only over portions of the flow cycle. All these complex variations of the Doppler power across the tube over a cycle are thought to be the result of red cell aggregation, which can be affected by shear rate and acceleration. [J457]

"Analysis of differentially coherent linear receivers over Rician-faded CDMA channels"

RicianAccurate performance analysis for linear receivers over frequency- and time-selective asynchronous code-division multiple-access Rician-fading channels is very useful and a general approach to this topic is very desirable. In this paper, by using a decision variable-based moment generating function approach, we provide a unified bit-error probability (BEP) analysis framework for different linear detectors with binary or quaternary differential phase-shift keying and postdetection combining over Rician-fading channels, taking into account the effects of the spreading code correlation, the system and fading-channel parameters, diversity combining, and branch correlation. To reduce the complexity of the exact BEP evaluation, we furthermore provide an approximate multivariate Gaussian assumption (MGA)-based method which entails a low complexity for BEP evaluation. Ideal and approximate linear minimum mean-squared error diversity receivers for correlated Rician-fading channels are proposed. Numerical results show that the phases of the line-of-sight (LOS) components of the desired user significantly affect the receiver performance over correlated multipath Rician channels, and this may be exploited to improve performance. Also, when the LOS components are affected by a significant Doppler shift, automatic frequency control is very useful in improving the receiver performance. [J458]

"Aperture error mitigation via local-state estimation for frequency-based emitter location"

This paper considers the problem of locating a stationary coherent emitter via a single moving platform making frequency measurements in the presence of aperture state uncertainty. It is shown that the estimated emitter location is most sensitive to the receiving aperture velocity uncertainty. The required aperture velocity accuracy is determined through a noninfinitesimal perturbation analysis. A solution to location accuracy enhancement with a minimal hardware addition is attempted. It is shown that this can be achieved by mounting a high-resolution tri-axis microelectromechanical systems (MEMS) accelerometer at the aperture to measure its velocity, which can deviate significantly from that estimated by the on-board navigation system. The Doppler shifts of the GPS signal carrier frequency, whenever it can be acquired through the aperture, are also considered as a way to aid the aperture velocity measurement. A decentralized, federated processing method for the aperture velocity estimate referenced at the aperture, integrating all measurement data, is presented. An upper bound for the error of aperture velocity estimate is derived. The potential for significant accuracy enhancement for emitter location is demonstrated. [J459]

"Effect of antenna phase centre displacement on FM-CW measurements: application to radar system"

In FM-CW measurements, the displacement of the phase centre of the antenna generates a parasitic Doppler effect. Comparisons between measurements and simulations of a LPD antenna are described and validated. The Doppler effect induced by this antenna is then computed for the FM-CW radar application and compared to the classical one due to the aircraft movement. [J460]

"Application of a six-port wave-correlator for a very low velocity measurement using the Doppler effect"

A new radar system based on a six-port wave-correlator is proposed for measuring the Doppler frequency of a moving object. The six-port wave-correlator is operated as a two-channel wave receiver and the vector relation, both amplitude and phase, between the two input signals is determined directly by measuring the power levels. By using the six-port wave-correlator, no circulator or mixer is needed for the phase measurement. The proposed system has been applied for the measurement of an object moving at a very low velocity. The experiment and simulation results at 10 GHz show that the target velocity around 0.2 mm/s has been successfully inferred, which proved the validity of the proposed scheme. [J461]

"Beamforming and interference canceling with very large wideband arrays"

Future radio telescopes are envisioned to be beamforming arrays containing hundreds to millions of elements distributed over thousands of km2, with bandwidths that are 10% or more of the RF center frequency. It is awkward to analyze such systems using traditional narrowband beamforming theory. This paper presents a frequency-domain model that includes relevant features such as true time delay, distributed Doppler effects, and nonideal instrumental frequency response. Conventional beamforming-i.e., maximizing the gain in a certain direction subject to no other constraints-is analyzed in the context of the model. A simple method for suppressing interference in the beamformer output is also analyzed. In this method, a second beam is formed in the direction of the interference and subtracted from the output of the desired beam. Although the concept is sound, two problems are identified. First is the potential for partial or complete canceling of the desired source, along with the interference. The second problem is coloring of the noise spectrum, which may thwart the detection of weak spectral features. These problems are shown to be closely related to the array geometry, and some workarounds are suggested. [J462]

"Digital radio frequency memory linear range gate stealer spectrum"

In this paper, we develop an expression for the frequency spectrum of a digital radio frequency memory (DRFM) linear range gate stealer (RGS) electronic attack (EA) signal. A DRFM linear RGS EA signal has a slightly different center frequency than the input radar signal and evenly spaced harmonics or spectral lines. Previously, we presented a top-level analysis to predict the center frequency shift and the spacing of the spectral lines. However, our top-level analysis did not address the magnitude of the spectral lines. The expression developed in this paper reveals the magnitude of the spectral lines along with the center frequency shift and the spacing of the spectral lines. We also present laboratory spectral measurements to demonstrate the validity of the expression. [J463]

"Removing autocorrelation sidelobes by overlaying orthogonal coding on any train of identical pulses"

A coherent train of identical linear FM (LFM) pulses is used extensively in radar because of its good range and Doppler resolution. Its relatively high autocorrelation function (ACF) sidelobes are sometimes reduced through spectrum shaping (e.g., nonlinear FM, or intrapulse weighting on receive). We show how to completely remove most of the ACF sidelobes about the mainlobe peak, without any increase to the mainlobe width, by diversifying the pulses through overlaying them with orthonormal coding. A helpful byproduct of this design is reduced ACF recurrent lobes. The overlaid signal also results in reduced Doppler tolerance, which can be considered as a drawback for some applications. The method is applied to several trains of identical pulses (LFM and others) using several orthonormal codes. The effect on the three important properties of the radar signal: ACF, ambiguity function (AY), and frequency spectrum is presented. The effect on Doppler tolerance is studied, and implementation issues are discussed. The new design is also compared with complementary and sub-complementary pulse trains and is shown to be superior in many aspects. [J464]

"Analysis and measurement of FM click rate in fast Rician fading channel"

For the prediction of the error probability performance of a digital frequency modulation (FM) receiver that uses a limiter-discriminator-integrator (LDI) detector, expressions for the rates of "clicks" are needed. Recently, formulas for FM click rates valid for the slow Rician fading channels have been derived by N.P. Secord et al. (see ibid., vol.42, p.197-204, 1993) by taking expectation of the classical click-rate formulas of Rice, which is valid for the additive white Gaussian noise (AWGN) channel, over the Rician distribution. We derive and present new closed-form expressions for average FM click rates for the fast Rician fading channels, taking into account the effect of Doppler spread or fading bandwidth. We exploit the fact that the multipath component of the Rician process can be combined with the AWGN into another Gaussian process, so that the classical click-rate analysis of Rice can be applied. An experiment using modern equipment is conducted, and the measured click rates match the theory closely for both the fast Rician and Rayleigh fading channels. [J465]

"Reference-based dual switch and stay diversity systems over correlated Nakagami fading channels"

We provide new generic and exact analytical results for the performance of nonideal reference-based dual predetection switch and stay diversity systems in receiving M-ary digitally modulated signals in the presence of additive white Gaussian noise and correlated slow and nonselective Nakagami-m fading channels. Pilot-tone-aided, pilot-symbol-aided, and differential detection (DD) reference-based systems are considered. The impact of symbol alphabet cardinality, normalized distance between antennas, fading severity, and normalized Doppler frequency on the performance of these systems is analyzed. Optimum switching threshold and optimum pilot-to-signal power ratio as a function of channel fading characteristics, normalized distance between antennas, and

modulation type are determined. Furthermore, some fixed switching strategies-minimum cost strategy, fixed average strategy, and midpoint strategy-that allow one to obtain diversity gain with a reduced complexity receiver are considered. [J466]

"Impulse burst position detection and channel estimation schemes for OFDM systems"

A new method for compensating the effects of impulse noise in OFDM systems has been presented by Rinne, Henriksson and Hazmi (see Proc. 7th International OFDM Workshop, Hamburg. Germany, p.183-187, Sept. 2002). It is shown that in the AWGN case, the method can effectively cancel the impulse noise. However in the time-frequency selective channel further measures are needed. The purpose of this paper is to present an enhanced channel estimation scheme for the standard method to overcome its sensitivity to the time frequency selective channel estimates. The scheme uses the impulse free pilots to estimate the corrupted ones. Three different alternatives are discussed. Their performances in mean squared error (MSE) versus Doppler frequency are studied analytically. Bit error rate ratio (BER) simulations results are given, in the cases of SFN hilly terrain static and mobile channels. Additionally, results on simple practical impulse burst position detection method are also presented. [J467]

"Absence of the relativistic transverse Doppler shift at microwave frequencies"

An experiment is described showing that a 33-GHz microwave signal received by rotating antennas is not exhibiting the frequency shift ("transverse Doppler effect") predicted by the relativistic Doppler formula. The sensitivity of the apparatus used has been tested to be sufficient for detecting frequency shifts as small as 10-3Hz which corresponds to the value of (v/c)2= 5.10-14used in the transverse Doppler shift experiment reported here. From the observed absence of the transverse Doppler shift it is concluded that either the time dilation predicted by the standard theory of special relativity does not exist in reality or, if it does, is a phenomenon which does not depend on relative velocities but may be a function of absolute velocities in the fundamental frame of the isotropic microwave background radiation. [J468]

"Medium PRF radar PRF selection using evolutionary algorithms"

Evolutionary algorithms are applied to the optimization of pulse repetition frequency (PRF), for both eight-and nine PRFs, in medium PRF radar while considering the detailed effects of sidelobe clutter and many other technical factors. The algorithm presented also ensures that all the solutions produced are fully decodable and have no blind velocities. The evolutionary algorithm was able to identify near-optimum PRF sets for a realistic radar system with only a modest computational effort. [J469]

"Feasibility study of using hybrid collimation for nuclear environmental imaging"

This paper presents a feasibility study of a gamma-ray imager using a hybrid collimation (HC) scheme. This detector is based on the use of a multiple pinhole collimator and a position sensitive scintillation detector with Anger logic readout. A pixelated semiconductor detector, located between the collimator and the scintillation detector, is used as a scattering detector. For gamma-rays scattered in the first detector and then stopped in the second detector, an image can be built up based on the joint probability of their passing through the collimator and falling into a broadened conical surface, defined by the detected Compton scattering event. Since these events have a much smaller angular uncertainty, they provide more information per photon compared with using solely the mechanical or electronic collimation. Therefore, the overall image quality can be improved. This feasibility study used a theoretical approach based on analyzing the resolution-variance tradeoff in images reconstructed using maximum a posteriori (MAP) algorithms. The effect of the detector configuration, Doppler broadening, the energy resolution of the scattering detector and mechanical aperture design are studied. The results showed that the combined collimation leads to a significant improvement in image quality at energies below 300 keV. However, due to the mask penetration, the performance of such a detector configuration is worse than a standard Compton camera above this energy. [J470]

"Orthogonal multiple access over time- and frequency-selective channels"

Suppression of multiuser interference (MUI) and mitigation of time- and frequency-selective (doubly selective) channel effects constitute major challenges in the design of third-generation wireless mobile systems. Relying on a basis expansion model (BEM) for doubly selective channels, we develop a channel-independent block spreading scheme that preserves mutual orthogonality among single-cell users at the receiver. This alleviates the need for complex multiuser detection, and enables separation of the desired user by a simple code-matched channel-independent block despreading scheme that is maximum-likelihood (ML) optimal under the BEM plus white Gaussian noise assumption on the channel. In addition, each user achieves the maximum delay-Doppler diversity for Gaussian distributed BEM coefficients. Issues like links with existing multiuser transceivers,

existence, user efficiency, special cases, backward compatibility with direct-sequence code-division multiple access (DS-CDMA), and error control coding, are briefly discussed. [J471]

"Acoustic and electromagnetic wave interaction: estimation of Doppler spectrum from an acoustically vibrated metallic circular cylinder"

The idea of using acoustically induced Doppler spectra as a means of target detection and identification is introduced. An analytical solution for the calculation of the bistatic scattered Doppler spectrum from an acoustically excited, vibrating, metallic, circular cylinder is presented. First, the electromagnetic scattering solution of a slightly deformed circular cylinder is obtained using a perturbation method. Then, assuming the vibration frequency is much smaller than the frequency of the incident electromagnetic wave, a closed form expression for the time-frequency response of the bistatic scattered field is obtained which can be used directly for estimating the Doppler spectrum. The acoustic scattering solution for an incident acoustic plane wave upon a solid elastic cylinder is applied to give the displacement of the cylinder surface as a function of time. Results indicate that the scattered Doppler frequencies correspond to the mechanical vibration frequencies of the cylinder, and the sidelobe Doppler spectrum level is, to the first order, linearly proportional to the degree of deformation and is a function of bistatic angle. Moreover, the deformation in the cylinder, and thus the Doppler sidelobe level, only becomes sizeable near frequencies of normal modes of free vibration in the cylinder. Utilizing the information in the scattered Doppler spectrum could provide an effective means of buried object identification, where acoustic waves are used to excite the mechanical resonances of a buried object. [J472]

"Sample volume misregistration in linear array-based dual beam Doppler ultrasound systems"

Large velocity estimation errors can occur in dual beam Doppler ultrasound velocity measurement systems when there is left/right sample volume misregistration, particularly when the interbeam angle is small. Such misregistration will occur when there is tissue inhomogeneity. This is investigated for a typical type of inhomogeneity-a layer of fat-by calculating the amount of both angle and translation misregistration occurring in such a system realized using a single linear array transducer. The complex sample volume sensitivity is calculated using a modified time domain approach, combining the spatial impulse response method with ray tracing. The effects on these misregistrations of altering the aperture sizes and their relative positions on the array is then investigated to derive an improved aperture configuration for dual beam velocity estimation. Arrangements with transmit apertures wider than the receive apertures are shown to be preferable in this context. [J473]

"An empirical model of EM scattering from steepening wave profiles derived from numerical computations"

The variation in scattered power from steepening wave profiles, as functions of radar frequency and bistatic grazing angles, has been investigated using a hydrodynamic code called CHY and a version of the forward-backward (FB) electromagnetic scattering code. A comparison of the frequency response of the FB numerical results with radar data showed excellent agreement and has indicated that the lateral coherence of a breaking wave is around one third of the water wavelength. A simple empirically derived model based on the height spectrum of the surface has been shown to capture almost all the important trends in the scattering, including the Doppler velocities, but with the exception of the effect of multipath. The Doppler spectrum of the steepening wave was found to be well modeled by a Lorentzian lineshape with different spectral widths for vertical-vertical and horizontal-horizontal polarization. [J474]

"Optimal OFDM design for time-frequency dispersive channels"

Transmission over wireless channels is subject to time dispersion due to multipath propagation and to frequency dispersion due to the Doppler effect. Standard orthogonal frequency-division multiplexing (OFDM) systems, using a guard-time interval or cyclic prefix, combat intersymbol interference (ISI), but provide no protection against interchannel interference (ICI). This drawback has led to the introduction of pulse-shaping OFDM systems. We first present a general framework for pulse shape design. Our analysis shows that certain pulse shapes proposed in the literature are, in fact, optimal in a well-defined sense. Furthermore, our approach provides a simple way to adapt the pulse shape to varying channel conditions. We then show that (pulse-shaping) OFDM systems based on rectangular time-frequency lattices are not optimal for time- and frequency-dispersive wireless channels. This motivates the introduction of lattice-OFDM (LOFDM) systems which are based on general time-frequency lattices. Using results from sphere packing theory, we show how to design LOFDM systems (lattice and pulse shape) optimally for timeand frequency-dispersive channels in order to minimize the joint ISI/ICI. Our theoretical analysis is confirmed by numerical simulations, showing that LOFDM systems outperform traditional pulse-shaping OFDM systems with respect to robustness against ISI/ICI. [J475]

"Effects of bistatic clutter dispersion on STAP systems"

The performance of several space-time adaptive processing (STAP) approaches in bistatic applications is analysed. Specific consideration is given to the effects of bistatic clutter spectral dispersion on covariance estimation and the algorithm's resulting clutter-rejection capability. The role of adaptive processing methods capable of high performance with efficient utilisation of the required training data is emphasised. A deterministic two-dimensional (angle-Doppler) compensation technique is used as a pre-processor and is compared to the Doppler warping approach. The algorithm performance is assessed using the output signal to interference plus noise ratio (SINR) compared to that of the matched filter with a known covariance. [J476]

"Benefits of space-time adaptive processing (STAP) in bistatic airborne radar"

The paper investigates the merits of using STAP for clutter suppression in bistatic airborne radar. Particular emphasis is placed on the clutter angle-Doppler inter-relationships in bistatic geometries, and it is demonstrated that there can be ground regions where small changes in arrival angle imply large changes in the Doppler shift. STAP clutter rejection methods are not ideally suited to these cases. It is also shown that the angle-Doppler inter-relationships vary with the ground topography, but the effects of this are usually small. Finally, it is shown that the clutter-suppression performance is dependent on the transmit and receive beam mainlobe/sidelobe interactions. [J477]

"Comparison of Doppler clutter cancellation techniques for naval multi-function radars"

The authors describe a comparison of fixed and adaptive clutter cancellation processes applied to measured multi-function radar (MFR) data in a littoral environment. The adaptive filters require estimates of the clutter covariance, and comparisons of different strategies for obtaining this are made. The results for the adaptive filters generally show substantially improved target detectabilities over non-adaptive filters. [J478]

"Robust Doppler classification technique based on hidden Markov models"

A classification algorithm is presented that uses hidden Markov models (HMMs) to carry out recognition between three classes of targets: personnel, tracked vehicles and wheeled vehicles. It exploits the time-varying nature of radar Doppler data in a manner similar to techniques used in speech recognition, albeit with a modified topology, to distinguish targets with different Doppler characteristics. The algorithm was trained and tested on real radar signatures of multiple examples of moving targets from each class, and the performance was shown to be invariant to target speed and orientation and was able to be generalised with respect to variants within a class. [J479]

"Diversity combining for DS/SS systems with time-varying, correlated fading branches"

Diversity combining of multiple time varying and correlated fading branches is investigated for direct-sequence spread-spectrum systems. The correlated branches are modeled and estimated jointly as a vector autoregressive (VAR) process. The joint estimation is shown to provide performance gain over separate estimation of the fading branches. The parameter matrices of the VAR model are estimated via the method of expectation maximization (EM) with two algorithms. The first algorithm, using results from Kalman smoothing, provides a closed-form solution to the maximization problem in the iterative EM procedure. However, the iterative EM-Kalman algorithm operates repeatedly on a batch of training data and results in large storage requirements and long processing delays. To overcome these disadvantages, a new algorithm with only forward-time recursions is proposed that approximates the iterative EM solution and efficiently adapts to slowly changing Doppler spreads. As a result, the new algorithm significantly reduces memory and training sequence requirements. Through computer simulations, a near ideal bit-error rate performance is found for both algorithms, and the efficacy of the new adaptive algorithm for channels with changing Doppler spreads is demonstrated. [J480]

"Syllectometry: the effect of aggregometer geometry in the assessment of red blood cell shape recovery and aggregation"

Syllectometry is a measuring method that is commonly used to assess red blood cell (RBC) aggregability. In syllectometry, light is incident on a layer of whole blood initially exposed to shear flow. The backscattered light is measured after abruptly stopping the driving mechanism. The resultant time-dependent intensity plot is called the syllectogram. Parameters that quantify RBC aggregability are obtained by analyzing the syllectogram. As we will show in this paper, the upstroke in the initial part of the syllectogram contains the information for measurement of RBC-shape recovery in whole blood as well. To estimate RBC-shape recovery, we extended the existing two-exponential mathematical representation of the syllectogram by a third exponent that describes the upstroke. To

investigate the feasibility of RBC-shape recovery measurement from the upstroke, we derived an analytical model of the flow decay that follows after abruptly stopping the driving mechanism. The model reveals that for large gaps the flow decay may interfere with the true RBC-shape recovery process. These theoretical findings were confirmed by velocity measurements in a Couette-type aggregometer. Syllectograms obtained using large gaps differ in many respects from those obtained using small gaps. As predicted by our model large gaps show a prolonged apparent shape-recovery time-constant. Moreover, a delayed intensity peak, a reduced upstroke of the intensity peak and a considerable increase of the half-life parameter are observed. The aggregation indices for large gaps are lower than for small gaps. This paper yields a better understanding of the velocity and shear-rate decay following upon abruptly stopping the driving mechanism. A better mathematical representation of the syllectogram and recommendations for a maximum gap width enables both RBC-shape recovery and aggregation measurements in whole blood using syllectometry. [J481]

"Rapid estimation of the range-Doppler scattering function"

Under wide sense stationary uncorrelated scattering (WSSUS) conditions, the signal spreading due to a random channel may be described by the scattering function (SF). In an active acoustic system, the received signal is modeled as the superposition of delayed and Doppler spread replicas of the transmitted waveform. The SF completely describes the second-order statistics of a WSSUS channel and can be considered a density function that characterizes the average spread in delay and Doppler experienced by an input signal as it passes through the channel. The SF and its measurement will be reviewed. An estimator is proposed based on a two-dimensional (2-D) autoregressive (AR) model for the scattering function. In order to implement this estimator, we derive the conditional minimum variance unbiased estimator of the time-varying frequency response of a linear channel. Unlike conventional Fourier methods, the AR approach does not suffer from the usual convolutional smoothing due to the signal ambiguity function. Simulation results are given. [J482]

"Iterative diversity detection for correlated continuous-time Rayleigh fading channels"

An antenna array is proposed as a means of achieving a space-diversity effect that partly overcomes the severity of continuous-time Rayleigh fading channels. The investigated channel is assumed to be frequency-nonselective with correlated diversity links, where the correlation is related to the array geometry and the spatial and Doppler dispersions. Further, the error performance is improved by bit interleaving and channel coding, where the encoders/channel is viewed as a serially concatenated system: a convolutional code constitutes the outer code, whereas a differential encoder and the fading channel (having truncated memory) form a joint inner code. In order to obtain a practical detector structure it is desirable to perform iterative decoding by applying some a posteriori probability (APP) algorithms. For this purpose, we propose a novel generalization of the well-known Bahl-Cocke-Jelinek-Raviv (1974) algorithm that calculates the APPs over channels having memory. Numerical results indicate that iterative decoding becomes more powerful when the exploited channel memory depth is extended. Also, the error performance is significantly improved by introducing multiple antennas. The interleaver gain is, however, seen to be quite moderate, in contrast to additive white Gaussian noise channels. [J483]

"Subcomplementary code pairs: new codes for ST/MST radar observations"

A new type of codes, named subcomplementary codes, are introduced. These codes are close to, but not strictly, complementary. Each of the two sequences of the pair has an equal number of opposite elements, which enables the codes to have very high interference-suppression-factor (ISF) performances in and around the radar center frequency. The disadvantage of these codes is the presence of sidelobes of amplitude of -N in their autocorrelation functions for lag 1 (N being the code length). Some properties of these codes are presented along with a technique for generating the code pairs. Subcomplementary code pairs have been found for values of N equal to 4, 8, 16, 20, and 32. A simulation study confirms a major improvement in ISF over complementary code pairs around the zero Doppler frequency. Experimental observations were performed with the middle and upper atmosphere radar in Japan using complementary and subcomplementary code pairs of length 16 and an uncoded pulse for range resolution performance comparisons. The results obtained so far indicate that the effects of the sidelobes in the subcomplementary code pair are minimal for wind observations, although significant for shear velocity observations. The degradation in performance in signal-to-noise ratio observations is found to be noticeable but not severe. The subcomplementary code pairs may, therefore, be used in situations where their advantages for interference suppression are exploited and where the effects of their weaknesses are not so important as in the case of observations for applications in meteorology. [J484]

"Characterization of Doppler spectra for mobile communications at 5.3 GHz"

Tapped-delay-line (TDL) channel models are developed from a measured database for outdoor and indoor mobile communications at 5.3 GHz. Meanwhile, several types of Doppler spectra are found at the different taps

of the TDL models. For simulation purposes, a general three-dimensional autocorrelation function of the scattered waves is derived and connected to the distributions of angles of arrival of the waves and antenna radiation patterns. Furthermore, the propagation mechanisms of the different types of Doppler spectra observed in the TDL models are explained based on the comparisons between measured and simulated results where the Fourier transformations are performed on the autocorrelation functions to obtain the Doppler power spectra. [J485]

"Error performance of BPSK in fast Rician fading channels"

The bit error rate for binary phase shift keying (BPSK) modulation used on a Rician fading channel with an arbitrary Doppler frequency is studied. An expression is derived for the moment generating function of the signal sample at the output of the matched filter and is then used to calculate the BER. Numerical results are provided which illustrate the effect of the Rician factor, the Doppler frequency and different transmit pulse shapes. [J486]

"Neural network space diversity combination and ring coding for multicarrier CDMA over fast fading channels"

Multicarrier CDMA is a major candidate to fulfil the requirements of 3G mobile systems. A novel scheme is developed combining modulo-S ring TCM with RNN-based adaptive space diversity for multicarrier CDMA systems with single-antenna transmitter and multiple-antenna receiver. The nonlinear RTRL algorithm for antenna diversity combining combats the distortive effects of the communication channel and reduces the interference. Ring TCM channel coding and RNN space diversity are evaluated in 16-QAM multicarrier CDMA systems transmitting over Rician and Rayleigh fast fading channels with a maximum Doppler frequency of 96 Hz. Modulo-4 ring TCM codes of 16 and 64 states have been designed. The RNN system is shown to be superior to the linear algorithms in channels dominated by multipath fading, inter-symbol interference and multiple access interference. The complexity of the RNN structure is comparable to that of the linear techniques. The joint utilisation of RNN based diversity, ring TCM and binary TCM coding schemes has been implemented. Whereas coding and space diversity do not provide sufficient benefit separately, the combination of both produces an increase in performance. [J487]

"Estimating the Doppler spectrum of a short-range fixed wireless channel"

Time variations of fixed wireless channels result from the relative movements of scatterers in the propagating environment. We consider the temporal gain variations of short-range channels due to scattering from wind-blown leaves. In particular, we present a method for estimating the Doppler spectrum from the received signal's power samples, without requiring the phase information. We then apply the method to the results of measurements we recently conducted on fixed, short-range paths. [J488]

"Beamforming using the fractional Fourier transform"

We present a new method of beamforming using the fractional Fourier transform (FrFT). This method encompasses the conventional minimum mean-squared error (MMSE) beamforming in the frequency domain or spatial domain as special cases. It is especially useful for applications involving chirp signals such as signal enhancement problems with accelerating sinusoidal sources where the Doppler effect generates chirp signals and a frequency shift and active radar problems where chirp signals are transmitted. Numerical examples demonstrate the potential advantage of the proposed method over the ordinary frequency or spatial domain beamforming for a moving source scenario. [J489]

"On uplink CDMA cell capacity: mutual coupling and scattering effects on beamforming"

It has been shown that code-division multiple-access (CDMA) systems that employ digital beamforming and base station antenna arrays have the potential to increase capacity significantly. Therefore, accurate performance prediction of such systems is important. We propose to take the electromagnetic behavior of the base station antenna array into account, as well as its impact on wireless channel propagation. Specifically, the wideband channel introduces scattering, while the mobile environment causes Doppler fading, which in turn degrades power controllability. We develop a more accurate performance analysis of antenna arrays, where the performance degradation in digital beamforming, due to the combination of mutual coupling, scatter and imperfect power control, and its impact on uplink CDMA system capacity is quantified. A Rayleigh fading amplitude with varying angle-of-arrival spread is assumed, and maximum signal-to-noise ratio beamforming weights are used. These weights are further correlated with mutual coupling at the base station array. Despite the degradation due to the combination of mutual coupling, scattering, and imperfect power control, significant capacity increases are possible. [J490]

"Effect of employing directional antennas on mobile OFDM system with time-varying channel"

In this letter, we analyze the inter-carrier-interference (ICI) caused by Doppler spreading in an orthogonal frequency-division multiplexing system when the angle-of-arrival (AOA) of the received signal is not uniformly distributed. An expression of the ICI power is derived by taking into account the probability density function of the AOA. We also present examples using directional antennas at the base station, at the mobile or at both mobile and base station. The ICI power changes marginally when a directional antenna is placed at the base station. Finally, we show that the ICI power can be reduced substantially when a directional antenna, along with frequency tracking, is employed at the mobile. [J491]

"Optimal training for block transmissions over doubly selective wireless fading channels"

High data rates give rise to frequency-selective propagation, whereas carrier frequency-offsets and mobility-induced Doppler shifts introduce time-selectivity in wireless links. To mitigate the resulting time- and frequency-selective (or doubly selective) channels, optimal training sequences have been designed only for special cases: pilot symbol assisted modulation (PSAM) for time-selective channels and pilot tone-assisted orthogonal frequency division multiplexing (OFDM) for frequency-selective channels. Relying on a basis expansion channel model, we design low-complexity optimal PSAM for block transmissions over doubly selective channels. The optimality in designing our PSAM parameters consists of maximizing a tight lower bound on the average channel capacity that is shown to be equivalent to the minimization of the minimum mean-square channel estimation error. Numerical results corroborate our theoretical designs. [J492]

"Forward-link soft-handoff in CDMA with multiple-antenna selection and fast joint power control"

We consider forward-link soft-handoff with multiple antenna selection and fast joint power control at high data rates in a cellular code-division multiple-access network, where signals are directed to a mobile station (MS) from antennas located at the same or different base stations. The total power transmitted to any mobile is divided among the active antennas selected according to the momentary channel conditions so as to maximize the signal-interference ratio at each MS. Multiple-antenna selection is used to mitigate the effects of both short- and long-term fading, and achieve the best soft-handoff with respect to system capacity and complexity. To achieve capacity gains with soft-handoff, we derive optimum handoff thresholds corresponding to the optimum handoff region in different cell environments. Numerical results demonstrate that under high Doppler spread and large handoff-delay conditions, the proposed soft-handoff employing two transmit antennas and the optimum handoff threshold achieves a significant gain in microcell environments, but not in macrocell environments. [J493]

"Optimization of attenuation estimation in reflection for in vivo human dermis characterization at 20 MHz"

In vivo skin attenuation estimators must be applicable to backscattered radio frequency signals obtained in a pulse-echo configuration. This work compares three such estimators: short-time Fourier multinarrowband (MNB), short-time Fourier centroid shift (FC), and autoregressive centroid shift (ARC). All provide estimations of the attenuation slope (β, dB.cm-1.MHz-1); MNB also provides an independent estimation of the mean attenuation level (IA, dB.cm-1). Practical approaches are proposed for data windowing, spectral variance characterization, and bandwidth selection. Then, based on simulated data, FC and ARC were selected as the best (compromise between bias and variance) attenuation slope estimators. The FC, ARC, and MNB were applied to in vivo human skin data acquired at 20 MHz to estimate βFC, βARC, and IAMNB, respectively (without diffraction correction, between 11 and 27 MHz). Lateral heterogeneity had less effect and day-today reproducibility was smaller for IA than for β. The IA and βARCwere dependent on pressure applied to skin during acquisition and IA on room and skin-surface temperatures. Negative values of IA imply that IA and β may be influenced not only by skin's attenuation but also by structural heterogeneity across dermal depth. Even so, IA was correlated to subject age and IA, βFC, and βARCwere dependent on subject gender. Thus, in vivo attenuation measurements reveal interesting variations with subject age and gender and thus appeared promising to detect skin structure modifications. [J494]

"Propagation of light in low-pressure ionized and atomic hydrogen: application to astrophysics"

Impulsive stimulated Raman scattering (ISRS) uses ultrashort laser pulses to shift light frequencies; the frequency shift depends on the power of the laser pulses because this power is very large. The relative frequency shifts of coherent Raman effect on incoherent light (CREIL) described in this paper are independent on the intensity of the ordinary incoherent light that it uses, and, in a first approximation, on the frequency of the light. Since CREIL does not blur images or alter the spectral pattern, CREIL effect may be confused with

Doppler frequency shifts. ISRS and CREIL are parametric effects that do not excite matter; they transfer energy from "hot beams" to "cold beams." These transfers correspond to spectral shifts; in CREIL thermal radiation is blue-shifted, that is heated. CREIL requires low-pressure gases acting as catalysts. These gases must have Raman transitions in the radio frequencies range: for example, H2+or excited atomic hydrogen in a magnetic field. The spectral lines resulting from a simultaneous absorption (or emission) and CREIL have a width at least equal to the frequency shift, so that the lines of a complex spectrum may be weakened and mixed, becoming nearly invisible. In interstellar space, molecular hydrogen is ionized, but since H2+is quickly destroyed by collisions it persists only at pressures low enough to provide CREIL; the redshift widens the weak absorption lines of H2+which becomes undetectable. It contributes to the "cosmological redshift" and amplification of the microwave 2.7 K background radiation. Using only well-established physics and normal astronomical objects, CREIL provides a plausible explanation for the enigmatic spectra of the quasars. [J495]

"Redshifts of cosmological neutrinos as definitive experimental test of Doppler versus non-Doppler redshifts"

The observed cosmological redshifts of electromagnetic photons have been interpreted as due to Doppler recessional velocities and/or space-expansion. However, energy-loss interactions between light and intervening matter can also lead to redshifts. It is proposed that experimental observation of neutrino redshifts compared with photon redshifts will provide distinctive definitive evidence for the validity of a Doppler versus non-Doppler mechanism as the cause of any observed redshift. A Doppler and/or space-expansion effect will yield comparable photon and neutrino redshifts. Whereas, a non-Doppler mechanism arising from an energy-loss interaction with intervening matter will yield a very small neutrino redshift compared to a photon redshift. Consistent with Type 1A Supernova observations, any non-Doppler light mechanism will also yield a significant time delay in light arrival at Earth compared to neutrino arrival. [J496]

"Gamma-diagnostics of alpha-particles in 4 He and D-T plasmas"

This article reports on gamma -ray diagnosis of ICRF-accelerated 4Heions and fusion alpha particles used in the JET tokamak. This diagnostic based on the analysis of gamma rays emitted in nuclear reaction 9Be(alpha ,ngamma)12C.The results of the first observation of the 4.44-MeV gamma -radiation due to the reaction 9Be(alpha ,ngamma)12Cin JET deuterium-tritium experiment (DTE1) are presented. Gamma-ray spectra have been recorded with collimated spectrometer, and the gamma -ray emission radial profiles measured with the JET neutron/gamma profile monitor. Doppler broadening effects which could be used for the ICRF-accelerated 4He-iondiagnosis with high energy resolution gamma -ray detectors are discussed. Capabilities of the gamma -ray measurements in next step D-T devices are discussed. copyright 2003 American Institute of Physics. [J497]

"Volume scattering of distributed microbubbles and its influence on blood flow estimation"

In recent years, microbubble contrast agents have become a potential adjunct in Doppler ultrasound diagnosis. In this paper, we show that volume scattering makes the effective band in Doppler spectrum shift downward after injection of microbubbles. Because the insonified volume comprises a collection of distributed microbubbles, the statistical properties such as the autocorrelation function and ensemble average power spectrum of the echoes from a collection of distributed microbubbles were derived first. It can be observed that, beyond a critical frequency, the theoretical volume backscattering cross section derived from the ensemble average power spectrum of microbubbles decreases with frequency. On the contrary, the volume backscattering cross section of red cells increases with frequency. Using two-dimensional (2-D) Fourier transform, the variation in Doppler spectrum caused by different volume backscattering cross section can be demonstrated, and the consequential downward shifts of the estimated Doppler parameters (e.g., the mean and maximum Doppler shifts, and the variance of Doppler power spectrum) after microbubble injection are shown. In addition, it can be observed that the variation gets larger as the transmitted bandwidth increases. And, the variations in Doppler parameters estimated with experimental data are presented to verify the theoretical deviations. [J498]

"Bounding performance and suppressing intercarrier interference in wireless mobile OFDM"

While rapid variations of the fading channel cause intercarrier interference (ICI) in orthogonal frequency-division multiplexing (OFDM), thereby degrading its performance considerably, they also introduce temporal diversity, which can be exploited to improve performance. We first derive a matched-filter bound (MFB) for OFDM transmissions over doubly selective Rayleigh fading channels, which benchmarks the best possible performance if ICI is completely canceled without noise enhancement. We then derive universal performance bounds which show that the time-varying channel causes most of the symbol energy to be distributed over a few subcarriers, and that the ICI power on a subcarrier mainly comes from several neighboring subcarriers. Based on this fact, we develop low-complexity minimum mean-square error (MMSE) and decision-feedback equalizer (DFE)

receivers for ICI suppression. Simulations show that the DFE receiver can collect significant gains of ICI-impaired OFDM with affordable complexity. In the relatively low Doppler frequency region, the bit-error rate of the DFE receiver is close to the MFB. [J499]

"Predictive self-organizing map for vector quantization of migratory signals and its application to mobile communications"

This paper proposes a predictive self-organizing map (P-SOM) that performs an adaptive vector quantization of migratory time-sequential signals whose stochastic properties such as average values of signals in each cluster are varying continuously. The P-SOM possesses not only the weight corresponding to the signal values themselves but also those related to the time-derivative information. All the weights self-organize to predict appropriate future reference vectors. The prediction using the time-derivative weights enables the separation of continuously varying components form random noise components, resulting in a better performance of the adaptive vector quantization. That is to say, the stationary random noise components are captured by the ordinary weights, whereas the migrating components are captured by the first (and higher) order time-derivative ones. An application to a mobile communication receiver using quasi-coherent detection is presented. By utilizing both the ordinary and time-derivative weights consistently, the P-SOM generates a predictive reference vectors and quantizes the migratory signals adaptively. Simulation experiments on the bit-error rates (BERs) demonstrate that a P-SOM adaptive demodulator has a superior capability to track phase rotations caused by the Doppler effect. A theoretical noise analysis is also reported for the conventional SOM and the P-SOM. It is found that the calculation results are approximately in good agreement with the experimental ones. [J500]

"Effects of coexistent pores and paramagnetic defects on positron annihilation in silicon oxide thin films"

We measured the Doppler broadening of positron 2gamma annihilation and the probability of positron 3gamma annihilation (I3gamma)for paramagnetic defects (E' and Pb)containing SiOx (1.5 x 2)films with different porosities, which were prepared by radio-frequency cosputtering of Si and SiO2at different Ar pressures. The observed increase of I3gamma with increasing Ar pressure was attributed to the increased open porosity of the film. Under a condition of constant paramagnetic defect concentration, Doppler broadening S parameter increases with increasing I3gamma and open porosity of the film. This was caused by enhancement of a relative contribution from p-Psto the 511 keV 2gamma annihilation peak as a result of reduced probability of o-Pspickoff annihilation. The relationship between the S parameter and I3gamma can be affected strongly by the paramagnetic defects in the sense that film with a higher open porosity does not necessarily present a higher S parameter. A low porosity film with higher concentration Pbcenters exhibited a higher S parameter than did more porous films containing lower concentration Pbcenters because in the former film a larger number of positrons annihilate from p-Psas a consequence of the Psspin exchange caused by the paramagnetic defects. copyright 2003 American Institute of Physics. [J501]

"Structural evolution in Ar + implanted Si-rich silicon oxide"

Silicon-rich silicon oxide films were deposited by plasma-enhanced chemical vapor deposition. Energy was released into the film by ion bombardment, with the aim of promoting formation of Si nanoclusters and reordering the oxide matrix. The effect of the initial stoichiometry, as well as the evolution of the oxide films due to the ion bombardment and to subsequent thermal treatments, has been studied by depth-resolved positron annihilation Doppler spectroscopy, Raman scattering and Fourier transform infrared spectroscopy. As-deposited films were found to contain an open volume fraction in the form of subnanometric cavities that are positively correlated with oxygen deficiency. No Si aggregates were observed. The ion bombardment was found to promote the formation of amorphous Si nanoclusters, together with a reduction of the open volume in the matrix and a substantial release of hydrogen. It also leaves electrically active sites in the oxide and produces gas-filled vacancy defects in the substrate, with the concentrations depending on the implantation temperature. Thermal treatment at 500 °C removes charge defects in the oxide, but vacancy defects are not completely annealed even at 1100 °C. In one case, heating at 1100 °C produced cavities of about 0.6 nm in the oxide. Transformation of Si nanoclusters into nanocrystals is observed to occur from 800 °C. copyright 2003 American Institute of Physics. [J502]

"Improved depth profiling with slow positrons of ion implantation-induced damage in silicon"

Variable-energy positron annihilation spectroscopy (VEPAS) has been extensively applied to study defects in near-surface regions and buried interfaces, but there is an inherent limit for depth resolution due to broadening of the positron implantation profile. In order to overcome this limit and obtain optimum depth resolution, iterative chemical etching of the sample surface and VEPAS measurement are employed. This etch-and-measure technique is described in detail and the capabilities are illustrated by investigating the depth profile of defects in

Si after B and P implantations with 2Ч1014/cm2at 100 keV followed by annealing. Defect tails can be accurately examined and the extracted defect profile is proven to extend beyond the implanted ion range predicted by the Monte Carlo code TRIM. This behavior is more remarkable for P ion implantation than B, and the mass difference of the implanted ions is strongly related to it. No significant difference is recognized in the annealing behavior between B and P implantations. After annealing at 300 °C,the defect profile is hardly changed, but the ratio of the characteristic Doppler broadening, S,a parameter for defects, to that for the bulk Si rises by 0.01, indicating that divacancies, V2,are transformed into V4.Annealing at more than 500 °Ccauses diffusion of the defects toward the surface and positron traps are annealed out at 800 °C.It is proved that this resolution-enhanced VEPAS can eliminate some discrepancies in defect profiles extracted by conventional means.copyright 2003 American Institute of Physics. [J503]

"X-ray emission line profile modeling of hot stars"

The launch of high-spectral-resolution x-ray telescopes (Chandra, XMM) has provided a host of new spectral line diagnostics for the astrophysics community. In this paper we discuss Doppler-broadened emission line profiles from highly supersonic outflows of massive stars. These outflows, or winds, are driven by radiation pressure and carry a tremendous amount of kinetic energy, which can be converted to x rays by shock-heating even a small fraction of the wind plasma. The unshocked, cold wind is a source of continuum opacity to the x rays generated in the shock-heated portion of the wind. Thus the emergent line profiles are affected by transport through a two-component, moving, optically thick medium. While complicated, the interactions among these physical effects can provide quantitative information about the spatial distribution and velocity of the x-ray-emitting and absorbing plasma in stellar winds. We present quantitative models of both a spherically symmetric wind and a wind with hot plasma confined in an equatorial disk by a dipole magnetic field. copyright 2003 American Institute of Physics. [J504]

"High dispersion spectrometer for time resolved Doppler measurements of impurity lines emitted during ISTTOK tokamak discharges"

A high dispersion, multichannel, visible spectrometer has been developed for the ISTTOK tokamak, aiming at measuring the evolution of both the edge ion temperature and plasma poloidal velocity, by analysis of a CIII spectral line. It is based on a double monochromator configuration with two high ruling densities (2700 l/mm) and 1 m focal length concave diffraction gratings, a commercial double microchannel plate image intensifier, a fast (f/#=1)relay lens built with two high diameter condensers in a back-to-back configuration, and a 2048 element photodiode charge coupled device optical multichannel analyzer. Laboratory tests have shown that a high dispersion has been achieved (≈1.65 E/mm), while keeping good temporal resolution (5 ms). Typical values measured for ion temperature (from Doppler broadening) were Ti 25 eVwhile for poloidal velocity (from Doppler shift) vtheta 6 km/s.copyright 2003 American Institute of Physics. [J505]

"Signal-to-noise ratio improvement by sideband intermixing: Application to Doppler ultrasound vibrometry"

A simple technique for improving the sensitivity of measuring devices based on angle modulation of a continuous-wave carrier is presented. The proposed approach involves the addition of a second carrier signal separated by twice the modulation frequency. In the Fourier domain, the upper sideband of the first carrier and the lower sideband of the second carrier intermix. By sweeping the relative phase between the two carriers, the magnitude of the resultant sideband can grow up to double the original value. In noisy environments, this effect can lead to an improvement of the signal-to-noise ratio. As a proof of concept, the technique is applied to a Doppler ultrasonic vibration sensor, with encouraging results. copyright 2003 American Institute of Physics. [J506]

"An integrated sensory-intelligent system for underwater acoustic signal-processing applications"

A generic integrated sensory-intelligent system (ISIS) is developed for underwater acoustic signal-processing applications. ISIS constantly monitors the current acoustic channel conditions and smoothly integrates the outputs of the most appropriate signal-processing procedures or algorithms available to it for those conditions. The system is based on a generalization of a tuneable approximate piecewise linear (TAPL) model derived from the modified probabilistic neural network (MPNN). This model was designed to seamlessly integrate a set of local linear signal-processing algorithms within a given multidimensional data space. Depending on the input signal distortions, which are determined by environmental effects, ISIS automatically weighs and adds the outputs from a set of processing algorithms working in parallel. The weighting is related to the "closeness" of each algorithm to the sensed input signal characteristics or some other measured environmental state. A single tuning parameter is used to smoothly and seamlessly select appropriately among the parallel processing algorithm outputs. A very small tuning-parameter value selects the closest most appropriate algorithm output. At

the other extreme, a fixed weighted average of all the algorithm outputs is produced with a very large value. Otherwise, a dynamic weighed average of all algorithm outputs is achieved with values in between. Some features and benefits of ISIS are demonstrated with an illustrative linear sweep chirp signal-detector estimation problem characterized by extremely variable Doppler conditions. [J507]

"Assessment of chaos-based FM signals for range-Doppler imaging"

The authors analysed a set of random frequency modulated (FM) signals for wideband radar imaging and assessed their resolution capability and sidelobe distribution on the range-Doppler plane. To this effect deterministic, bounded, nonlinear iterated maps were first considered. The initial condition of each chaotic map was assigned to a random variable to obtain statistically independent samples with invariant probability density function. The resulting sequences, which have white time-frequency representations, are used to construct wideband stochastic FM signals. These FM signals are ergodic and stationary. The autocorrelation, spectrum and the ambiguity surface associated with each of the FM signals were characterised. It was also demonstrated that the ambiguity surface of an FM signal generated via a chaotic map with uniform sample distribution and tail-shifted chaotic attractor is comparable to the ambiguity function of a Gaussian FM signal [J508]

"Analysis of micro-Doppler signatures"

Mechanical vibration or rotation of a target or structures on the target may induce additional frequency modulations on the returned radar signal which generate sidebands about the target's Doppler frequency, called the micro-Doppler effect. Micro-Doppler signatures enable some properties of the target to be determined. In the paper, the micro-Doppler effect in radar is introduced and the mathematics of micro-Doppler signatures is developed. Computer simulations are conducted and micro-Doppler features in the joint time-frequency domain are exploited [J509]

"Effect of nonuniform target motion on radar backscattered waveforms"

The effect of nonuniform motion on radar waveforms is discussed. By considering the physical model of a perfectly reflecting mirror with an arbitrary law of motion r(t), it is possible to determine the functional form of the scattered wave at the receiver for any waveform in general. The particular example of an interrupted continuous wave waveform is used to analyse the effect of nonuniform motion on the return spectrum. These models provide a theoretical foundation for the observations of micro-Doppler that have been discussed by a number of authors. Finally, some of the implications, both physical and mathematical, of nonuniform motion for time-frequency methods are addressed [J510]

"Micro-Doppler analysis of vibrating targets in SAR"

Vibrating targets cause phase modulation of the azimuth phase history for a SAR system. The phase modulation may be seen as a time-dependent micro-Doppler frequency. It is useful to analyse such signals with Cohen's (1995) class time-frequency methods due to their superior resolution potential. The method must be chosen with care, as the effective time integration window of the kernel should not be longer than about a cycle of the modulation signal. Using the adaptive optimal kernel method (AOK), the authors obtained good results from a controlled experiment where two oscillating corner reflectors were placed within a SAR scene collected by the US Navy APY-6 radar. The oscillation frequency and amplitude were calculated from the time-frequency distributions and the results agree well with available ground truth. To resolve the instantaneous frequencies, the kernel time extent had to be sufficiently short [J511]

"Manoeuvring target detection in over-the-horizon radar using adaptive clutter rejection and adaptive chirplet transform"

In over-the-horizon radar (OTHR) systems, the signal-to-clutter ratio (SCR) used for moving target detection is very low. For slowly moving targets such as ships, the SCR is typically from -50 dB to -60 dB and their Doppler frequencies are close to that of the clutter. For manoeuvring targets, such as aircraft and missiles, the Doppler frequencies are time-varying when a long integration time is considered. When a target does not move uniformly, the Fourier transform based target detection techniques, including super-resolution spectrum techniques, may fail to work appropriately. In such situations, the Doppler signatures are time-varying and, therefore, time-frequency analysis techniques can be used for manoeuvring target detection. In addition, clutter rejection is also required for target detection due to the low SCR. The existing adaptive clutter rejection algorithms combine clutter rejection with spectrum analysis methods, which usually assume uniformly moving target (i.e. sinusoidal Doppler signature) models. An adaptive clutter reject algorithm is proposed together with the adaptive chirplet transform technique for manoeuvring target detection in a multipath environment. Simulation results using a simulated manoeuvring target signal with received raw OTHR clutter data show that targets with

SCR below -50 dB can be detected by using the proposed algorithm [J512]

"High-resolution time-frequency distributions for manoeuvring target detection in over-the-horizon radars"

A novel high-resolution time-frequency representation method is proposed for source detection and classification in over-the-horizon radar (OTHR) systems. A data-dependent kernel is applied in the ambiguity domain to capture the target signal components, which are then resolved using root-MUSIC based coherent spectrum estimation. This two-step procedure is particularly effective for analysing a multicomponent signal with time-varying complex time-Doppler signatures. By using the different time-Doppler signatures, important target manoeuvring information, which is difficult to extract using other linear and bilinear time-frequency representation methods, can be easily revealed using the proposed method [J513]

"Application of ultrasound-based velocity estimate statistics to strain-rate estimation"

Quantification of the relative myocardial deformation rate, or strain rate, is an emerging capability to aid a cardiologist in assessing myocardial function. Ultrasound Doppler techniques can be used to compute tissue motion relative to a transducer. The myocardial strain rate can be computed as the localized spatial derivative of the tissue velocity. Such a strain-rate estimate is typically numerically noisy. We present the relevant speckle statistics to faciliate the computation of the strain rate based on a weighted least squares regression, with statistically appropriate weights. [J514]

"Human walking estimation with radar"

Radar can be used to observe humans that are obscured by objects such as walls. These humans cannot be visually observed. The radar measurements are used to animate an obscured human in virtual reality. This requires detailed information about the motion. The radar measurements give detailed information about the movements of the human body parts; the Doppler signatures are time-varying and observed in the spectrogram. The authors focus on the extraction of parameters and describe a method for estimating human walking parameters from radar measurements. The parameters are estimated by minimising the difference between a simulated model and real measurements. A human walking model is presented which can be used both to calculate the radar response and visually to animate a walking person. The method is applied to real radar measurements of inbound walking humans from a distance of 20 m. The results show that estimation of the walking parameters is possible. The animated walking human generated with estimated parameters is a realistic likeness of the real walking human. [J515]

"Distortion in the inverse synthetic aperture radar (ISAR) images of a target with time-varying perturbed motion"

Large distortion in ISAR images of a moving target has been investigated and demonstrated under controlled experiments. The distortion is a result of small time-varying perturbed motion experienced by the target and is attributed to a modulation effect in the phase of the radar return from the target. The Doppler motion of the target, modulated by a time-varying perturbation, results in a broad smear in the phase of the radar signal. A numerical model of the distortion based on the phase modulation effect has been developed. Simulated ISAR images produced by this model are in good agreement with experimental results. The numerical and experimental studies described provide a better understanding of the distortion mechanism that affects the ISAR images of a target in motion [J516]

"Frequency-coded waveforms for enhanced delay-Doppler resolution"

In this paper, we propose techniques for the construction of frequency-coding sequences that give rise to frequency-coded waveforms having ambiguity functions with a clear area-containing no sidelobes-in a connected region surrounding the main lobe. These constructed sequences are called pushing sequences. First, two important properties of pushing sequences are investigated: the group D4dihedral symmetry property and the frequency omission property. Using the group D4dihedral symmetry property, we show how to construct additional pushing sequences from a given pushing sequence. Using the frequency omission property, we show how to construct pushing sequences of any length N and design proper frequency-coded waveforms that meet specific constraints in the frequency domain. Next, we use the Lempel T4construction of Costas sequences to construct pushing sequences with power 1. Finally, we show how to construct pushing sequences with any desired power using Lee codewords. Because these arbitrary-power pushing sequences constructed using Lee codewords do not have the Costas property, we derive expressions for the pattern of hits in the geometric array. Based on this, the general form of the positions and levels of all the sidelobe peaks are derived. [J517]

"Pilot-symbol aided channel estimation for OFDM with fast fading channels"

In this paper, we address the problem of estimating a rapidly-varying channel in orthogonal frequency division multiplexing (OFDM) systems. To handle rapid variation within a transmission block, we propose a novel pilot-based estimation scheme which uses channel interpolation. In addition, we develop a simple Doppler frequency estimation scheme. We show that the proposed scheme has better performance in the high-Doppler frequency by simulations. [J518]

"Multichannel ATI-SAR with application to the adaptive Doppler filtering of ocean swell waves"

Multichannel along-track interferometric (MATI) SAR systems are discussed from the point of view of ocean remote sensing. It is shown that the signals scattered by range moving scatterers can be Doppler filtered using a MATI-SAR. Processing techniques are presented, including a phase screen method for the removal of phase errors (including systematic errors and also those resulting from platform motion). A particular radar system (the ESR, enhanced surveillance radar) is described; this has a 3 cm wavelength MATI with two, three or four beams. It is used for investigating and exploiting Doppler effects in ocean radar scattering. It is demonstrated that, by applying adaptive Doppler filtering techniques, the MATI-SAR can significantly increase the imaging sensitivity of ocean features with respect to a conventional SAR. Examples illustrate the use of the ESR MATI-SAR system for imaging ship generated swell waves. Using three beams, the visibility of the wave images is increased by 9.5 dB looking downwind and 5.0 dB looking upwind for horizontal polarisation at grazing angles of 39° and 32°, respectively. Associated Doppler filter responses are shown which show that the scatterers modulated by the swell wave are located in the neighbourhood of the wave crests. [J519]

"Clutter filters adapted to tissue motion in ultrasound color flow imaging"

The quality of ultrasound color flow images is highly dependent on sufficient attenuation of the clutter signals originating from stationary and slowly moving tissue. Without sufficient clutter rejection, the detection of low velocity blood flow will be poor, and the velocity estimates will have a large bias. In some situations, e.g., when imaging the coronary arteries or when the operator moves the probe in search for small vessels, there is considerable movement of tissue. It has been suggested that clutter rejection can be improved by mixing down the signal with an estimate of the mean frequency prior to high pass filtering. In this paper, we compare this algorithm with several other adaptive clutter filtering algorithms using both experimental data and simulations. We found that realistic accelerations of the tissue have a large effect on the clutter rejection. The best results were obtained by mixing down the signal with non-constant phase increments estimated from the signal. This adapted the filter to a possibly accelerated tissue motion and produced a significant improvement in clutter rejection. [J520]

"Doppler angle estimation using AR modeling"

The transit time spectrum broadening effect has long been explored for Doppler angle estimation. Given acoustic beam geometry, the Doppler angle can be derived based on the mean Doppler frequency and the Doppler bandwidth. Spectral estimators based on the fast Fourier transform (FFT) are typically used. One problem with this approach is that a long data acquisition time is required to achieve adequate spectral resolution, with typically 32-128 flow samples being needed. This makes the method unsuitable for real-time two-dimensional Doppler imaging. This paper proposes using an autoregressive (AR) model to obtain the Doppler spectrum using a small number (e.g., eight) of flow samples. The flow samples are properly selected, then extrapolated to ensure adequate spectral resolution. Because only a small number of samples are used, the data acquisition time is significantly reduced and real-time, two-dimensional Doppler angle estimation becomes feasible. The approach was evaluated using both simulated and experimental data. Flows with various degrees of velocity gradient were simulated, with the Doppler angle ranging from 20\° to 75\°. The results indicate that the AR method generally provided accurate Doppler bandwidth estimates. In addition, the AR method outperformed the FFT method at smaller Doppler angles. The experimental data for Doppler angles, ranging from 33\° to 72\°, showed that the AR method using only eight flow samples had an average estimation error of 3.6\°, which compares favorably to the average error of 4.7\° for the FFT method using 64 flow samples. Because accurate estimates can be obtained using a small number of flow samples, it is concluded that real-time, two-dimensional estimation of the Doppler angle over a wide range of angles is possible using the AR method. [J521]

"FPGA realization of a novel frontend signal processor for pager decoders"

This paper proposes a novel frontend signal processor for pager decoders. It consists of noise detector, noise filter, and timing recovery circuit which are designed and implemented into an FPGA chip. Some unique and creative design algorithms for the proposed circuit are developed to improve interference-resistant performance.

To testify the reliability and robustness of the proposed circuit, stringent glitches and variation of bit period are purposely added in our FPGA verification and even a much faster system clock of 50 MHz besides the normal one, 76.8 kHz, is utilized to verify our circuit. Actually, these actions often drive our design to take as many ill effects into account as possible and make our circuit more realistic in real operation. The testing results show that our circuit works well under glitches with SNR equal to 8.5 dB and 8% variation of bit period due to Doppler effect, phase changes, and phase jitters [J522]

"The effects of modulation combination, target BER, Doppler frequency, and adaptation interval on the performance of adaptive OFDM in broadband mobile channel"

OFDM is one of the promising modulation candidates for a fourth generation broadband mobile communication system because of its robustness against intersymbol interference (ISI). The adaptive modulation scheme is also an efficient scheme to increase the transmission rate by changing the channel modulation scheme according to the estimated channel state information. Since its implementation depends on the channel environment of the system and control period by using feedback information, this paper presents an evaluation for the effects of various modulation scheme combinations, target BER, Doppler frequency, and various adaptation intervals as control period on the performance of adaptive OFDM. We also propose a predicted feedback information scheme which increases the adaptation interval using the predicted power estimation in order to reduce the transmission time of feedback information from receiver to transmitter. Computer simulation results show that the case with BPSK, QPSK and 16QAM modulation combination at target BER 10-2achieves 2Mbit/s improvement over other combination cases in high Doppler frequency. On the other hand, at target BER 10-3, the case with BPSK, QPSK, 8PSK and 16QAM modulation combination achieves 3Mbit/s improvement compared to the case of target BER 10-2. It is also shown that the predicted feedback information scheme effectively reduces the transmission time of feedback information from the receiver to transmitter [J523]

"Improved models for the generation of multiple uncorrelated Rayleigh fading waveforms"

An improved sum-of-sinusoids simulation model is proposed for Rayleigh fading channels. The new model employs random initial phase, and conditional random Doppler frequency for all individual sinusoids. The second-order statistics of the new simulator match the desired ones exactly even if the number of sinusoids is a single-digit integer. Other key statistics of the new simulator approach the desired ones of Clarke's (1968) reference model as the number of sinusoids approaches infinity, while good convergence is achieved when the number of sinusoids is small. Moreover, the new simulator can be directly used to generate multiple uncorrelated fading waveforms; it is also pointed out that a class of 16 different simulators, which have identical statistical properties, can be developed for Rayleigh fading channels [J524]

"Modeling the channel time-variance for fixed wireless communications"

We propose a new stochastic model for the time-variance of channels for fixed wireless communications. In the classical Jakes' Doppler spectrum, the receiver (or the transmitter) is assumed to move at a certain speed. However, in fixed wireless communication systems, both the transmitter and the receiver are stationary and time-variations are actually due to moving scatterers. A novel stochastic model for this sort of time-varying channels is introduced specifically for indoor environments, which can be employed to more accurately simulate the performance of fixed wireless communications. [J525]

"Diagnostic ultrasound-induced membrane damage in phagocytic cells loaded with contrast agent and its relation to Doppler-mode images"

Cell membrane damage induced by diagnostic ultrasound exposure with contrast agent was examined and related to the display of stimulated acoustical emission in Doppler images. Monolayers of mouse macrophage-like cells were cultured on the inside of one window of an exposure chamber. The monolayers were incubated with 5% Optison®(Mallinckrodt, Inc., St. Louis, MO) for 15 minutes then rinsed to remove unattached gas bodies. A Spectra Plus scanner (Diasonics GE Medical Systems, Inc., Cincinnati, OH) in B-scan or Doppler-imaging modes exposed the chamber 3.5 cm away in a 37°C water bath. The cells were scored either for uptake of fluorescent Dextran (sonoporation), or for trypan blue dye exclusion (cell death). No significant effect was seen for exposure in any mode without a contrast agent. Significant effects with contrast agent included 5.8% (2.3% standard deviation, SD) fluorescent cells and 33.4% (7.7% SD) trypan blue-stained cells in Doppler-imaging modes, compared to 0.0% and 2.2% (1.7% SD), respectively, in sham exposures. Frames of the power Doppler image were analyzed for pixel brightness to quantify the brief flash in the Doppler window. Although both membrane damage and the flash brightness increased with increasing pressure amplitude, there did not appear to be a direct correlation between the two phenomena. [J526]

"Level crossing rate in terms of the characteristic function: a new approach for calculating the fading rate in diversity systems"

The level crossing rate (LCR) of a random process conveys useful information about the underlying process, and is of interest in diverse engineering fields. In wireless communications, it is related to the system characteristics such as handoff, outage probability, fading rate, average duration of fades, velocity (or maximum Doppler shift) of the mobile, and the effect of diversity on fading. The LCR formula was originally derived by Rice in terms of the joint probability density function (pdf) of the underlying process and its time derivative. In this letter, we express the LCR in terms of the joint characteristic function (cf). This new formula is useful for many cases where the joint cf is simpler to derive than the associated joint pdf. As an application and for a direct-sequence code-division multiple-access system, the fading rate at the output of a RAKE receiver with either maximal ratio combiner or postdetection equal gain combiner, operating over a frequency-selective fading channel with different path statistics, is easily calculated using the new cf-based LCR formula. [J527]

"Pilot-based estimation of time-varying multipath channels for coherent CDMA receivers"

Reliable coherent wireless communication requires accurate estimation of the time-varying multipath channel. This paper addresses two issues in the context of direct-sequence code-division multiple access (CDMA) systems: (i) linear minimum-mean-squared-error (MMSE) channel estimation based on a pilot transmission and (ii) impact of channel estimation errors on coherent receiver performance. A simple characterization of the MMSE estimator in terms of a bank of filters is derived. A key channel characteristic controlling system performance is the normalized coherence time, which is approximately the number of symbols over which the channel remains strongly correlated. It is shown that the estimator performance is characterized by an effective signal-to-noise ratio (SNR)-the product of the pilot SNR and the normalized coherence time. A simple uniform averaging estimator is also proposed that is easy to implement and delivers near-optimal performance if properly designed. The receivers analyzed in this paper are based on a time-frequency RAKE structure that exploits joint multipath-Doppler diversity. It is shown that the overall receiver performance is controlled by two competing effects: shorter coherence times lead to degraded channel estimation but improved inherent receiver performance due to Doppler diversity, with opposite effects for longer coherence times. Our results demonstrate that exploiting Doppler diversity can significantly mitigate the error probability floors that plague conventional CDMA receivers under fast fading due to errors in channel estimation [J528]

"Interferometric alignment of the X-SAR antenna system on the space shuttle radar topography mission"

The on-orbit alignment of the antenna beams of both the X-band and C-band radar systems during operations of the shuttle radar topography mission/X-band synthetic aperture radar (SRTM/X-SAR) was a key requirement for achieving best interferometric performance. In this paper, we consider the X-SAR antenna beam alignment in azimuth. For a single-pass cross-track SAR interferometer, we establish the relation between yaw and pitch misalignment of the antenna beams and the resulting relative shift of the Doppler frequency bands. This relation is used to provide solutions for the mechanical adjustments of the outboard antenna and electronic beam steering to correct for azimuth misalignment. Furthermore, the effects of the X-SAR effective outboard antenna pattern on the azimuth beam alignment are analyzed. As a result, a so-called "relaxing" factor is derived, which increases the limit for the difference in antenna azimuth angle with respect to the requirement on spectral overlap, and hence spatial interferogram resolution. However, we also show that the alignment requirement is driven by the constraint on decreasing the azimuth ambiguity-to-signal ratio (AASR) for the effective outboard antenna pattern to reduce the resulting additional height error. The strategy for misalignment determination and correction is presented, and results of the analysis of the in-flight X-SAR antenna beam alignment are discussed [J529]

"A delay/Doppler-mapping receiver system for GPS-reflection remote sensing"

A delay/Doppler-mapping receiver system, developed specifically for global positioning system (GPS)-reflection remote sensing, is described, and example delay/Doppler waveforms are presented. The high-quality data obtained with this system provide a more accurate and detailed examination of ground-based and aircraft GPS-reflection phenomenology than has been available to date. As an example, systematic effects in the reflected signal delay waveform, due to nonideal behavior of the C/A-code auto-correlation function, are presented for the first time. Both a single-channel open-loop recording system and a recently developed 16-channel recorder are presented. The open-loop data from either recorder are postprocessed with a software GPS receiver that performs the following functions: signal detection; phase and delay tracking; delay, Doppler, and delay/Doppler waveform mapping; dual-frequency (L1 and L2) processing; C/A-code and Y-code waveform extraction; coherent integrations as short as 125 μs; navigation message decoding; and precise observable time tagging. The

software can perform these functions on all detectable satellite signals without dead time, and custom signal-processing features can easily be included into the system [J530]

"Using short-time Fourier transform and wavelet packet filter banks for improved frequency measurement in a Doppler robot tracking system"

Previous research has shown that an ultrasonic tracking system using the Doppler effect can potentially track high-speed robot motion very accurately. However, ultrasound energy that is reflected by obstacles in the robot workspace can cause significant distortions in the frequency measurement. To reduce the distortions, a novel method for frequency measurement is described in this paper. This uses the short-time Fourier transform (STFT) to estimate the frequency of the interference signal. Then, the estimated frequencies are analyzed with an adaptive filter constructed with wavelet packet filter banks. Results are given that demonstrate great improvements in frequency measurement [J531]

"Strengths and limitations of the Fourier method for detecting accelerating targets by pulse Doppler radar"

The Fourier transform method has been generally used in pulse Doppler radar for detecting targets that are moving with acceleration, despite the phenomenon known as Doppler smearing which limits the performance of the method. Examples of accelerating targets are manoeuvring aircraft and missiles. The authors quantify the effects of Doppler smearing. In using a pulse Doppler radar to detect a nonaccelerating target in additive white Gaussian noise and to estimate its radial velocity, the Fourier method provides an output signal-to-noise ratio (SNR) that increases linearly with the number of pulses. When the target is accelerating, the Fourier method may still be used to detect the target and estimate its median velocity, provided the acceleration is small enough in the sense described. For a given acceleration, when the number of pulses is increased, the output SNR of the Fourier method varies as a concave function, increasing to a maximum and then decreasing, before the method fails catastrophically. Thus the number of pulses and the acceleration have to be matched to achieve optimum performance. Empirical formulas for the dependence of the optimum SNR and the optimum number of pulses on the acceleration are given. The results are shown to be relevant to the design of generalised likelihood ratio test detectors that apply a search over a grid [J532]

"Analysis of observed Doppler fading signal in low-VHF band"

Short-term amplitude variations of a tropospheric radio signal are presented and discussed. Radio wave transmissions from Newbury on 46.95 MHz were received at the University of Hull. These fluctuating signals were recorded, edited and finally analysed using time-frequency and regression techniques [J533]

"Iterative receivers for space-time block-coded OFDM systems in dispersive fading channels"

We consider the design of iterative receivers for space-time block-coded orthogonal frequency-division multiplexing (STBC-OFDM) systems in unknown wireless dispersive fading channels, with or without outer channel coding. First, we propose a maximum-likelihood (ML) receiver for STBC-OFDM systems based on the expectation-maximization (EM) algorithm. By assuming that the fading processes remain constant over the duration of one STBC code word and by exploiting the orthogonality property of the STBC as well as the OFDM modulation, we show that the EM-based receiver has a very low computational complexity and that the initialization of the EM receiver is based on the linear minimum mean square error (MMSE) channel estimate for both the pilot and the data transmission. Since the actual fading processes may vary within one STBC code word, we also analyze the effect of a modeling mismatch on the receiver performance and show both analytically and through simulations that the performance degradation due to such a mismatch is negligible for practical Doppler frequencies. We further propose a turbo receiver based on the maximum a posteriori-EM algorithm for STBC-OFDM systems with outer channel coding. Compared with the previous noniterative receiver employing a decision-directed linear channel estimator, the iterative receivers proposed here significantly improve the receiver performance and can approach the ML performance in typical wireless channels with very fast fading, at a reasonable computational complexity well suited for real-time implementations [J534]

"Aeronautical channel modeling"

A class of aeronautical wide-band channel models is proposed, featuring parking and taxi environments, takeoff and landing situations, and en-route scenarios for ground-air and air-air links. Typical and worst case parameter sets are suggested, based on published measurement results and empirical data. The models are suitable for channel emulators that can be easily implemented on digital computers or in hardware and thus are useful for the validation of digital aeronautical links. A time-domain and frequency-domain implementation of such a

channel emulator are derived, and results for a typical multicarrier system are presented. It is shown that the scenarios have distinguishable performance results depending on the underlying maximum ranges and shapes of the Doppler and delay spectra and the presence of a line-of-sight path. Finally, the degrading effects of intersymbol interference and intersubcarrier interference on the multicarrier signal are explained [J535]

"Results of small-signal gain measurements on a supersonic chemical oxygen iodine laser with an advanced nozzle bank"

High-resolution diode laser spectroscopy has been used to probe the gain in the active medium formed by an advanced supersonic chemical oxygen iodine laser (COIL), ejector nozzle bank. The probe beam was directed through the medium at 90° (normal) to the flow velocity and at an angle of 27.5° away from normal incidence. Analysis of the small-signal gain spectrum allowed for the determination of the gain, average gas velocity, static pressure, and temperature. The dependence of gain, temperature, and gas velocity on the primary nitrogen molar flow rate and basic hydrogen peroxide temperature was obtained. A maximum small-signal gain of 7 Ч 10-3cm-1, average gas velocity of 575 m/s, static temperature of 172 K were measured for flow rates of 270 mmole/s of primary nitrogen, 39.2 mmole/s of chlorine, 11 mmole/s of secondary nitrogen, and 0.8 mmole/s of iodine. Estimation of the static pressure in the flow core from spectroscopic data is very close to the static sidewall pressure. The role of transverse velocity components in the gas flow and their effect on the interpretation of gain profiles is discussed [J536]

"Initial synchronization of DS-CDMA via bursty pilot signals"

We consider initial timing acquisition in discrete-sequence code-division multiple-access (DS-CDMA) when propagation is affected by multipath and fading, and where the base-station broadcasts a synchronization pilot signal in the form of bursts of modulated chips transmitted periodically and separated by long silent intervals. Subject to certain simplifying assumptions, we derive the maximum-likelihood (ML) estimator by solving a constrained maximization problem. Our ML timing estimator has constant complexity per observation sample. The relation to other estimation methods is addressed, and performance comparisons are provided by simulation. The proposed estimator yields good performance independently of the multipath-intensity profile of the channel, provided that the delay spread is not larger than a given maximum spread. Moreover, our estimator is fairly robust to the mismatch in the fading Doppler spectrum and provides good performance for both fast and slow fading [J537]

"A space-time correlation model for multielement antenna systems in mobile fading channels"

Analysis and design of multielement antenna systems in mobile fading channels require a model for the space-time cross correlation among the links of the underlying multiple-input multiple-output (MIMO) channel. In this paper, we propose a general space-time cross-correlation function for mobile frequency nonselective Rice fading MIMO channels, in which various parameters of interest such as the angle spreads at the base station and the user, the distance between the base station and the user, mean directions of the signal arrivals, array configurations, and Doppler spread are all taken into account. The new space-time cross-correlation function includes all the relevant parameters of the MIMO fading channel in a clean compact form, suitable for both mathematical analysis and numerical calculations/simulations. It also covers many known correlation models as special cases. We demonstrate the utility of the new space-time correlation model by clarifying the limitations of a widely accepted correlation model for MIMO fading channels. As another application, we quantify the impact of nonisotropic scattering around the user, on the capacity of a MIMO fading channel [J538]

"Minimum mean square error space-varying filtering of interferometric SAR data"

This paper addresses the problem of filtering interferometric synthetic aperture radar (IFSAR) signals in presence of nonplanar topography to mitigate geometrical decorrelation effects. The problem is space-variant. The authors assume knowledge about the scene topography and derive an optimal, minimum mean square error (MMSE), filtering procedure. The algorithm is flexible and, beside the standard stripmap-stripmap interferometry, it may be applied to IFSAR data acquired in any operative mode. For instance, in scan-scan, scan-strip, and scan-spot interferometry. The scene topography contribution may be either derived from an external rough digital elevation model (DEM) or directly estimated from the SAR data. The filtering technique is extended to the azimuth direction to account for possible Doppler centroid decorrelation. Experimental results carried out on real data confirm the validity of the theory and show that this filtering procedure allows the authors to obtain a reduction of the interferometric noise content. Its gain is particularly marked in the cases of steep topography, where application of the standard common band filters could deteriorate the signal quality, or for large Doppler centroid shifts between the two acquisitions [J539]

"Doppler velocimetry of cryogenic ion plasmas"

We describe a technique and present results for imaging wakes and modes excited in a laser-cooled plasma of 9Be+ions in a cylindrical Penning trap. Wakes are created by an off-axis laser "push" beam, while individual modes are excited by sinusoidally time-varying potentials applied to the trap endcaps. Variations in ion velocities are imaged by changes in the ion fluorescence due to Doppler shifts. A comparison between theory and experiment shows good agreement [J540]

"Performance characterisation of hybrid STAP architecture incorporating elevation interferometry"

Radar space-time adaptive processing (STAP) techniques have classically focused on azimuth-Doppler adaptivity while placing minimal emphasis on elevation. Elevation beamforming offers significant clutter suppression improvement, allowing further suppression of interference sources having identical Doppler and azimuth. This work incorporates elevation adaptivity through an interferometric approach, greatly improving clutter suppression while providing an often overlooked target height discrimination capability. A mathematical construct encapsulating the multistage processing framework is developed for the proposed technique. This framework allows extension of the traditional factored time-space (FTS) technique into the azimuth-Doppler-elevation hypercube and represents a subclass of more generalised hybrid methods. The proposed concept is validated through results based on simulated airborne radar data. Target detection improvement of the order of 25 dB, when compared to standard two-dimensional FTS processing, is demonstrated for an 8 Ч 8 nonuniform rectangular array. Elevation pattern data are provided to illustrate achievable null width/depth capabilities. These data also indicate target height discrimination is inherently provided and further development is warranted [J541]

"The effects of disk morphology on flying-height modulation: experiment and simulation"

The effect of morphology on flying height modulation (FHM) of a sub-10 nm flying air bearing slider was studied for three different disks by experiment and simulation. The experimental measurement methods are discussed and a new single beam laser Doppler vibrometer (LDV) measurement method, which yielded the highest resolution with a 2 μm beam spot size, was introduced. Analysis was performed in three different frequency bandwidths-a geometric FHM from 10 to 100 kHz, a dynamically excited FHM from 100 to 500 kHz and the third being negligible compared to the other two bands, above 500 kHz. Transfer function analysis was carried out to investigate the FHM in the lowest frequency band. FHM in the first band was shown to be caused primarily by a phase shift between the sliders' response and the disks' morphology and secondarily by decreasing slider motion with decreasing morphology wavelength, which correlated well with previous work. For two of the disks investigated, the FHM due to the disks' morphology showed air bearing excitation that resulted in an intolerable level of FHM. However, for one of the disks studied, the FHM was as low as the disk morphology for wavelengths of 2 μm and less, which was within tolerable limits. It is concluded that when designing a disk for low FHM, it is not sufficient to characterize the quality of a disk by a single number such as roughness or waviness. Proper design and optimization of both the disk and air bearing slider results in FHM that is lower than the disks' morphology. [J542]

"Space-time fading channel estimation and symbol detection in unknown spatially correlated noise"

We present maximum likelihood (ML) methods for space-time fading channel estimation with an antenna array in spatially correlated noise having unknown covariance; the results are applied to symbol detection. The received signal is modeled as a linear combination of multipath-delayed and Doppler-shifted copies of the transmitted waveform. We consider structured and unstructured array response models and derive the Cramer-Rao bound (CRB) for the unknown directions of arrival, time delays, and Doppler shifts. We also develop methods for spatial and temporal interference suppression. Finally, we propose coherent matched-filter and concentrated-likelihood receivers that account for the spatial noise covariance and analyze their performance [J543]

"A deterministic channel simulation model for spatially correlated Rayleigh fading"

We propose a deterministic vector channel simulation model for generating the fading waveforms that satisfy not only rigorous temporal correlation but also arbitrary spatial correlation by means of Doppler phase difference sampling. The proposed method is more efficient than the conventional pseudonoise (PN) filtered Gaussian model with coloring process in evaluating the laboratory level performance of the mobile communication systems employing adaptive arrays or space diversity [J544]

"Intercarrier interference in MIMO OFDM"

In this paper, we examine multicarrier transmission over time-varying channels. We first develop a model for such a transmission scheme and focus particularly on multiple-input multiple output (MIMO) orthogonal

frequency division multiplexing (OFDM). Using this method, we analyze the impact of time variation within a transmission block (time variation could arise both from Doppler spread of the channel and from synchronization errors). To mitigate the effects of such time variations, we propose a time-domain approach. We design ICI-mitigating block linear filters, and we examine how they are modified in the context of space-time block-coded transmissions. Our approach reduces to the familiar single-tap frequency-domain equalizer when the channel is block time invariant. Channel estimation in rapidly time-varying scenarios becomes critical, and we propose a scheme for estimating channel parameters varying within a transmission block. Along with the channel estimation scheme, we also examine the issue of pilot tone placement and show that in time-varying channels, it may be better to group pilot tones together into clumps that are equispaced onto the FFT grid; this placement technique is in contrast to the common wisdom for time-invariant channels. Finally, we provide numerical results illustrating the performance of these schemes, both for uncoded and space-time block-coded systems. [J545]

"Linear time-variant transformations of generalized almost-cyclostationary signals.II. Development and applications"

For pt. I see ibid., vol.50, no.12, p.2947-61 (2000). In Part I, the problem of the linear time-variant (LTV) filtering is addressed in the fraction-of-time (FOT) probability framework. The adopted approach, which is an alternative to the classical stochastic one, provides a statistical characterization of the systems in terms of functions that can be estimated by a single time-series. The analysis is carried out with reference to the wide class of the generalized almost-cyclostationary (GACS) signals, which includes, as a special case, the class of the almost-cyclostationary (ACS) signals. Examples of applications and developments of the theory introduced in Part I are presented here in Part II. Specifically, the countability of the set of the output cycle frequencies is studied with reference to linear time-variant systems for both ACS and GACS not containing any ACS component input signals. Thus, the linear almost-periodically time-variant filtering and the product modulation are considered in detail. Moreover, several Doppler channel models are analyzed. In all these examples, it is shown that the FOT probability approach allows one to characterize the system and its output in terms of statistical functions that can be measured by a single time-series. Furthermore, the usefulness of considering the linear filtering problem within the class of the GACS signals is clarified, and several pitfalls arising from continuing to adopt for the observed time-series the ACS model when an increase in the data-record length makes the GACS model more appropriate are pointed out. [J546]

"Effect of LiF/metal electrodes on the performance of plastic solar cells"

The insertion of thin interlayers of LiF under the negative metal electrode (Al and Au) of bulk heterojunction solar cells significantly enhances the fill factor and stabilizes high open circuit voltages. Compared to devices without the LiF interfacial layer, the white light efficiencies increase by over 20% up to eta eff 3.3%.Substitution of the LiF by another insulating interlayer SiOxresults in lower overall efficiencies. In the case of a LiF/Au electrode, substantial efficiency enhancement is observed compared to a pristine Au electrode and white light efficiencies up to eta eff 2.3%are reported.copyright 2002 American Institute of Physics. [J547]

"Minimal sample support space-time adaptive processing with fast subspace techniques"

The authors investigate finite data support for subspace or projection methods for STAP which are robust against strong clutter returns. A theoretical analysis of the eigenvector projection technique is presented that provides insight into the problem of determining the optimum choice of the projected clutter subspace and matched filter adjustments (with respect to target Doppler frequency). An estimator of the optimum subspace dimension, which is significantly smaller than clutter rank, as a function of the number of samples is presented. This result, combined with a previously proposed near-optimal eigenvector-free projection techniques with minimal sample support, reduce the computational burden so drastically that even fully adaptive optimum STAP with large degrees of freedom may become practical for real-time applications. [J548]

"Comments on "On the Doppler spectrum at the mobile unit employing a directional antenna""

In the letter by Xu et al. (see ibid., vol.5, p.13-15, Jan. 2001), the Doppler PSD when using directional antenna at the mobile station was derived. However, the ranges in some equations in this letter were not correctly stated. In this letter, we point out the discrepancies and give correct range of values. [J549]

"A Mossbauer spectral study of the magnetic properties of Ho 2 Fe 17 and Ho 2 Fe 17 D 3.8"

The Mossbauer spectra of Ho2Fe17and Ho2Fe17D3.8have been measured between 4.2 and 295 K and analyzed with a model which takes into account both the disordered nonstoichiometric hexagonal Th2Ni17-like structure and the basal orientation of the iron magnetic moments. The isomer shifts of the five crystallographically inequivalent iron sites in both Ho2Fe17and Ho2Fe17D3.8follow the sequence of Wigner-Seitz

cell volumes and their temperature dependence follows the typical second-order Doppler shift. An increase in the weighted average isomer shift upon deuterium insertion results from the lattice expansion. The sequence of the site-averaged hyperfine fields is in agreement with the increasing number of iron near neighbors. The five quadrupole interactions agree with those observed in the paramagnetic spectra of other R2Fe17compounds. For the dumbbell 4eand 4fsites, the asymmetry parameter and the theta angle are zero and 90° in agreement with the site point symmetry and the basal orientation of the iron magnetic moment. For the 6gsite, the asymmetry parameter is zero in agreement with the site point symmetry. In both compounds the 12jsite asymmetry parameter is 0.9 and for the 12ksite this parameter increases from 0.0 in Ho2Fe17to 0.8 in Ho2Fe17D3.8as a result of the insertion of an additional deuterium near neighbor. The theta angles for the magnetically inequivalent 12jand 12ksites differ by 60° as expected in the hexagonal symmetry. The variations with rare-earth of the weighted average isomer shifts and hyperfine fields in R2Fe17,R2Fe17Hx,and R2Fe17N3,are discussed in terms of the lanthanide contraction and lattice expansion upon insertion of hydrogen, or deuterium, or nitrogen and the axial and basal magnetic anisotropy. copyright 2002 American Institute of Physics. [J550]

"A moving-mirror frequency modulator for cold atom spectroscopy"

We have investigated the use of a moving or "Doppler" mirror to probe laser cooled atoms. The device uses the Doppler shift induced on reflection at a moving surface to modulate the frequency of a probing laser beam, with a modulation bandwidth and frequency resolution sufficient for the narrow spectral features typically encountered. We anticipate that the device could be a simple and cost-effective alternative to acousto-optic modulators for cold atom spectroscopy, and demonstrate its usefulness by performing stimulated optical Compton scattering on an optical molasses. copyright 2002 American Institute of Physics. [J551]

"Thinking about energy matters"

We give a short explanation about a new way to examine force of gravity in Nature. With this summary of the general theory, we claim that the right way to achieve this goal is to assume that the world is a chaos of energy constantly flowing in space and creating concentrations in semi-random points in space. [J552]

"Characterization of Mg doped GaN by positron annihilation spectroscopy"

Metalorganic vapor-phase epitaxially grown GaN films have been studied using beam positron annihilation spectroscopy. Positron lifetime and Doppler broadening of annihilation radiation measurements indicate that defects, probably Ga vacancies, are reduced in concentration when films are doped with Mg, as previously observed by other workers. In lightly doped films a homogeneous layer with a minimum defect concentration is present from just below the surface, to a depth of around 0.1 mcm. For heavily doped films, there is evidence of a further substantial decrease in the defect concentration following an anneal to 900 °C. The effects of impurities and defects are discussed. copyright 2002 American Institute of Physics. [J553]

"Robust progressive image transmission over OFDM systems using space-time block code"

A joint source-channel coding (JSCC) scheme for robust progressive image transmission over broadband wireless channels using orthogonal frequency division multiplexing (OFDM) systems with spatial diversity is proposed for the application environments where no feedback channel is available such as broadcasting services. Most of current research about JSCC focuses on either binary symmetric channels (BSC) or additive white Gaussian noise (AWGN) channels. To deal with fading channels in most previous methods, the fading channel is modeled as two state Gilbert-Elliott channel model and the JSCC is normally aimed at the BER of bad channel status, which is not optimal when the channel is at good status. By using diversity techniques and OFDM, the frequency selective fading effects in broadband wireless channels can be significantly decreased and we show that subchannels in OFDM systems approach Gaussian noisy channels when the diversity gain gets large; as a result, the system performance can be improved in terms of throughput and channel coding efficiency. After analyzing the channel property of OFDM systems with spatial diversity, a practical JSCC scheme for OFDM systems is proposed. Simulation results are presented for transmit diversity with different numbers of antennas and different multipath delay and Doppler spread. It is observed from simulations that the performance can be improved more than 4 dB in terms of peak signal-to-noise ratio (PSNR) of the received image Lena and the performance is not very sensitive to different multipath spread and Doppler frequency. [J554]

"Narrowband acoustic Doppler volume backscattering signal .I. Evolutionary spectral analysis"

This paper examines the statistical properties of the narrowband Doppler volume backscattering process and analyzes its evolutionary spectrum. After clarifying the mechanism of both the finite duration Doppler effect and the continuously space-shifted integration process, the first two order time-varying statistics under a more general assumption, i.e., von Mises distribution, of random phase are derived. The generalization permits

nonuniform phase tendency, which occurs in layered medium scattering. Based on the locally stationary process model, the evolutionary spectrum of the signal is derived. It is shown that the variation of the backscattering strength enters the spectrum as an amplitude modulation, whereas the variation of the random phase distribution acts as both the amplitude modulation and the frequency modulation. Finally, the observability of the average flow speed using the spectral centroid estimate is discussed. [J555]

"Doppler estimator operating with matched filter for vehicular spread spectrum radar"

A Doppler estimator is designed for vehicular spread spectrum radar operating with the matched filter. Simulation results demonstrate that the estimated error of the relative speed between the leading car and the host car decreases with the relative speed. The maximum estimated error of the relative speed could be reduced to ±0.15 km/h within 0.84667 μs processing time [J556]

"Doppler compensation for binary phase-coded waveforms"

Codes used in phase-coded pulse compression waveforms suffer from Doppler mismatch. Based on an analysis of the effects of Doppler mismatch on binary phase-coded waveforms, a class of codes is proposed (hereafter referred to as the component codes), its derivation and processing is described, and the performance results are analyzed. This technique solves the problem of the Doppler mismatch of binary phase-coded waveforms at the expense of about 3 dB loss in signal-to-noise ratio (SNR). This technique may be used in tracking applications, such as accurately and rapidly measuring and tracking targets of unknown speeds. Simulation results demonstrate the validity of this technique. [J557]

"Estimation of continuous flat fading MIMO channels"

Multiple-input-multiple-output (MIMO) systems can provide high data rate wireless services in a rich scattering environment. We study one of the proposals for MIMO systems, the Bell Labs Layered Space-Time (BLAST) architecture. Channel estimation using training sequences is required for coherent detection in BLAST. We apply the maximum-likelihood channel estimator and the optimal training sequences for block flat fading channels to continuous flat fading channels and analyze the estimation error. The optimal training length and training interval that maximize the throughput for a given target bit error-rate are found by computer simulations as functions of the Doppler frequency and the number of antennas. [J558]

"Average-rate optimal PSAM transmissions over time-selective fading channels"

Enabling linear minimum-mean square error (LMMSE)-based estimation of random time-selective channels, pilot-symbol-assisted modulation (PSAM) has well-documented merits as a fading counter-measure boosting bit-error rate performance. We design average-rate optimal PSAM transmissions by maximizing a tight lower bound of the average channel capacity. Relying on a simple closed-form expression of this bound in terms of the LMMSE channel estimator variance, we obtain PSAM transmissions with optimal spacing of pilot symbols and optimal allocation of the transmit-power budget between pilot and information symbols. Equi-powered transmitted symbols, channels with special Doppler spectra, and analytical and simulation based comparisons of possible alternatives shed more light on information-theoretic aspects of PSAM-based transmissions. [J559]

"Narrowband acoustic Doppler volume backscattering signal .II. Spectral centroid estimation"

For pt.I see ibid., vol.50, p.2644-2655 (2002). This paper proposes a novel algorithm to estimate the time-varying spectral centroid of the narrowband Doppler volume backscattering signal. It is constructed in a semi-parametric way, that is, modeling parametrically the local narrowband evolutionary spectrum using an AR(2) and nonparametrically adapting its time-varying coefficients using the wavelet shrinkage. The improved performance is gained by the underlying linear prediction function of the AR(2) and the minimax optimality of the unknown smoothness adaptation of the wavelet shrinkage procedure. [J560]

"A study of the air bearing effect on the lubricant displacement using an optical surface analyzer"

Lubricant flow on a hard disk due to a flying head slider was studied using an optical surface analyzer. The tests were performed using a pico (1.25 Ч 1 mm) slider, and a regular modulation of lubricant thickness was observed, which was greater under the lower flying rail of the pico slider as a result of its roll.. The stronger modulation is thought to be due to the higher air bearing pressure under the lower rail. The frequency spectrum clearly showed distinct peaks at 100 and 140 kHz, which were consistent with the natural frequency modes of the flying slider motion detected by an LDV. We also found that the flying slider attitude affected the lubricant thickness modulation as did the disk texture. The lubricant modulation tended to follow the direction of the texture lines within the rail tracks of the slider. We conclude that the behavior of the lubricant layer depends

strongly on the head flying motion. [J561]

"Doppler compensation in forward-looking STAP radar"

For air- and spaceborne MTI radar the clutter Doppler frequency depends on range for all array geometries other than linear sidelooking. This applies particularly to forward-looking arrays. The range dependence of the clutter Doppler causes specific problems in clutter rejection through STAP (space-time adaptive processing) techniques. One aspect is the lack of training data required for adapting the STAP filter. Another aspect is that the STAP filter becomes range dependent. A technique for compensating for the range dependence is proposed. The efficiency of the method is verified by use of clutter data measured with the multichannel radar AER II (airborne experimental radar) [J562]

"VLSI implementation of a 100-μW multirate FSK receiver"

A very low-power frequency-shift keying (FSK) receiver has been designed for dual-purpose operation: deep space applications and general purpose baseband processing. The receiver is based on a novel, almost all-digital architecture. It supports a wide range of data rates and is very robust against large and fast frequency offsets due to Doppler effects. The architecture utilizes subsampling and l-b data processing together with an FFT-based detection scheme to enable power consumption dramatically lower than a conventional implementation., A system/hardware co-design approach allows the use of a number of circuit-level power reduction techniques while still meeting system-level constraints. In particular, we designed a combination of fully parallel and word-serial decimation stages to simultaneously optimize power consumption and silicon area. We also designed a very efficient FFT block that uses approximate arithmetic and pruning to greatly reduce overall complexity. Additional modules, such as direct digital frequency synthesizer (DDFS) and magnitude computation, have also been optimized in view of the targeted system parameters: signal-to-noise ratio and bit-error rate. The entire architecture has been made maximally flexible and power efficient by utilizing local clock gating and simple interstage, handshaking mechanism. The receiver has been implemented in 0.25-μm CMOS technology and takes up under 1 mm2. The power consumption is below 100 μW for data rates below 20 kb/s. Rates up to 2 Mb/s are supported [J563]

"Microwave interrogation of cesium atoms cooled in isotropic light"

Describes here a configuration of an atomic clock using a source of cesium atoms cooled with isotropic light. This three-dimensional (3-D)-cooling scheme yields a number of atoms of nearly 109with a temperature below 100 μK. These values are suitable for metrological applications. We present the preliminary results obtained and give a first estimation of the frequency performances for this kind of atomic clock [J564]

"Communication over Doppler spread channels. II. Receiver characterization and practical results"

For pt. I see ibid., vol. 25, no. 1, p. 62-72 (2000). A receiver for coherent communication through underwater communication channels is analyzed. The receiver performance and stability versus delay spread, Doppler spread, and signal-to-noise ratio is quantified. The stability is governed by the ill-conditioning of a correlation matrix estimate and it sets the limit on how many taps should be used for a channel with a given number of degrees of freedom. The receiver is used extensively on both simulated and real data that are Doppler spread, and good performance in these channels is verified [J565]

"Chaotic communications over radio channels"

The real issues of communicating over radio channels with continuous time chaotic signals are addressed. Synchronized and nonsynchronized methods are assessed. The modeling of radio channels (including multipath and Doppler) is reviewed, and then the effect on chaotic signals is investigated. The bandwidth efficiency of chaotic communication systems is discussed, and compared to conventional methods. The practical issues of symbol synchronization and equalization are discussed. It is pointed out that discussing these systems as spread spectrum is often unhelpful, because a noise free reference signal is not available at the receiver to exploit the excess bandwidth. [J566]

"Local spline approximation of time-varying channel model"

Methods of local spline approximation of random functions described by Clarke's model are investigated. Such a model is known to describe time-varying amplitudes of multipath components in mobile fading channels, Splines of zero, first and second orders with different spline coefficients are compared. The comparison shows that local linear and parabolic splines with quasi-optimal spline coefficients provide a low approximation error. This makes them attractive for estimating and modelling fast fading channels [J567]

"Performance analysis of synchronous MC-CDMA in mobile Rayleigh channel with both delay and Doppler spreads"

Rapid time variations of the mobile communication channel have a dramatic effect on the performance of multicarrier modulation. This paper models the Doppler spread and computes its effect on the bit error rate (BER) for multicarrier code division multiple access (MC-CDMA) transmission and compares it to orthogonal frequency division multiplexing (OFDM). Also, we evaluate the transmission capacity per subcarrier to quantify the potential of MC-CDMA and (coded-) OFDM. We focus on linear receivers, in particular those using the minimum mean-square error (MMSE) criterion. Our channel and system models allow the computation of analytical performance results. Simulations verify some commonly used, yet critical assumptions [J568]

"Super resolution feature extraction of moving targets"

High range resolution (HRR) moving target indicator (MTI) is becoming increasingly important for many military and civilian applications such as the detection and classification of moving targets in strong clutter background. We consider the problem of extracting the HRR features of moving targets with very closely spaced scatterers in the presence of strong stationary clutter, where the range migration and Doppler frequency are taken into account. A relaxation-based algorithm, which is robust and computationally simple, is proposed to deal with the above problem. Numerical results have shown that the proposed algorithm exhibits super resolution and excellent estimation performance [J569]

"Application of the linear dispersion relation with respect to depth inversion and remotely sensed imagery"

Remote sensing methods have been developed to estimate bathymetry through the use of a theoretical relationship between wave speed and water depth known as the linear, finite depth, dispersion equation for surface gravity waves. The authors describe a validation effort encompassing several hundred observations of wavenumber magnitude for sea-swell frequencies obtained over a wide variety of conditions to investigate possible error sources resulting from the practical application of this relationship. These wavenumber estimates were computed from pressure gauge signals using signal processing algorithms that can be equivalently applied to measurements of wave phase as imaged through remote sensors. The major goal was to determine the accuracy of the dispersion relation while attempting to minimize errors associated with sensor positioning, tidal variations, and Doppler shifts due to mean currents. For water depths outside the surf zone, the linear dispersion relation is highly accurate, with average depth estimation errors on the order of 3-9% of the observed depth. In shallower regions, nominally less than 4 m for this field site, where wave breaking is evident and nonlinear shoaling effects are more pronounced, normalized depth errors of over 50% were commonly observed with most predictions being deeper than observations. Strong correlation between these bias errors and measured wave heights emphasizes the importance of accounting for wave amplitude in the calculation of shallow water phase speeds for depth estimation. A simple depth correction is provided to allow for bathymetry estimation within the surf zone [J570]

"Surface clutter due to antenna sidelobes for spaceborne atmospheric radar"

A spaceborne radar for atmospheric observation must be able to detect atmospheric backscatter in the presence of clutter from the surface, due to antenna sidelobes. Such clutter can come from the same pulse as that observing the atmosphere if the radar antenna is pointed off-nadir. However pulses both prior and subsequent to the pulse observing the atmosphere can also contribute to clutter, and surface clutter can be a problem even for nadir-looking radars. Here, the problem is analyzed by deriving a method for computing clutter which includes effects of all contributing transmit pulses, Doppler shifting, finite receiver bandwidth, and curved Earth's surface. The results are applied to analysis of existing radars and design of future radar systems [J571]

"Impact of clutter spectra on radar performance prediction"

The effect on radar detection of the shape of the Doppler spectrum of windblown vegetated ground clutter is analyzed. An extensive experimental campaign carried out by MIT Lincoln Laboratory showed the shape of the windblown clutter Doppler spectrum to be exponential, in contrast to two other widely-used spectral models (i.e., Gaussian and power-law). The detection performance of two classes of surveillance radar, ground-based and Airborne Early Warning, is evaluated and compared against windblown ground clutter using the three above-mentioned Doppler spectral shapes. The analysis is first done with closed-form equations, and subsequently validated using a set of measured clutter data. It is demonstrated that the exponentially shaped Doppler spectrum should be used as the reference to model windblown ground clutter for the prediction of radar detection performance [J572]

"Minimum duration outages in Rayleigh fading channels"

Minimum duration outages have been introduced for lognormal shadow fading where the durations of signal fades were considered in evaluating outages. We develop and analyze such minimum duration outages for channels susceptible to Rayleigh fading. The results show that under typical Doppler frequencies the outages due to Rayleigh fading are more likely to cause frame or packet errors rather than call dropping due to the short time scales in effect [J573]

"On the feasibility of a Doppler weather radar for estimates of drop size distribution using two closely spaced frequencies"

Dual-frequency weather radar data can be gathered using a single broadband power amplifier and antenna for the purpose of estimating parameters of the hydrometeor size distribution. This is an attractive feature for observation platforms that are limited with respect to mass or available power. Whether useful properties of the scattering medium can be obtained from data of this type is the focus of the paper. Generally, as the center frequency or the bandwidth is decreased, the reflectivity factor difference falls below the level of the inherent signal fluctuations. Even if large numbers of independent samples can be gathered to permit estimates of the differential signals, the question remains as to whether the signal can be related unambiguously to properties of the rain or snow. Center frequencies at or near 35 GHz with bandwidths in excess of 5% give relatively strong differential signals. The signal, moreover, is directly related to the median mass diameter of the size distribution. The differential mean Doppler at frequencies where non-Rayleigh scattering effects are significant is also of use because the quantity depends only on the terminal velocity of the drops and is insensitive to the mean air and platform motion. In principle, the mean and differential mean Doppler velocities from a nadir-viewing radar can be used to estimate the mean vertical air motion and the median drop diameter of the size distribution [J574]

"Acoustic and electromagnetic wave interaction: analytical formulation for acousto-electromagnetic scattering behavior of a dielectric cylinder"

An analytical solution for the bistatic electromagnetic (EM) scattering from an acoustically excited vibrating dielectric circular cylinder is presented. The incident acoustic wave causes a boundary deformation as well as a dielectric inhomogeneity within the dielectric cylinder. First, a perturbation method is developed to calculate the EM scattering from a slightly deformed and inhomogeneous dielectric cylinder. Then, assuming the vibration frequency is much smaller than the frequency of the incident EM wave, a closed form expression for the time-frequency response of the bistatic scattered field is obtained. The solution for acoustic scattering from an elastic cylinder is applied to give the displacement on the surface as well as the compression and dilation within the cylinder. Both the surface displacement and the variation in material density (dielectric constant fluctuation) within the cylinder contribute to the Doppler component of the EM scattered field. Results indicate that the Doppler frequencies correspond to the mechanical vibration frequencies of the cylinder and that the Doppler components only become sizeable near frequencies corresponding to the natural modes of free vibration in the cylinder. These resonances depend only on the object properties and are independent of the surrounding medium. Thus, utilizing the information in the Doppler spectrum scattered by an acoustically excited object vibrating at resonance could provide a means for buried object identification [J575]

"Erratum: "Optical coherence techniques for plasma spectrometry" [JRev. Sci. Instrum. 72, 888 (2001)]"

{no data available} [J576]

"Ion dynamics and oscillation frequencies in a linear combined trap"

Ion traps have been pivotal in opening new frontiers for the precision spectroscopy of stable ions. We report on the demonstration of an additional ion trap: the linear combined trap. This device is particularly well suited for trapping ions with unstable nuclei, due to its large range of stability parameters that facilitates external injection online to an accelerator. The motion of an ion in such a linear combined trap is investigated theoretically and experimentally. In the trap ions oscillate harmonically in the radial direction and move nearly harmonically between fixed boundaries along the longitudinal axis. The presence of a homogeneous magnetic field and the applied dc and rf electric fields, lead to a set of coupled Mathieu equations. Their approximate solutions exhibit motional frequencies, which are combinations of shifted macromotion frequencies and the cyclotron frequency. The dependence of these motional frequencies on the applied trapping fields was studied in detail. For the measurements we used small clouds of laser cooled 9Be+ions and crystallized 9Be+ions. The observed oscillation frequencies are compared to both the results of zeroth order analytical solutions and to numerical

simulations in which the frequency spectrum was obtained from the ion orbits by using the fast fourier transform formalism. The various motional resonances were experimentally recorded by applying a weak dipole excitation field to one of the trap electrodes, and by simultaneously observing at resonance the changes in the fluorescence intensity. Depending on the detuning of the cooling laser the ions gain energy during the motional excitation process in such a way that they are shifted further in or out of optical resonance by the Doppler effect. This leads to either positive or negative ion motion signa- ls at the various ion oscillation frequencies. copyright 2001 American Institute of Physics. [J577]

"Vacancies and deep levels in electron-irradiated 6H SiC epilayers studied by positron annihilation and deep level transient spectroscopy"

The annealing behavior of defects in n-type 6H SiC epilayers irradiated with 2 MeV electrons have been studied using positron annihilation and deep level transient spectroscopy. Vacancy-type defects are annealed at 500-700 °C and 1200-1400 °C. From the analysis of Doppler broadening spectra (core electron momentum distribution), the latter annealing process is attributed to the disappearance of complexes related to silicon vacancies and not to nearest neighbor divacancies. Among the observed deep levels, the E1/E2levels show similar annealing behavior to that of positron annihilation centers above 1000 °C. It is thus proposed that the E1/E2levels originate from complexes containing silicon vacancies. copyright 2001 American Institute of Physics. [J578]

"The MOSS camera on H-1NF"

We have configured the modulated optical solid-state spectrometer, a recently developed high-resolution instrument for plasma Doppler spectroscopy, as an imaging spectroscopic camera. The camera features a wide field of view (10°), large aperture (40 mm), and high spectral resolution nu /Delta nu greater than 10 000. The camera installation on the H-1NF Heliac is described, together with the steps in the design process, including field widening. Calibration and characterization of the instrument function is discussed and the instrument performance is illustrated with some sample results of spatially resolved ion temperature measurements in H-1NF. copyright 2001 American Institute of Physics. [J579]

"Optical coherence techniques for plasma spectroscopy (invited)"

A new electro-optically modulated optical solid-state (MOSS) spectrometer has been constructed for high temporal resolution measurement of the coherence of line radiation from plasmas. The instrument is an electro-optically modulated fixed delay polarization interferometer, or Fourier transform spectrometer. It has high light throughput compared with conventional grating based instruments of comparable resolving power while being compact and robust against alignment errors. By employing electro-optical path-length modulation techniques, the spectral information is transferred to the temporal frequency domain and can be obtained using a single photodetector. A wide field-of-view MOSS camera has been developed for imaging applications, while multiple-delay variants of the basic single fixed delay instrument have also been successfully tested. We discuss applications including passive Doppler spectroscopy, charge exchange recombination spectroscopy, and Zeeman and motional Stark effects. For Doppler tomographic applications, we show that such time-domain instruments have certain fundamental advantages, not least of which is a simple relationship between fringe visibility and the line integral of the intensity weighted velocity distribution function. copyright 2001 American Institute of Physics. [J580]

"Simulations of beam-emission spectroscopy on Alcator C-Mod (abstract)"

An eight-channel beam-emission-spectroscopy (BES)1system has been installed on the Alcator C-Mod tokamak, intended for use with a diagnostic neutral hydrogen beam (DNB). Capable of localized measurements from the plasma edge to the plasma core, the BES diagnostic collects light from the first Balmer transition (Halpha)resultant from beam/plasma collisions. The Halpha line splits into several components whose central wavelengths depend on the viewing geometry, the magnetic field, and the beam energy. This is due to the Doppler shifts from viewing the beam off perpendicular, the different velocities of the three mass components of the beam (H, H2,H3),and the large motional Stark effect. Optimal signal-to-noise requires collecting these components while attenuating all other emission: primarily bremsstrahlung and Dalpha radiation (from plasma D0/e-collisions). Tunable bandpass filters are thus required. A BES simulation code has been developed that calculates the brightnesses (bremsstrahlung, Dalpha ,Halpha)versus wavelength using plasma profile data from the C-Mod MDSplus database,2a computation of the beam penetration, the viewing and DNB geometries, and bandpass filter characteristics. The model was first used to estimate signal levels and choose the optimal BES bandpass filters; its ultimate purpose is to determine the shot-to-shot tuning requirements of the filters for different discharge conditions. Comparisons of measured and predicted background bremsstrahlung and Dalpha brightnesses are presented, as are f- irst measurements and calculations of the beam emission. The code is

written in the IDL programming language3utilizing the "widget" graphical user interface. Designed for geometrical and spectral flexibility, it can be modified to simulate other beam diagnostics such as motional-Stark-effect plasma current measurements and charge-exchange recombination spectroscopy, as well as passive diagnostics measuring chord-averaged spectral emission. copyright 2001 American Institute of Physics. [J581]

"First charge exchange recombination spectroscopy and motional Stark effect results from the Madison Symmetric Torus reversed field pinch"

We report on the first results of charge exchange recombination spectroscopy (CHERS) and motional Stark effect (MSE) measurements in the Madison Symmetric Torus reversed field pinch. A 30 keV, 4 A neutral H beam is used in combination with visible and ultraviolet spectroscopy to make the measurements. For CHERS, we find that the C VI line at 3433.69 E yields the largest charge-exchange signal/background ratio and is most clearly resolved from other nearby lines. Equilibrium ion temperature measurements have been made with an existing fast Doppler spectrometer and a higher throughput spectrometer is being designed to do velocity and temperature fluctuation measurements. MSE measurements are made by recording the Doppler shifted Halpha spectrum emitted by the beam with a charge coupled device and imaging spectrometer. We have observed separation of the pi components of the Stark manifold at magnetic fields of about 0.5 T and are considering options for increasing measurement accuracy. copyright 2001 American Institute of Physics. [J582]

"Synchronization improvements using traceability in spread spectrum signal design"

Synchronization improvements using traceability information found in the narrowband auto-ambiguity function (NB AAF) are demonstrated. This new auto-ambiguity function property, traceability, is the key to defining a signal design approach for solving the synchronization problems in spread spectrum system such as communication systems, radar networks, and sonar systems. This work defines the property and introduces a new tracing synchronization scheme that significantly reduces initial synchronization time and the number of false synchronization events [J583]

"High-resolution ISAR imaging of maneuvering targets by means of the range instantaneous Doppler technique: modeling and performance analysis"

Very high resolution inverse synthetic aperture radar (ISAR) imaging of maneuvering targets is a complicated task. In fact, the conventional range Doppler (RD) ISAR technique does not work properly when target motions generate terms higher than the first order in the phase of the received signal relative to each scatterer. This effect typically happens when at least one of these situations occur: (1) very high resolution images are required; (2) the target maneuvers; and (3) the target undergoes significant angular motions (roll, pitch, and yaw). A novel ISAR technique, named range instantaneous Doppler (RID), has been proposed for the reconstruction of very high resolution images of maneuvering targets. In this paper, we analytically show that the RID technique works properly when high-resolution ISAR images are required of maneuvering and/or rolling, pitching, and yawing targets; we also quantify the performance improvement of the RID technique with respect to the RD technique. The problem is tackled from an analytical point of view. First, we define a new model of the ISAR received signal that is valid for maneuvering targets, then we derive and compare the analytical expression of the point spread function (PSF) for the two techniques. Furthermore, we perform a statistical analysis to evaluate the improvement of the RID technique versus the RD technique in terms of spatial resolution. Finally, we prove the effectiveness of the RID technique by simulating the imaging process for two different targets: (1) a ship that undergoes roll, pitch and yaw motions and (2) a fast maneuvering airplane [J584]

"Estimation of mobile speed and average received power in wireless systems using best basis methods"

A new method is presented for estimating the mobile speed and the average received power in general wireless propagation environments. The locally stationary received signal is expanded in a local exponential basis using best basis methods of wavelet analysis. An estimate of the time-varying Doppler power spectrum is obtained together with an estimate of the maximum Doppler frequency, which is proportional to the mobile speed. The average received power is then estimated by integrating the time-varying spectrum. Simulations demonstrate good tracking of variable mobile speed and average received power for a wide range of angular distributions of incident power. The estimator is shown to perform significantly better than an adaptive averaging method described in the literature. The speed and average power estimates are also used to detect the corner effect in urban cellular systems to improve handoff performance and reduce the call dropping rate [J585]

"Two- and three-dimensional ray tracing applied to the land mobile satellite (LMS) propagation

channel"

This work examines the application of ray-tracing propagation models to system simulations for satellite mobile communications. A two-dimensional (2D) and a three-dimensional (3D) algorithm are outlined and compared using canonical propagation problems. Additional comparisons of both models with measurement campaigns are performed. The results show that two-dimensional models are suited for coverage and network planning. For system-design studies, however, three-dimensional ray tracing is mandatory. The novel three-dimensional ray-tracing model is able to predict time series of power delay profiles, Doppler and polarimetric information with high precision. It includes the time-variant correlation between the propagation channels of all visible satellites of an arbitrary satellite constellation. It therefore proves to be especially suited for system investigation of future LMS communication and navigation systems [J586]

"Three-dimensional reconstruction of in vivo blood vessels in human skin using phase-resolved optical Doppler tomography"

Phase-resolved optical Doppler tomography (ODT) has very high sensitivity while maintaining a fast axial scanning rate, making it possible to reconstruct blood flow in three dimensions. Here we demonstrate an ODT system that employed novel signal-processing techniques to remove aliasing effects and artifacts caused by lateral scanning and target movement. The results show that these techniques not only simplified ODT, but also improved lateral scanning speed. Using these signal-processing techniques, three-dimensional images of in vivo blood vessels in human skin were then reconstructed [J587]

"Spectroscopy of a ferroelectric plasma cathode"

Results of spectroscopic investigations of the plasma formed on the surface of a ferroelectric cathode upon the application of a driving pulse are presented. The ferroelectric plasma cathode was made of a solid solution of Sr, Ba, Ti, Nb, Pb, and O. Its front side was covered by Cu grounded strip electrodes. A driving pulse with an amplitude >~18 kV and pulse duration of 400 ns was applied to the rear Cu disk electrode. A Jobin-Yvon 750M spectrometer was used for visible light dispersion. Spectral line profiles were obtained by a fast framing camera. It was shown that light is emitted from the excited ions and neutral atoms of Cu, Pb, Sr, Ba, Ti, and H within the first 50 ns after the beginning of the driving pulse. By analyzing the Doppler broadening of the observed spectral line profiles it was found that the ion and neutral atom temperature is ≤0.8 eV. Analysis of the Stark broadening of the Halpha and Hbeta spectral lines showed the absence of a high (1 kV/cm) electric field which could be developed at the surface of the ferroelectric due to the appearance of noncompensated surface polarization charges. The same Stark analysis also showed that the plasma density does not exceed 1013 cm-3.By comparing the relative intensities of the Halpha and Hbeta spectral lines obtained with the results of collision radiative modeling, the plasma electron temperature was found to be 3 eV. copyright 2001 American Institute of Physics. [J588]

"Analysis of distortion in the high range resolution profile from a perturbed target"

Experimental results have demonstrated that even when a target possesses very small perturbed rotational motion, its high range resolution (HRR) radar image profile can be severely distorted. A numerical model has been developed and is able to accurately simulate the observed distorting effects. The well known range-Doppler coupling effect offers a partial explanation for the distortion of a target's HRR profile when the perturbing rotational motion is constant in time during radar interrogation. A more interesting and much more dramatic situation arises when the perturbing motion is time-varying; severe distortion in the target's HRR profile can occur due to the excitation of higher-order sidebands in the phase of the target echo [J589]

"Bounds on the interchannel interference of OFDM in time-varying impairments"

In this article, tight and universal bounds have been derived for the interchannel interference (ICI) of an orthogonal frequency-division multiplexing (OFDM) signal resulting from Doppler spread. The universal bound depends only on the product of the maximum Doppler frequency and the OFDM symbol duration. The tight bound also depends on the variance of the Doppler spectrum. Compared with the exact ICI expressions derived by other researchers, these bounds are easier to evaluate and can provide useful insight [J590]

"The near-surface current velocity determined from image sequences of the sea surface"

A method to measure the ocean's near-surface current velocity vector based on the analysis of remote sea-surface image sequences was developed. The spatial and temporal records were transformed to the wavenumber-frequency domain, resulting in a three-dimensional (3-D) image power spectrum. In the spectrum, the signal energy of the waves is localized on a shell defined by the dispersion relation of surface waves. The

sum of the sensor's velocity and the near-surface current profile deforms the dispersion shell due to the Doppler-frequency shift. An iterative least-squares fitting technique and an error-estimation model was implemented. To improve the method's accuracy, spectral wave energy found in higher harmonics of the dispersion shell and aliasing effects are taken into account. The most important nonlinear mechanism leading to higher harmonics is explained as resulting from wave shadowing due to the low grazing angles typical for ground- or ship-based radars. The improved method is examined analytically and is tested with Monte Carlo simulations. The variation of the shape of the measured or simulated 3-D image spectra, especially the peak wavenumber, the directional spread, and the main travel direction, controls the behavior and accuracy of the technique. A comparison of velocities acquired by nautical radar and independent Doppler log current measurements is presented. The technique's accuracy, its limits, and its adaptability are discussed. Additional improvements are proposed [J591]

"Optimal “focusing” for low resolution ScanSAR"

Deals with the focusing of low resolution ScanSAR data, for both detected amplitude images and interferometric applications. The SAR reference is exploited to achieve ScanSAR focusing in conventional techniques. Such techniques provide quite effective compensation of the azimuth antenna pattern (e.g. no scalloping) when the azimuth time-bandwidth product of the ScanSAR echo is large, but fail to do so as the burst shortens, being reduced to an ineffective weighting of the output. The result is an azimuth varying distortion of the focused impulse responses, a distortion that is partly compensated for in the multilook average (not available for interferometric applications) at the price of a reduction in the processed Doppler bandwidth. This paper proposes quite a different approach. A set of short kernels, each suitable for “focusing” at a specific azimuth bin, has been optimized to reconstruct source reflectivity in the minimum mean square error sense. That pseudoinversion converges to the “conventional” focusing when the burst extent is large and for short bursts, edge effects are accounted for. These azimuth-varying kernels can be suitably tuned to meet constraints in the resolution/sidelobes trade-off and have proved capable of providing fairly undistorted output and fine resolution. They better exploit the available Doppler bandwidth, maximizing the number of looks and the interferometric quality. A decomposition is suggested that implements the inverse operator as a fast preprocessing to be followed by a conventional ScanSAR processor [J592]

"Frequency estimation in the presence of Doppler spread: performance analysis"

We are concerned with the estimation of the frequency of a complex sinusoid that has been corrupted by complex-valued multiplicative and additive noise. This problem is important in many applications including array processing in the case of spatially distributed sources and synchronization in the context of time-selective channels. The multiplicative noise smears the spectral line due to the sinusoid. This smearing, which is often called Doppler spreading, may significantly degrade the estimation accuracy. The goal of this paper is to analytically assess this degradation. The finite-sample Cramer-Rao bounds (CRBs) are derived, and closed-form expressions are given for the large-sample CRB. The latter gives insights into the effective coherent and noncoherent SNRs for frequency estimation. We then analyze the accuracy of frequency estimators that are based on the angles of the sample covariances. Simulations results are presented to illustrate the theoretical results [J593]

"Finite element simulation of nonlinear wave propagation in thermoviscous fluids including dissipation"

A recently developed finite element method (FEM) for the numerical simulation of nonlinear sound wave propagation in thermoviscous fluids is presented. Based on the nonlinear wave equation as derived by Kuznetsov, typical effects associated with nonlinear acoustics, such as generation of higher harmonics and dissipation resulting from the propagation of a finite amplitude wave through a thermoviscous medium, are covered. An efficient time-stepping algorithm based on a modification of the standard Newmark method is used for solving the nonlinear semidiscrete equation system. The method is verified by comparison with the well-known Fubini and Fay solutions for plane wave problems, where good agreement is found. As a practical application, a high intensity focused ultrasound (HIFU) source is considered. Impedance simulations of the piezoelectric transducer and the complete HIFU source loaded with air and water are performed and compared with measured data. Measurements of radiated low and high amplitude pressure pulses are compared with corresponding simulation results. The obtained good agreement demonstrates validity and applicability of the nonlinear FEM. [J594]

"Performance of coherent DS-SS/QPSK for mobile communications in fast-fading multipath and high-frequency offset"

We derive a closed-form bit error rate (BER) solution for equal- and nonequal-strength L-path channels considering imperfect channel estimation. The channel model assumes independent paths with Rayleigh fading statistics in a single-cell downlink environment. By using a simple maximum likelihood (ML) estimator, the effects of the channel estimation error due to Doppler shift, residual carrier frequency offset, interference, and additive white Gaussian noise are analyzed. In addition, we present the tradeoff between the noise compression capability and phase tracking capability of the ML estimator with observation length as a parameter. The results indicate that even with channel estimation, the high carrier frequency offset makes an uncoded BER unacceptably high. Also, we present two kinds of modulation techniques such as EC-QPSK and NC-QPSK. Through analysis, we show the performance comparison between these modulation techniques. Finally, we verify the derived BER by using Monte Carlo computer simulation [J595]

"Nonlinear dynamic effects at the head-disk interface"

The contact dynamics of pico sliders is investigated using a high bandwidth laser Doppler vibrometer (LDV) and a high bandwidth acoustic emission (AE) sensor. Sliding contact of the slider near the glide avalanche point is analyzed for a lubricant thickness of 1.5 nm, 2.5 nm, and 3.5 nm, respectively. Slider airbearing modes as well as torsional and bending mode vibrations are investigated as a function of disk velocity and lubricant thickness. Damping of the airbearing pitch and roll frequency is found to increase with increased lubricant thickness. Nonlinear slider/lubricant interactions are observed leading to additional peaks in the LDV spectrum near the bending mode frequency. Nonlinear effects due to slider/lubricant interactions are modeled using a nonlinear stiffness term in the equation of motion. The numerical and experimental results are found to be in good agreement [J596]

"Improved modeling of system response in list mode EM reconstruction of Compton scatter camera images"

An improved List Mode EM method for reconstructing Compton scattering camera images has been developed. First, an approximate method for computation of the spatial variation in the detector sensitivity has been derived and validated by Monte Carlo computation. A technique for estimating the relative weight of system matrix coefficients for each gamma in the list has also been employed, as has a method for determining the relative probabilities of emission having come from pixels tallied in each list-mode back-projection. Finally, a technique has been developed for modeling the effects of Doppler broadening and finite detector energy resolution on the relative weights for pixels neighbor to those intersected by the back-projection, based on values for the FWHM of the spread in the cone angle computed by Monte Carlo. Memory issues typically associated with list mode reconstruction are circumvented by storing only a list of the pixels intersected by the back-projections, and computing the weights of the neighboring pixels at each iteration step. Reconstructions have been performed on experimental data for both point and distributed sources [J597]

"On the Doppler power spectrum at the mobile unit employing a directional antenna"

The effects of directional antennas at the mobile unit on the Doppler power spectrum are investigated. The Doppler power spectral density (PSD) functions at the mobile unit employing a directional antenna have been derived and presented. These Doppler PSD functions were derived for both the omnidirectional and directional antenna cases at the base station [J598]

"A compact manufacturable 76-77-GHz radar module for commercial ACC applications"

The design and measured results of a single-substrate transceiver module suitable for 76-77-GHz pulsed-Doppler radar applications are presented. Emphasis on ease of manufacture and cost reduction of commercial millimeter-wave systems is employed throughout as a design parameter. The importance of using predictive modeling techniques in understanding the robustness of the circuit design is stressed. Manufacturing techniques that conform to standard high-volume assembly constraints have been used. The packaged transceiver module, including three waveguide ports and intermediate-frequency output, measures 20 mmЧ22 mmЧ8 mm. The circuit is implemented using discrete GaAs/AlGaAs pseudomorphic high electron mobility transistors (pHEMTs), GaAs Schottky diodes, and varactor diodes, as well as GaAs p-i-n and pHEMT monolithic microwave integrated circuits mounted on a low-cost 127-µm-thick glass substrate. A novel microstrip-to-waveguide transition is described to transform the planar microstrip signal into the waveguide launch. The module is integrated with a quasi-optical antenna. The measured performance of both the component parts and the complete radar transceiver module is described [J599]

"Defects in 30 keV Er + -implanted SiO 2 /Si studied by positron annihilation and cathodoluminescence"

Defects in SiO2 (48 nm)/Siinduced by 30 keV Er ion implantation were studied by positron annihilation. Depth-selective information on defects for samples implanted with doses of 3.0Ч1014and 1.5Ч1015 Er/cm2was obtained by a variable-energy positron beam by measuring Doppler broadening of positron annihilation gamma rays as a function of incident positron energy. Comparison of the results by Doppler broadening with those by electron spin resonance after annealing indicates that the types of defects (which predominantly exist in the SiO2layer) depend on implantation dose. The annealing temperature dependence of positron data is compared with that of the cathodoluminescence intensity at 1.54 mcm, and the possible effect of defects on luminescence intensity is discussed. copyright 2001 American Institute of Physics. [J600]

"Moving target feature extraction for airborne high-range resolution phased-array radar"

We study the feature extraction of moving targets in the presence of temporally and spatially correlated ground clutter for airborne high-range resolution (HRR) phased-array radar. To avoid the range migration problems that occur in HRR radar data, we first divide the HRR range profiles into low-range resolution (LRR) segments. Since each LRR segment contains a sequence of HRR range bins, no information is lost due to the division, and hence, no loss of resolution occurs. We show how to use a vector auto-regressive (VAR) filtering technique to suppress the ground clutter, Then, a parameter estimation algorithm is proposed for target feature extraction. From the VAR-filtered data, the target Doppler frequency and the spatial signature vectors are first estimated by using a maximum likelihood (ML) method. The target phase history and direction-of-arrival (DOA) (or the array steering vector for an unknown array manifold) are then estimated from the spatial signature vectors by minimizing a weighted least squares (WLS) cost function. The target radar cross section (RCS)-related complex amplitude and range-related frequency of each target scatterer are then extracted from the estimated target phase history by using RELAX, which is a relaxation-based high-resolution feature extraction algorithm. Numerical results are provided to demonstrate the performance of the proposed algorithm [J601]

"On the spectral efficiency of wideband CDMA systems"

The reverse-link spectral efficiency is evaluated for a direct-sequence (DS) code division multiple access (CDMA) cellular communication system that employs rapid closed-loop power control and coding with interleaving on channels that exhibit doubly selective Rician fading. The focus of the paper is the effect of the chip rate of the DS spread-spectrum signal on the spectral efficiency of the system. Performance is considered for systems with different numbers of demodulators in the RAKE receiver and for systems both with and without antenna diversity. Channels with different delay spectra and Doppler spreads are used to examine the performance of the system in various operating conditions. The implications of the results for the design of wideband CDMA are discussed [J602]

"Equivalence of flat and classical Doppler sample generators"

It is shown that, as far as the first- and second-order statistics are concerned, samples generated from a flat Doppler spectrum generator having a maximum Doppler frequency fFare equivalent to those generated from a classical generator having a maximum Doppler frequency fC=√2/3fT [J603]

"Time-scale analysis of quadrature Doppler ultrasound signals"

Most Doppler ultrasound systems employ quadrature demodulation techniques at the detection stage. The information concerning flow direction, encoded in the phase relationship between in-phase and quadrature-phase channels, is not obvious at this stage. The complex fast Fourier transform can be used to obtain directional information in the frequency domain, as well as time frequency analysis of Doppler signals. However, it has an inherent time-frequency resolution limitation. The wavelet transform allows the time-frequency resolution compromise to be optimised. Mapping directional information in the scale domain is also desirable. A method is described, based on the utilisation of complex wavelets and negative scales. It eliminates the intermediate processing stages for obtaining directional Doppler signals for time-scale analysis [J604]

"On velocity estimation and correlation properties of narrow-band mobile communication channels"

The estimation of the maximum Doppler spread or, equivalently, the vehicle velocity, is useful in improving handoff algorithms and necessary for the optimal tuning of parameters for systems that adapt to changing channel conditions. We provide a novel velocity estimator based on the spectral moments of the in-phase and the quadrature phase components or the envelope of the received signal. We characterize the joint effects of the Ricean K factor, the directivity and the angle of nonisotropic scattering, and the effects of additive white noise on our estimator and other covariance-based velocity estimators analytically. We also prove the mean-square consistency of the covariance-based velocity estimators under some assumptions on the angle of arrival

distribution. Simulations illustrate our approach and compare with existing techniques [J605]

"Flight path estimation using frequency measurements from a wide aperture acoustic array"

A narrowband technique based on the acoustical Doppler effect is proposed for estimating the trajectory of a turbo-prop aircraft in level flight with constant velocity as it transits over a ground-based passive acoustic sensor array. The basic principle is to measure the temporal variation of the instantaneous frequency (IF) of the acoustic signal received by each sensor and then to minimize the sum of the squared deviations of the IF estimates from their predicted values over a sufficiently long period of time for all sensors. The technique provides estimates of the propeller blade rate and the five source motion parameters that describe the aircraft trajectory. The six dimensional minimization problem is reduced to a five dimensional maximization problem, which is solved numerically using the quasi-Newton method. A simple method is described that provides the initial parameter estimates required for the numerical maximization. The effectiveness of the motion parameter estimation technique is verified using real acoustic data recorded from a wide aperture microphone array during various transits of a turbo-prop aircraft [J606]

"Analytical solution for pulsatile axial flow velocity waveforms in curved elastic tubes"

An analytical solution for pulsatile axial flow velocity waveforms in curved elastic tubes is presented. The result is obtained by exact solution of linearized Navier-Stokes and tube motion equations in a toroidal coordinate system. Fourier analysis is used to divide the flow into constant and oscillatory components which are separately considered. The solution is used to investigate the effects of curvature on volumetric axial velocity flow waveforms, as would be measured by Doppler ultrasound techniques. In typical human arteries, the greatest effects of curvature on the volumetric axial flow are exerted on the constant component and at low values of the frequency parameter for the oscillatory components. Here, the magnitude and phase angle of oscillatory flow in the curved tube, relative to that in the straight tube, differ by maximum values of 1.2% and 0.15 rad, respectively. However, constant flow may vary by as much as 60% at high Dean numbers. The solution is presented in a form similar to Womersley's solution for the straight elastic tube and may, thus, be incorporated into a transmission-line analog model. These models are frequently used to investigate axial flow velocity variations in mammalian circulatory systems and this work offers a tool which may extend these models to incorporate the effects of curvature. [J607]

"The effect of automatic gain control on serial, matched-filter acquisition in direct-sequence packet radio communications"

The performance of a noncoherent serial acquisition technique is evaluated for direct-sequence spread-spectrum packet communications. The acquisition technique that is considered uses threshold crossing of a matched-filter output to detect a fixed-length preamble at the start of each packet. The analysis accounts for frequency mismatch between the transmitter and the receiver due to oscillator inaccuracies and mobility-induced Doppler shifts. It also accounts for the effects of automatic gain control (AGC) in the receiver. The role of the AGC system in determining the acquisition performance is examined. In addition, selection of the optimal acquisition threshold is considered, and a simple method for selection of a good suboptimal threshold is presented. It is shown that use of this threshold results in performance close to that obtained with the optimal threshold over a wide range of channels [J608]

"An experimental study of dimple separations and head-disk impacts of negative pressure slider in unload process"

This paper presents an experimental study of the dimple separation and head-disk impact of negative pressure slider in unloading process. Two types of negative pressure sliders and HGAs with different limiters were used in the experiments. The dimple impacts, which reflect the close of separated dimple in unloading process, were observed in most of the tested cases by using AE measurements. The head-disk impact was occasionally observed for HGA with under larger unload speed, by using electrical resistance measurements. By using LDV and AE measurements, the dimple impact frequencies were characterized from the response of unloaded HGA to an impulse excitation. FEM analysis shows that the HGA with separated dimple has two cantilever mode frequencies, which are correlated with the measured dimple impact frequencies. It was also found that the effects of the difference of the two negative pressure sliders on the impacts features are not obvious, whereas the effect of the limiters and the unloading condition are essential to the impacts [J609]

"Effect of air-bearing design on slider dynamics during unloading process"

Slider dynamics during unloading process are studied experimentally using a laser Doppler vibrometer. A lift tab

of a suspension is vertically lifted to unload the slider, and vertical displacements of the slider and suspension at several locations are measured. Using this procedure, the following steps are clearly observed: (I) the lift tab bending, (II) dimple separation from the slider back surface, (III) contact of a load beam with limiters, and (IV) slider unloading from disk surface followed by the slider vibration. The unloading process for three different sliders with different levels of negative pressure force are examined. As negative pressure force of the slider decreases, slider unloading occurs early and amplitude of the slider vibration after unloading decreases. It is experimentally shown that the slider air-bearing design has a strong effect on dynamics on unloading process [J610]

"Matched filter bounds for wireless communication over Rayleigh fading dispersive channels"

This letter extends the theory of the matched filter bound for fading dispersive channels. We generalize to arbitrary fading, as well as delay, properties of the channel. The channel model is a standard time varying linear filter and the calculation of the matched filter bound is based on a Karhunen-Loeve expansion of the received pulse spectrum when an isolated pulse is transmitted. Results are presented illustrating the various diversity effects. We conclude that in addition to the effect on probability of bit error of implicit delay diversity there is the less well known effect of implicit Doppler diversity in fast fading. The effect on probability of bit error of pulse shaping and explicit diversity is also illustrated [J611]

"On velocity estimation using speckle decorrelation [Jblood]"

Quantitative estimation of blood velocity using Doppler techniques is fundamentally limited because only the axial component can be detected. Speckle decorrelation resulting from scatterer motion may be used to compute non-axial components and to obtain quantitative flow information. Based on both simulations and experimental results, it is shown that the decorrelation technique is feasible only for constant flows. If flow gradients are present, the correlation between two signals along the same line of observation may be significantly affected by the gradients. Therefore, the decorrelation method cannot be used for quantitative flow estimation if flow gradients are not accurately measured and effects on signal correlation are not fully compensated. Results in this paper show that accurate estimation of flow gradients is practically difficult. It is further shown that effects of signal-to-noise ratio (SNR) on the correlation must also be taken into account for quantitative flow analysis. [J612]

"Cramer-Rao bounds for estimating range, velocity, and direction with an active array"

We derive Cramer-Rao bound (CRB) expressions for the range (time delay), velocity (Doppler shift), and direction of a point target using an active radar or sonar array. First, general CRB expressions are derived for a narrowband signal and array model and a space-time separable noise model that allows both spatial and temporal correlation. We discuss the relationship between the CRB and ambiguity function for this model. Then, we specialize our CRB results to the case of temporally white noise and the practically important signal shape of a linear frequency modulated (chirp) pulse sequence. We compute the CRB for a three-dimensional (3-D) array with isotropic sensors in spatially white noise and show that it is a function of the array geometry only through the “moments of inertia” of the array. The volume of the confidence region for the target's location is proposed as a measure of accuracy. For this measure, we show that the highest (and lowest) target location accuracy is achieved if the target lies along one of the principal axes of inertia of the array. Finally, we compare the location accuracies of several array geometries [J613]

"Doppler modelling of radar sea clutter"

Data from a cliff top radar experiment conducted off the south coast of England are examined in order to investigate the applicability of a three-component model for radar Doppler spectra, developed using laboratory wavetank data, to coastal water sea clutter. This is achieved by a detailed analysis of the prominent features in the cliff top radar data in terms of polarisation and Doppler characteristics, and decorrelation times. This analysis confirms the presence of the same Bragg and non-Bragg scattering mechanisms as observed in the laboratory wave tank. A dependence of each of the scattering mechanisms on wind direction can also be inferred, showing that Bragg resonant scattering from capillary waves and non-Bragg scattering from highly disturbed white water after a wave has broken are present in both the up and down wind cases, while the highly polarised HH `sea spikes' appear only when the radar is looking into the wind. It is shown that the three-component Bragg-whitecap-spike model for Doppler spectra is able to describe both the up and down wind cases well, and that the RMS tilt angle of the underlying gravity waves can be extracted from the Bragg scattering polarisation ratio via the composite surface scattering model [J614]

"Experimental analysis of sea clutter in shipborne HFSWR"

The spreading of the dominant first order Bragg lines in shipborne HFSWR (high-frequency surface wave radar) severely obscures targets with Doppler frequencies within the spreading domain. STAP (space-time adaptive processing) is one of the effective methods for solving the problem. The experimental one-dimensional spreading spectrum and two dimensional space-time spectrum of sea clutter in shipborne HFSWR are given. The eigenvalue distribution of the space-time covariance matrix is also obtained. All experimental results show good agreement with the spreading model of sea clutter and theoretical analysis of the eigenspectrum for a random process, which is of advantage for sea clutter suppression and target detection in shipborne HFSWR with STAP [J615]

"Helicopter rotor-blade modulation of antenna radiation characteristics"

This paper investigates rotor modulation on the gain and input impedance of an antenna mounted on a helicopter's fuselage. The rotor blades, which are rotating about an axis with a given angular velocity, continuously modulate the signal transmitted by the antenna and adversely affect the established communication links. In this study, particular emphasis is placed on wire antennas operating within the HF and VHF bands. Specifically, the Doppler spectrum of the magnitude and phase of the radiated field from a vertical and a horizontal short dipole underneath the rotors is computed and analyzed. The variation of the corresponding antenna gain as a function of rotor angle and frequency is also investigated. The same type of analysis is then extended to a 14-ft towel-bar antenna mounted on the tail boom of a 10:1 scaled helicopter model. In addition to gain, the variation of input impedance versus angle and frequency is computed within the HF band. Finally, the bit error rate (BER) assuming a quadrature phase-shift keying (QPSK) modulation is evaluated assuming linearly and circularly polarized receiving antennas [J616]

"Intercarrier interference self-cancellation scheme for OFDM mobile communication systems"

For orthogonal frequency-division multiplexing (OFDM) communication systems, the frequency offsets in mobile radio channels distort the orthogonality between subcarriers resulting in intercarrier interference (ICI). This paper studies an efficient ICI cancellation method termed ICI self-cancellation scheme. The scheme works in two very simple steps. At the transmitter side, one data symbol is modulated onto a group of adjacent subcarriers with a group of weighting coefficients. The weighting coefficients are designed so that the ICI caused by the channel frequency errors can be minimized. At the receiver side, by linearly combining the received signals on these subcarriers with proposed coefficients, the residual ICI contained in the received signals can then be further reduced. The carrier-to-interference power ratio (CIR) can be increased by 15 and 30 dB when the group size is two or three, respectively, for a channel with a constant frequency offset. Although the redundant modulation causes a reduction in bandwidth efficiency, it can be compensated, for example, by using larger signal alphabet sizes. Simulations show that OFDM systems using the proposed ICI self-cancellation scheme perform much better than standard systems while having the same bandwidth efficiency in multipath mobile radio channels with large Doppler frequencies [J617]

"Ground target tracking with STAP radar"

The problem of tracking ground moving targets by a moving radar (airborne, spaceborne) is addressed. Tracking of low Doppler targets within a strong clutter background is of special interest. The motion of the radar platform induces a spreading of the clutter Doppler spectrum so that low Doppler target echoes may be buried in the clutter band. Detection of such targets can be much alleviated by space-time adaptive processing (STAP), which implicitly compensates for the Doppler spread effect caused by the platform motion. Even if STAP is applied, low Doppler targets can be masked by the clutter notch. This physical phenomenon is frequently observed and results in a series of missing detections which may seriously degrade the tracking performance. A new sensor model adapted to STAP is proposed and its benefits to tracking well-separated targets are discussed. By exploiting a priori information on the sensor specific clutter notch, the model in particular provides a more appropriate treatment of missing detections. In this context, the minimum detectable velocity (MDV) proves to be an important sensor parameter, explicitly entering into ground moving target indication (GMTI) tracking [J618]

"Simulation of ISAR imaging of moving targets"

The simulation of inverse synthetic aperture radar (ISAR) imaging of moving targets is described and the effects of the target's rotations on ISAR imaging are analysed. The simulation of ISAR imaging of an aircraft with a circular motion is demonstrated. An ideal ISAR image of a target can be derived by projection of the target onto an image projection plane. Time-varying Doppler shifts induced by roll, pitch and yaw motions are analysed using the rotation matrix and the effective rotation vector. Through the simulation, the individual effect of roll, pitch and yaw motion on ISAR imaging is observed and studied [J619]

СПИСОК ЛИТЕРАТУРЫ

J1. Napolitano A. Sampling of Spectrally Correlated Processes. IEEE Transactions on Signal Processing. - 2011. - Vol. 59, No. 2. - P. 525-539.

J2. Xiaofei Li. Scattering and Doppler Spectral Analysis for Two-Dimensional Linear and Nonlinear Sea Surfaces. / Xiaofei Li, Xiaojian Xu. // IEEE Transactions on Geoscience and Remote Sensing. - 2011. - Vol. 49, No. 2. - P. 603-611.

J3. Zheng Du. Maximum Likelihood Based Channel Estimation for Macrocellular OFDM Uplinks in Dispersive Time-Varying Channels. / Zheng Du, Xuegui Song, Cheng J., Beaulieu N.C. // IEEE Transactions on Wireless Communications. - 2011. - Vol. 10, No. 1. - P. 176-187.

J4. Rezk M. On High Performance MIMO Communications with Imperfect Channel Knowledge. / Rezk M., Friedlander B. // IEEE Transactions on Wireless Communications. - 2011. - Vol. 10, No. 2. - P. 602-613.

J5. Funamoto K. Numerical Analysis of Effects of Measurement Errors on Ultrasonic-Measurement-Integrated Simulation. / Funamoto K., Hayase T., Saijo Y., Yambe T. // IEEE Transactions on Biomedical Engineering. - 2011. - Vol. 58, No. 3. - P. 653-663.

J6. Zrnic D.S. Bias Correction and Doppler Measurement for Polarimetric Phased-Array Radar. / Zrnic D.S., Guifu Zhang, Doviak R.J. // IEEE Transactions on Geoscience and Remote Sensing. - 2011. - Vol. 49, No. 2. - P. 843-853.

J7. Battaglia A. DOMUS: DOppler MUltiple-Scattering Simulator. / Battaglia A., Tanelli S. // IEEE Transactions on Geoscience and Remote Sensing. - 2011. - Vol. 49, No. 1. - P. 442-450.

J8. Rambukkange M.P. Using Doppler Spectra to Separate Hydrometeor Populations and Analyze Ice Precipitation in Multilayered Mixed-Phase Clouds. / Rambukkange M.P., Verlinde J., Eloranta E.W., Flynn C.J., Clothiaux E.E. // IEEE Geoscience and Remote Sensing Letters. - 2011. - Vol. 8, No. 1. - P. 108-112.

J9. Lijia Huang. Focusing of Medium-Earth-Orbit SAR With Advanced Nonlinear Chirp Scaling Algorithm. / Lijia Huang, Xiaolan Qiu, Donghui Hu, Chibiao Ding. // IEEE Transactions on Geoscience and Remote Sensing. - 2011. - Vol. 49, No. 1. - P. 500-508.

J10. Maru K. Laser Doppler Velocimetry for Two-Dimensional Directional Discrimination by Monitoring Scattered Beams in Different Directions. / Maru K., Fujii Y. // IEEE Sensors Journal. - 2011. - Vol. 11, No. 2. - P. 312-318.

J11. Pinsky M. Application of a Simple Adaptive Estimator for an Atmospheric Doppler Radar. / Pinsky M., Figueras i Ventura J., Otto T., Sterkin A., Khain A., Russchenberg H.W.J. // IEEE Transactions on Geoscience and Remote Sensing. - 2011. - Vol. 49, No. 1. - P. 115-127.

J12. Shengqi Zhu. Ground Moving Targets Imaging Algorithm for Synthetic Aperture Radar. / Shengqi Zhu, Guisheng Liao, Yi Qu, Zhengguang Zhou, Xiangyang Liu. // IEEE Transactions on Geoscience and Remote Sensing. - 2011. - Vol. 49, No. 1. - P. 462-477.

J13. Finkel P. Enhanced resonant magnetoelectric coupling in frequency-tunable composite multiferroic bimorph structures. / Finkel P., Bonini J., Garrity E., Bussman K., Gao J., Li J. F., Lofland S. E., Viehland D. // Applied Physics Letters. - 2011. - Vol. 98, No. 9. - P. 092905-092905-3.

J14. Bercoff J. Ultrafast compound doppler imaging: providing full blood flow characterization. / Bercoff J., Montaldo G., Loupas T., Savery D., Me,zie,re F., Fink M., Tanter M. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2011. - Vol. 58, No. 1. - P. 134-147.

J15. Qinghui Liu. Effect of Phase Pattern of Antennas Onboard Flying Spin Satellites on Doppler Measurements. / Qinghui Liu, Matsumoto K., Iwata T., Namiki N., Noda H., Hanada H., Ishihara Y., Goossens S., Kikuchi F., Asari K., Tsuruta S., Ishikawa T., Sasaki S., Takano T. // IEEE Transactions on Aerospace and Electronic Systems. - 2011. - Vol. 47, No. 1. - P. 405-419.

J16. Ao T. Effect of window reflections on photonic Doppler velocimetry measurements. / Ao T., Dolan D. H. // Review of Scientific Instruments. - 2011. - Vol. 82, No. 2. - P. 023907-023907-8.

J17. Liu Shouxian. Analysis of photonic Doppler velocimetry data based on the continuous wavelet transform. / Liu Shouxian, Wang Detian, Li Tao, Chen Guanghua, Li Zeren, Peng Qixian. // Review of Scientific Instruments. - 2011. - Vol. 82, No. 2. - P. 023103-023103-4.

J18. Boyer R. Performance Bounds and Angular Resolution Limit for the Moving Colocated MIMO Radar. IEEE Transactions on Signal Processing. - 2011. - Vol. 59, No. 4. - P. 1539-1552.

J19. Deng X. Track-before-detect procedures for low pulse repetition frequency surveillance radars. / Deng X., Pi Y., Morelande M., Moran B. // IET Radar, Sonar & Navigation. - 2011. - Vol. 5, No. 1. - P. 65-73.

J20. Tao R. Analysing and compensating the effects of range and Doppler frequency migrations in linear frequency modulation pulse compression radar. / Tao R., Zhang N., Wang Y. // IET Radar, Sonar & Navigation. - 2011. - Vol. 5, No. 1. - P. 12-22.

J21. Mahue V. Comparison of pulse subtraction doppler and pulse inversion doppler. / Mahue V., Mari J.M., Eckersley R.J., Meng-Xing Tang. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2011. - Vol. 58, No. 1. - P. 73-81.

J22. Vitelaru C. Time resolved metal line profile by near-ultraviolet tunable diode laser absorption spectroscopy. / Vitelaru C., de Poucques L., Minea T. M., Popa G. // Journal of Applied Physics. - 2011. - Vol. 109, No. 5. - P. 053307-053307-6.

J23. de Wind H.J. DataWare: Sea Clutter and Small Boat Radar Reflectivity Databases [Best of the Web]. / de Wind H.J., Cilliers J.E., Herselman P.L. // IEEE Signal Processing Magazine. - 2010. - Vol. 27, No. 2. - P. 145-148.

J24. Chien-Hung Yeh. Theory and Technology for Standard WiMAX Over Fiber in High Speed Train Systems. / Chien-Hung Yeh, Chi-Wai Chow, Yen-Liang Liu, Sz-Kai Wen, Shi-Yang Chen, Chorng-Ren Sheu, Min-Chien Tseng, Jiunn-Liang Lin, Dar-Zu Hsu, Sien Chi. // Journal of Lightwave Technology. - 2010. - Vol. 28, No. 16. - P. 2327-2336.

J25. Kimura Y. Integrated Laser Doppler Blood Flowmeter Designed to Enable Wafer-Level Packaging. / Kimura Y., Goma M., Onoe A., Higurashi E., Sawada R. // IEEE Transactions on Biomedical Engineering. - 2010. - Vol. 57, No. 8. - P. 2026-2033.

J26. Lamont-Smith T. Electromagnetic scattering from wind blown waves and ripples modulated by longer waves under laboratory conditions. / Lamont-Smith T., Mitomi M., Kawamura T., Waseda T. // IET Radar, Sonar & Navigation. - 2010. - Vol. 4, No. 2. - P. 265-279.

J27. Herbert G.M. Clutter modelling for space-time adaptive processing in airborne radar. IET Radar, Sonar & Navigation. - 2010. - Vol. 4, No. 2. - P. 178-186.

J28. Tomasin S. Analysis of interpolated channel estimation for mobile OFDM systems. / Tomasin S., Butussi M. // IEEE Transactions on Communications. - 2010. - Vol. 58, No. 5. - P. 1578-1588.

J29. Aifei Liu. An Array Error Estimation Method for Constellation SAR Systems. / Aifei Liu, Guisheng Liao, Lun Ma, Qing Xu. // IEEE Geoscience and Remote Sensing Letters. - 2010. - Vol. 7, No. 4. - P. 731-735.

J30. Huigang Wang. Maximum Likelihood Angle-Doppler Estimator using Importance Sampling. / Huigang Wang, Kay S. // IEEE Transactions on Aerospace and Electronic Systems. - 2010. - Vol. 46, No. 2. - P. 610-622.

J31. Caire G. Multiuser MIMO Achievable Rates With Downlink Training and Channel State Feedback. / Caire G., Jindal N., Kobayashi M., Ravindran N. // IEEE Transactions on Information Theory. - 2010. - Vol. 56, No. 6. - P. 2845-2866.

J32. Naqvi A. Investigation of Doppler Features From Wind Turbine Scattering. / Naqvi A., Shang-Te Yang, Hao Ling. // IEEE Antennas and Wireless Propagation Letters. - 2010. - Vol. 9, {no data available}. - P. 485-488.

J33. Grosdidier S. HFSW Radar Model: Simulation and Measurement. / Grosdidier S., Baussard A., Khenchaf A. // IEEE Transactions on Geoscience and Remote Sensing. - 2010. - Vol. 48, No. 9. - P. 3539-3549.

J34. Azuma T. Dual-frequency ultrasound imaging and therapeutic bilaminar array using frequency selective isolation layer. / Azuma T., Ogihara M., Kubota J., Sasaki A., Umemura S.-i., Furuhata H. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2010. - Vol. 57, No. 5. - P. 1211-1224.

J35. Luo T. Saturation throughput analysis of WAVE networks in Doppler spread scenarios. / Luo T., Wen Z., Li J., Chen H.-H. // IET Communications. - 2010. - Vol. 4, No. 7. - P. 817-825.

J36. Blaunstein N. Spectral Properties of Modulated Signal in the Doppler Domain in Urban Radio Channels With Fading. / Blaunstein N., Katz D., Hayakawa M. // IEEE Transactions on Antennas and Propagation. - 2010. - Vol. 58, No. 8. - P. 2795-2800.

J37. Genender E. Simulating the Multipath Channel With a Reverberation Chamber: Application to Bit Error Rate Measurements. / Genender E., Holloway C.L., Remley K.A., Ladbury J.M., Koepke G., Garbe H. // IEEE Transactions on Electromagnetic Compatibility. - 2010. - Vol. 52, No. 4. - P. 766-777.

J38. Yu A. Eigen-based clutter filter design for ultrasound color flow imaging: a review. / Yu A., Lovstakken L. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2010. - Vol. 57, No. 5. - P. 1096-1111.

J39. Jung-Hwan Choi. Characterizing the Impact of Moving Mode-Stirrers on the Doppler Spread Spectrum in a Reverberation Chamber. / Jung-Hwan Choi, Jee-Hoon Lee, Seong-Ook Park. // IEEE Antennas and Wireless Propagation Letters. - 2010. - Vol. 9, {no data available}. - P. 375-378.

J40. Valencia E. Experimental Determination of the Sea Correlation Time Using GNSS-R Coherent Data. / Valencia E., Camps A., Marchan-Hernandez J.F., Rodriguez-Alvarez N., Ramos-Perez I., Bosch-Lluis X. // IEEE Geoscience and Remote Sensing Letters. - 2010. - Vol. 7, No. 4. - P. 675-679.

J41. Burt E.A. A new trapped ion atomic clock based on 201 Hg+. / Burt E.A., Taghavi-Larigani S., Tjoelker R.L. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2010. - Vol. 57, No. 3. - P. 629-635.

J42. Ying Luo. Micro-Doppler Effect Analysis and Feature Extraction in ISAR Imaging With Stepped-Frequency Chirp Signals. / Ying Luo, Qun Zhang, Cheng-wei Qiu, Xian-jiao Liang, Kai-ming Li. // IEEE Transactions on Geoscience and Remote Sensing. - 2010. - Vol. 48, No. 4. - P. 2087-2098.

J43. Khan I. On-Body Diversity Channel Characterization. / Khan I., Nechayev Y.I., Hall P.S. // IEEE Transactions on Antennas and Propagation. - 2010. - Vol. 58, No. 2. - P. 573-580.

J44. Berger C.R. Sparse Channel Estimation for Multicarrier Underwater Acoustic Communication: From Subspace Methods to Compressed Sensing. / Berger C.R., Shengli Zhou, Preisig J.C., Willett P. // IEEE Transactions on Signal Processing. - 2010. - Vol. 58, No. 3. - P. 1708-1721.

J45. Yufeng Zhang. Assessment of arterial distension based on continuous wave Doppler ultrasound with an improved Hilbert-Huang processing. / Yufeng Zhang, Nafeng Su, Zhiyao Li, Zhengpin Gou, Qiuying Chen, Yan Zhang. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2010. - Vol. 57, No. 1. - P. 203-213.

J46. Durisi G. Noncoherent Capacity of Underspread Fading Channels. / Durisi G., Schuster U.G., Bolcskei H., Shamai S. // IEEE Transactions on Information Theory. - 2010. - Vol. 56, No. 1. - P. 367-395.

J47. Al-Dweik A. Carrier Frequency Offset Estimation for OFDM Systems Over Mobile Radio Channels. / Al-Dweik A., Hazmi A., Younis S., Sharif B., Tsimenidis C. // IEEE Transactions on Vehicular Technology. - 2010. - Vol. 59, No. 2. - P. 974-979.

J48. Feng Zhu. ISAR Imaging for Avian Species Identification With Frequency-Stepped Chirp Signals. / Feng Zhu, Ying Luo, Qun Zhang, You-Qian Feng, You-Qing Bai. // IEEE Geoscience and Remote Sensing Letters. - 2010. - Vol. 7, No. 1. - P. 151-155.

J49. Xiaolei Lv. ISAR Imaging of Maneuvering Targets Based on the Range Centroid Doppler Technique. /

Xiaolei Lv, Mengdao Xing, Chunru Wan, Shouhong Zhang. // IEEE Transactions on Image Processing. - 2010. - Vol. 19, No. 1. - P. 141-153.

J50. Huaping Xu. Equivalence Analysis of Accuracy of Geolocation Models for Spaceborne InSAR. / Huaping Xu, Changhui Kang. // IEEE Transactions on Geoscience and Remote Sensing. - 2010. - Vol. 48, No. 1. - P. 480-490.

J51. Munoz-Ferreras J.M. On the Doppler Spreading Effect for the Range-Instantaneous-Doppler Technique in Inverse Synthetic Aperture Radar Imagery. / Munoz-Ferreras J.M., Perez-Martinez F. // IEEE Geoscience and Remote Sensing Letters. - 2010. - Vol. 7, No. 1. - P. 180-184.

J52. Shengqi Zhu. A New Slant-Range Velocity Ambiguity Resolving Approach of Fast Moving Targets for SAR System. / Shengqi Zhu, Guisheng Liao, Yi Qu, Xiangyang Liu, Zhengguang Zhou. // IEEE Transactions on Geoscience and Remote Sensing. - 2010. - Vol. 48, No. 1. - P. 432-451.

J53. Thim H. Response: The Case of Absence of Transverse Doppler Effect. IEEE Transactions on Instrumentation and Measurement. - 2010. - Vol. 59, No. 2. - P. 495.

J54. Qi Qu. Cross-layer distributed joint power control and scheduling for delay-constrained applications over CDMA-based wireless ad-hoc networks. / Qi Qu, Milstein L.B., Vaman D.R. // IEEE Transactions on Communications. - 2010. - Vol. 58, No. 2. - P. 669-680.

J55. Ui-kun Kwon. Spectral efficient transmit diversity techniques without cyclic prefix for fading relay channels. / Ui-kun Kwon, Dae-young Seol, Gi-hong Im. // IEEE Transactions on Communications. - 2010. - Vol. 58, No. 2. - P. 568-577.

J56. Kiracofe Daniel. On eigenmodes, stiffness, and sensitivity of atomic force microscope cantilevers in air versus liquids. / Kiracofe Daniel, Raman Arvind. // Journal of Applied Physics. - 2010. - Vol. 107, No. 3. - P. 033506-033506-9.

J57. Cizek J. Size distributions of nanoscopic holes in Ti /h-BN and Ti/B nanocomposites. / Cizek J., Prochazka I., Morozova O. S., Borchers C., Pundt A. // Journal of Applied Physics. - 2010. - Vol. 107, No. 4. - P. 043509-043509-11.

J58. Taubock G. Compressive Estimation of Doubly Selective Channels in Multicarrier Systems: Leakage Effects and Sparsity-Enhancing Processing. / Taubock G., Hlawatsch F., Eiwen D., Rauhut H. // IEEE Journal of Selected Topics in Signal Processing. - 2010. - Vol. 4, No. 2. - P. 255-271.

J59. Ram S.S. Simulation and Analysis of Human Micro-Dopplers in Through-Wall Environments. / Ram S.S., Christianson C., Youngwook Kim, Hao Ling. // IEEE Transactions on Geoscience and Remote Sensing. - 2010. - Vol. 48, No. 4. - P. 2015-2023.

J60. Yao Yu. MIMO Radar Using Compressive Sampling. / Yao Yu, Petropulu A.P., Poor H.V. // IEEE Journal of Selected Topics in Signal Processing. - 2010. - Vol. 4, No. 1. - P. 146-163.

J61. Sfarti A. Comment on "The Case of Absence of Transverse Doppler Effect". IEEE Transactions on Instrumentation and Measurement. - 2010. - Vol. 59, No. 2. - P. 494-495.

J62. Hijazi H. Joint data QR-detection and Kalman estimation for OFDM time-varying Rayleigh channel complex gains. / Hijazi H., Ros L. // IEEE Transactions on Communications. - 2010. - Vol. 58, No. 1. - P. 170-178.

J63. Hadzi-Velkov Z. Outage rates and outage durations of opportunistic relaying systems. / Hadzi-Velkov Z., Zlatanov N. // IEEE Communications Letters. - 2010. - Vol. 14, No. 2. - P. 148-150.

J64. Chau R. Shock Hugoniot of single crystal copper. / Chau R., Stolken J., Asoka-Kumar P., Kumar M., Holmes N. C. // Journal of Applied Physics. - 2010. - Vol. 107, No. 2. - P. 023506-023506-6.

J65. Arevalo J. Impurity temperature correction factors for the transmission grating spectrometer in the TJ-II stellarator. / Arevalo J., McCarthy K. J., Carmona J. M., Fontdecaba J. M. // Review of Scientific Instruments. - 2010. - Vol. 81, No. 10. - P. 10D705-10D705-3.

J66. Lo. LatinCon13-Planning a Mobile DVB-T Network for Colombia. / Lo,pez-Sa,nchez J., Acero C.G., Go,mez-Barquero D., Cardona N. // IEEE (Revista IEEE America Latina) Latin America Transactions. - 2010. - Vol. 8, No. 4. - P. 444-453.

J67. Ulmke M. GMTI Tracking via the Gaussian Mixture Cardinalized Probability Hypothesis Density Filter. / Ulmke M., Erdinc O., Willett P. // IEEE Transactions on Aerospace and Electronic Systems. - 2010. - Vol. 46, No. 4. - P. 1821-1833.

J68. Andrew R.K. Ship-Suspended Acoustical Transmitter Position Estimation and Motion Compensation. / Andrew R.K., Zarnetske M.R., Howe B.M., Mercer J.A. // IEEE Journal of Oceanic Engineering. - 2010. - Vol. 35, No. 4. - P. 797-810.

J69. Hongwei Gao. Micro-Doppler Signature Extraction from Ballistic Target with Micro-Motions. / Hongwei Gao, Lianggui Xie, Shuliang Wen, Yong Kuang. // IEEE Transactions on Aerospace and Electronic Systems. - 2010. - Vol. 46, No. 4. - P. 1969-1982.

J70. Jindal N. A Unified Treatment of Optimum Pilot Overhead in Multipath Fading Channels. / Jindal N., Lozano A. // IEEE Transactions on Communications. - 2010. - Vol. 58, No. 10. - P. 2939-2948.

J71. Jinbiao Fan. Triaxial Acceleration Measurement for Oblique Penetration Into Concrete Target. / Jinbiao Fan, Yan Wang, Jing Zu, Peng Xu. // IEEE Transactions on Instrumentation and Measurement. - 2010. - Vol. 59, No. 11. - P. 2907-2913.

J72. Socheleau F.-X. Concise Derivation of Scattering Function from Channel Entropy Maximization. / Socheleau F.-X., Laot C., Passerieux J.-M. // IEEE Transactions on Communications. - 2010. - Vol. 58, No. 11. - P. 3098-3103.

J73. Boiardt H. Low Earth Orbit nanosatellite communications using Iridium's network. / Boiardt H., Rodriguez C. // IEEE Aerospace and Electronic Systems Magazine. - 2010. - Vol. 25, No. 9. - P. 35-39.

J74. Qiang Shi. ICI Mitigation for OFDM Using PEKF. IEEE Signal Processing Letters. - 2010. - Vol. 17, No. 12. - P. 981-984.

J75. Shimada M. Ortho-Rectification and Slope Correction of SAR Data Using DEM and Its Accuracy Evaluation. IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing. - 2010. - Vol. 3, No. 4. - P. 657-671.

J76. Mujller T. Special Relativistic Visualization by Local Ray Tracing. / Mujller T., Grottel S., Weiskopf D. // IEEE Transactions on Visualization and Computer Graphics. - 2010. - Vol. 16, No. 6. - P. 1243-1250.

J77. Creese Mathew. Available information in 2D motional Stark effect imaging. / Creese Mathew, Howard John. // Review of Scientific Instruments. - 2010. - Vol. 81, No. 10. - P. 10D722-10D722-3.

J78. Maganga F. Experimental characterisation of flow effects on marine current turbine behaviour and on its wake properties. / Maganga F., Germain G., King J., Pinon G., Rivoalen E. // IET Renewable Power Generation. - 2010. - Vol. 4, No. 6. - P. 498-509.

J79. Brown T. Performance analysis of orthogonal signaling over fast fading channels. / Brown T., Wang M. // IEEE Transactions on Consumer Electronics. - 2010. - Vol. 56, No. 4. - P. 2067-2071.

J80. Boccia L. L-band array for ground-based remote sensing of volcanic eruptions. / Boccia L., Di Massa G., Venneri I. // IET Microwaves, Antennas & Propagation. - 2010. - Vol. 4, No. 12. - P. 2062-2068.

J81. Shimada M. Generating Large-Scale High-Quality SAR Mosaic Datasets: Application to PALSAR Data for Global Monitoring. / Shimada M., Ohtaki T. // IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing. - 2010. - Vol. 3, No. 4. - P. 637-656.

J82. Mousa A. Channels estimation in OFDM system over rician fading channel based on comb-type pilots arrangement. / Mousa A., Mahmoud H. // IET Signal Processing. - 2010. - Vol. 4, No. 5. - P. 598-602.

J83. Zedel L. Resolving Velocity Ambiguity in Multifrequency, Pulse-to-Pulse Coherent Doppler Sonar. / Zedel L., Hay A.E. // IEEE Journal of Oceanic Engineering. - 2010. - Vol. 35, No. 4. - P. 847-851.

J84. Qing Wang. An Experimental Study of WiMAX-Based Passive Radar. / Qing Wang, Chunping Hou, Yilong Lu. // IEEE Transactions on Microwave Theory and Techniques. - 2010. - Vol. 58, No. 12. - P. 3502-3510.

J85. Kado S. Grating spectrometer system for beam emission spectroscopy diagnostics using high-energy negative-ion-based neutral beam injection on LHD. / Kado S., Oishi T., Yoshinuma M., Ida K. // Review of Scientific Instruments. - 2010. - Vol. 81, No. 10. - P. 10D720-10D720-4.

J86. Akoum S. Limited Feedback for Temporally Correlated MIMO Channels With Other Cell Interference. / Akoum S., Heath R.W. // IEEE Transactions on Signal Processing. - 2010. - Vol. 58, No. 10. - P. 5219-5232.

J87. Smith G.E. Multistatic micro-Doppler radar signatures of personnel targets. / Smith G.E., Woodbridge K., Baker C.J., Griffiths H. // IET Signal Processing. - 2010. - Vol. 4, No. 3. - P. 224-233.

J88. Bharathi P. Effect of collisional quenching on the measurement of ion species mix in neutral beam injectors. / Bharathi P., Prahlad V. // Journal of Applied Physics. - 2010. - Vol. 107, No. 12. - P. 123307-123307-8.

J89. Belmonte A. Analysis of Wind Turbines Blockage on Doppler Weather Radar Beams. / Belmonte A., Fabregas X. // IEEE Antennas and Wireless Propagation Letters. - 2010. - Vol. 9, {no data available}. - P. 670-673.

J90. Elhissi A.M.A. Development and characterisation of freeze-dried liposomes containing two anti-asthma drugs. / Elhissi A.M.A., Islam M.A., Arafat B., Taylor M., Ahmed W. // IET Micro & Nano Letters. - 2010. - Vol. 5, No. 3. - P. 184-188.

J91. Orescanin M. Shear modulus estimation with vibrating needle stimulation. / Orescanin M., Insana M.F. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2010. - Vol. 57, No. 6. - P. 1358-1367.

J92. Sarens B. Investigation of contact acoustic nonlinearity in delaminations by shearographic imaging, laser doppler vibrometric scanning and finite difference modeling. / Sarens B., Verstraeten B., Glorieux C., Kalogiannakis G., Van Hemelrijck D. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2010. - Vol. 57, No. 6. - P. 1383-1395.

J93. Juang R.-T. Link adaptation based on repetition coding for mobile worldwide interoperability for microwave access systems. / Juang R.-T., Ting P., Lin H.-P., Lin D.-B. // IET Communications. - 2010. - Vol. 4, No. 9. - P. 1039-1048.

J94. Walsh J. The First-Order High Frequency Radar Ocean Surface Cross Section for an Antenna on a Floating Platform. / Walsh J., Weimin Huang, Gill E. // IEEE Transactions on Antennas and Propagation. - 2010. - Vol. 58, No. 9. - P. 2994-3003.

J95. Meng Ma. An interference self-cancellation technique for SC-FDMA systems. / Meng Ma, Xiaojing Huang, Guo Y. // IEEE Communications Letters. - 2010. - Vol. 14, No. 6. - P. 512-514.

J96. Merched R. Fast Algorithms in Slow and High Doppler Mobile Environments. IEEE Transactions on Wireless Communications. - 2010. - Vol. 9, No. 9. - P. 2890-2901.

J97. Nelson D.J. Formulation of Doppler and cross-ambiguity processes based on delay only. IET Signal Processing. - 2010. - Vol. 4, No. 4. - P. 438-446.

J98. Yu Gan. An Improved SoS Method for Generating Multiple Uncorrelated Rayleigh Fading Waveforms. / Yu Gan, Quan Xu. // IEEE Communications Letters. - 2010. - Vol. 14, No. 7. - P. 641-643.

J99. da Silva F. A Numerical Study of Forward- and Backscattering Signatures on Doppler-Reflectometry Signals. / da Silva F., Heuraux S., Gusakov E.Z., Popov A. // IEEE Transactions on Plasma Science. - 2010. - Vol. 38, No. 9. - P. 2144-2149.

J100. Giremus A. A Rao-Blackwellized Particle Filter for Joint Channel/Symbol Estimation in MC-DS-CDMA Systems. / Giremus A., Grivel E., Grolleau J., Najim M. // IEEE Transactions on Communications. - 2010. - Vol. 58, No. 8. - P. 2292-2304.

J101. Vilaipornsawai U. Joint Data Detection and Channel Estimation for Fading Unknown Time-Varying Doppler Environments. / Vilaipornsawai U., Leib H. // IEEE Transactions on Communications. - 2010. - Vol. 58, No. 8. - P. 2277-2291.

J102. Dolan D. H. Accuracy and precision in photonic Doppler velocimetry. Review of Scientific Instruments. - 2010. - Vol. 81, No. 5. - P. 053905-053905-7.

J103. Kim J. Inter-subcarrier interference compensation in the frequency-hopped single-carrier frequency division multiple access communication system. / Kim J., Ryu H.-G. // IET Communications. - 2010. - Vol. 4, No. 12. - P. 1443-1451.

J104. Wang B. Direct measurement of micromotion speed in a linear quadrupole trap. / Wang B., Zhang J. W., Lu Z. H., Wang L. J. // Journal of Applied Physics. - 2010. - Vol. 108, No. 1. - P. 013108-013108-5.

J105. Jing Zheng. ICI Analysis for FRFT-OFDM Systems to Frequency Offset in Time-Frequency Selective Fading Channels. / Jing Zheng, Zulin Wang. // IEEE Communications Letters. - 2010. - Vol. 14, No. 10. - P. 888-890.

J106. Ceballos Carrascosa P. Adaptive Channel Estimation and Data Detection for Underwater Acoustic MIMO-OFDM Systems. / Ceballos Carrascosa P., Stojanovic M. // IEEE Journal of Oceanic Engineering. - 2010. - Vol. 35, No. 3. - P. 635-646.

J107. Gran F. Adaptive spectral doppler estimation. / Gran F., Jakobsson A., Jensen J.A. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2009. - Vol. 56, No. 4. - P. 700-714.

J108. Callow H.J. Motion-Compensation Improvement for Widebeam, Multiple-Receiver SAS Systems. / Callow H.J., Hayes M.P., Gough P.T. // IEEE Journal of Oceanic Engineering. - 2009. - Vol. 34, No. 3. - P. 262-268.

J109. Qing-Chen Xu. Phase-Coded Interrupted CW Signals and Processors. / Qing-Chen Xu, Zi-Jie Yang, Xiong Hu. // IEEE Transactions on Aerospace and Electronic Systems. - 2009. - Vol. 45, No. 1. - P. 209-220.

J110. Jee-Hoon Lee. Noninvasive Biosignal Detection Radar System Using Circular Polarization. / Jee-Hoon Lee, Jung Man Hwang, Dong Hyuk Choi, Seong-Ook Park. // IEEE Transactions on Information Technology in Biomedicine. - 2009. - Vol. 13, No. 3. - P. 400-404.

J111. Hong Zhang. Cyclostationarity-based doppler spread estimation in mobile fading channels. / Hong Zhang, Abdi A. // IEEE Transactions on Communications. - 2009. - Vol. 57, No. 4. - P. 1061-1067.

J112. Kim Y. Through-Wall Human Tracking With Multiple Doppler Sensors Using an Artificial Neural Network. / Kim Y., Ling H. // IEEE Transactions on Antennas and Propagation. - 2009. - Vol. 57, No. 7. - P. 2116-2122.

J113. Molisch A.F. Propagation Issues for Cognitive Radio. / Molisch A.F., Greenstein L.J., Shafi M. // Proceedings of the IEEE. - 2009. - Vol. 97, No. 5. - P. 787-804.

J114. Souden M. Robust Doppler Spread Estimation in the Presence of a Residual Carrier Frequency Offset. / Souden M., Affes S., Benesty J., Bahroun R. // IEEE Transactions on Signal Processing. - 2009. - Vol. 57, No. 10. - P. 4148-4153.

J115. Peretto L. Analysis of the Effects of Flicker on the Blood-Flow Variation in the Human Eye. / Peretto L., Riva C.E., Rovati L., Salvatori G., Tinarelli R. // IEEE Transactions on Instrumentation and Measurement. - 2009. - Vol. 58, No. 9. - P. 2916-2922.

J116. Ohtsubo J. Numerical Study of Doppler Dynamics in Self-Mixing Semiconductor Lasers. / Ohtsubo J., Kumagai H., Shogenji R. // IEEE Photonics Technology Letters. - 2009. - Vol. 21, No. 11. - P. 742-744.

J117. Yemelyanov K.M. Adaptive Polarization Contrast Techniques for Through-Wall Microwave Imaging Applications. / Yemelyanov K.M., Engheta N., Hoorfar A., McVay J.A. // IEEE Transactions on Geoscience and Remote Sensing. - 2009. - Vol. 47, No. 5. - P. 1362-1374.

J118. Dong-Guk Paeng. Three-dimensional reconstruction of the "bright ring" echogenicity from porcine blood upstream in a stenosed tube. / Dong-Guk Paeng, Kweon-Ho Nam, Min Choi, Shung K.K. // IEEE Transactions

on Ultrasonics, Ferroelectrics and Frequency Control. - 2009. - Vol. 56, No. 4. - P. 880-885.

J119. Finkel Peter. Magnetoelastic/piezoelectric laminated structures for tunable remote contactless magnetic sensing and energy harvesting. / Finkel Peter, Lofland Samuel E., Garrity Ed. // Applied Physics Letters. - 2009. - Vol. 94, No. 7. - P. 072502-072502-3.

J120. Jones T.A. Injection Heights of Biomass Burning Debris Estimated From WSR-88D Radar Observations. / Jones T.A., Christopher S.A. // IEEE Transactions on Geoscience and Remote Sensing. - 2009. - Vol. 47, No. 8. - P. 2599-2605.

J121. Bae Jongsuck. Doppler frequency up conversion of electromagnetic waves in a slotline on an optically excited silicon substrate. / Bae Jongsuck, Xian Yuan Jun, Yamada Sho, Ishikawa Ryo. // Applied Physics Letters. - 2009. - Vol. 94, No. 9. - P. 091120-091120-3.

J122. Esch J. Prolog to On the Complexity of the Verification of the Costas Property. Proceedings of the IEEE. - 2009. - Vol. 97, No. 3. - P. 584-585.

J123. Lesturgie M. Improvement of high-frequency surface waves radar performances by use of multiple-input multiple-output configurations. IET Radar, Sonar & Navigation. - 2009. - Vol. 3, No. 1. - P. 49-61.

J124. Gokalp H. In-band interference reduction in FMCW channel data using Prony modelling. / Gokalp H., Taflan G.Y., Salous S. // Electronics Letters. - 2009. - Vol. 45, No. 2. - P. 132-133.

J125. Jing Song. Effect of Die-Bonding Process on MEMS Device Performance: System-Level Modeling and Experimental Verification. / Jing Song, Qing-An Huang, Ming Li, Jie-Ying Tang. // Journal of Microelectromechanical Systems. - 2009. - Vol. 18, No. 2. - P. 274-286.

J126. Panah A.Y. Optimizing Pilot Locations Using Feedback in OFDM Systems. / Panah A.Y., Vaughan R.G., Heath R.W. // IEEE Transactions on Vehicular Technology. - 2009. - Vol. 58, No. 6. - P. 2803-2814.

J127. Mahinthan V. Cross-Layer Performance Study of Cooperative Diversity System With ARQ. / Mahinthan V., Rutagemwa H., Mark J.W., Xuemin Shen. // IEEE Transactions on Vehicular Technology. - 2009. - Vol. 58, No. 2. - P. 705-719.

J128. Shouxing Qu. An Analysis of Probability Distribution of Doppler Shift in Three-Dimensional Mobile Radio Environments. IEEE Transactions on Vehicular Technology. - 2009. - Vol. 58, No. 4. - P. 1634-1639.

J129. Sili Lu. A Novel SFBC-OFDM Scheme for Doubly Selective Channels. / Sili Lu, Narasimhan B., Al-Dhahir N. // IEEE Transactions on Vehicular Technology. - 2009. - Vol. 58, No. 5. - P. 2573-2578.

J130. Tenner E. The Effect Effect. IEEE Spectrum. - 2009. - Vol. 46, No. 2. - P. 22.

J131. Sazontov A.G. The Influence of Emitter and Receiver Motion on Acoustic Coherence in Shallow Water. / Sazontov A.G., Vdovicheva N.K. // IEEE Journal of Oceanic Engineering. - 2009. - Vol. 34, No. 1. - P. 12-23.

J132. Whitworth T. Optimized training and basis expansion model parameters for doubly-selective channel estimation. / Whitworth T., Ghogho M., McLernon D. // IEEE Transactions on Wireless Communications. - 2009. - Vol. 8, No. 3. - P. 1490-1498.

J133. Kim T.T. Diversity Gains of Power Control With Noisy CSIT in MIMO Channels. / Kim T.T., Caire G. // IEEE Transactions on Information Theory. - 2009. - Vol. 55, No. 4. - P. 1618-1626.

J134. Carretero-Moya J. Application of the radon transform to detect small-targets in sea clutter. / Carretero-Moya J., Gismero-Menoyo J., Asensio-Lopez A., Blanco-del-Campo A. // IET Radar, Sonar & Navigation. - 2009. - Vol. 3, No. 2. - P. 155-166.

J135. Kaibin Huang. Limited Feedback Beamforming Over Temporally-Correlated Channels. / Kaibin Huang, Heath R.W., Andrews J.G. // IEEE Transactions on Signal Processing. - 2009. - Vol. 57, No. 5. - P. 1959-1975.

J136. Hansen K. In vivo validation of a blood vector velocity estimator with MR angiography. / Hansen K., Udesen J., Thomsen C., Jensen J.A., Nielsen M. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2009. - Vol. 56, No. 1. - P. 91-100.

J137. Benedetto J.J. Phase-Coded Waveforms and Their Design. / Benedetto J.J., Konstantinidis I., Rangaswamy M. // IEEE Signal Processing Magazine. - 2009. - Vol. 26, No. 1. - P. 22-31.

J138. Hillesheim J. C. A multichannel, frequency-modulated, tunable Doppler backscattering and reflectometry system. / Hillesheim J. C., Peebles W. A., Rhodes T. L., Schmitz L., Carter T. A., Gourdain P.-A., Wang G. // Review of Scientific Instruments. - 2009. - Vol. 80, No. 8. - P. 083507-083507-8.

J139. Hersey R.K. Adaptive ground clutter suppression for conformal array radar systems. / Hersey R.K., Melvin W.L., McClellan J.H., Culpepper E. // IET Radar, Sonar & Navigation. - 2009. - Vol. 3, No. 4. - P. 357-372.

J140. Nakagawa Kazuhisa. Small single-crystal silicon cantilevers formed by crystal facets for atomic force microscopy. / Nakagawa Kazuhisa, Hashiguchi Gen, Kawakatsu Hideki. // Review of Scientific Instruments. - 2009. - Vol. 80, No. 9. - P. 095104-095104-5.

J141. Burgos-Garcia M. Radar Signature of a Helicopter Illuminated by a Long LFM Signal. / Burgos-Garcia M., Perez-Martinez F., Gismero Menoyo J. // IEEE Transactions on Aerospace and Electronic Systems. - 2009. - Vol. 45, No. 3. - P. 1104-1110.

J142. Young-Jun Lee. Performance of Feedback Cancellers for T-DMB On-Channel Repeaters. / Young-Jun Lee, Ho min Eum, Yong-Tae Lee, Kyung Sik Son, Hyoung-Nam Kim. // IEEE Transactions on Broadcasting. - 2009. - Vol. 55, No. 4. - P. 810-817.

J143. Toni L. Channel Coding for Progressive Images in a 2-D Time-Frequency OFDM Block With Channel Estimation Errors. / Toni L., Yee Sin Chan, Cosman P.C., Milstein L.B. // IEEE Transactions on Image Processing. - 2009. - Vol. 18, No. 11. - P. 2476-2490.

J144. Seifter A. Use of IR pyrometry to measure free-surface temperatures of partially melted tin as a function of shock pressure. / Seifter A., Furlanetto M. R., Grover M., Holtkamp D. B., Macrum G. S., Obst A. W., Payton J. R., Stone J. B., Stevens G. D., Swift D. C., Tabaka L. J., Turley W. D., Veeser L. R. // Journal of Applied Physics. - 2009. - Vol. 105, No. 12. - P. 123526-123526-6.

J145. Yuh-Ren Tsai. Approximate ML Doppler Spread Estimation Over Flat Rayleigh Fading Channels. / Yuh-Ren Tsai, Kai-Jie Yang. // IEEE Signal Processing Letters. - 2009. - Vol. 16, No. 11. - P. 1007-1010.

J146. Liou A.E.-L. Characterization of time variation on 1.9 GHz fixed wireless channels in suburban macrocell environments. / Liou A.E.-L., Sivertsen K.N., Michelson D.G. // IEEE Transactions on Wireless Communications. - 2009. - Vol. 8, No. 8. - P. 3975-3979.

J147. Shum C.K. Orbit Accuracy Requirement for ABYSS: The Space Station Radar Altimeter to Map Global Bathymetry. / Shum C.K., Abusali P.A.M., Chung-Yen Kuo, Hyongki Lee, Ogle J., Raney R.K., Ries J.C., Smith W.H.F., Svehla D., Changyin Zhao. // IEEE Geoscience and Remote Sensing Letters. - 2009. - Vol. 6, No. 4. - P. 653-657.

J148. Talbot S. Time-varying carrier offsets in mobile OFDM. / Talbot S., Farhang-Boroujeny B. // IEEE Transactions on Communications. - 2009. - Vol. 57, No. 9. - P. 2790-2798.

J149. Molisch A. A survey on vehicle-to-vehicle propagation channels. / Molisch A., Tufvesson F., Karedal J., Mecklenbrauker C. // IEEE Wireless Communications. - 2009. - Vol. 16, No. 6. - P. 12-22.

J150. Feng-Yi Yang. Functional changes in arteries induced by pulsed high-intensity focused ultrasound. / Feng-Yi Yang, Wei-Hsiu Chiu, Shing-Hwa Liu, Guan-Liang Lin, Feng-Ming Ho. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2009. - Vol. 56, No. 12. - P. 2643-2649.

J151. Gladkova I. Analysis of Stepped-Frequency Pulse Train Design. IEEE Transactions on Aerospace and Electronic Systems. - 2009. - Vol. 45, No. 4. - P. 1251-1261.

J152. Mendel S. A Phase-Domain All-Digital Phase-Locked Loop Architecture Without Reference Clock Retiming. / Mendel S., Vogel C., Da Dalt N. // IEEE Transactions on Circuits and Systems II: Express Briefs. - 2009. - Vol. 56, No. 11. - P. 860-864.

J153. Laskin E. Nanoscale CMOS Transceiver Design in the 90-170-GHz Range. / Laskin E., Khanpour M.,

Nicolson S.T., Tomkins A., Garcia P., Cathelin A., Belot D., Voinigescu S.P. // IEEE Transactions on Microwave Theory and Techniques. - 2009. - Vol. 57, No. 12. - P. 3477-3490.

J154. Xing X. J. Modulation of propagation characteristics of spin waves induced by perpendicular electric currents. / Xing X. J., Yu Y. P., Li S. W. // Applied Physics Letters. - 2009. - Vol. 95, No. 14. - P. 142508-142508-3.

J155. Zhongshan Zhang. OFDMA uplink frequency offset estimation via cooperative relaying. / Zhongshan Zhang, Wei Zhang, Tellambura C. // IEEE Transactions on Wireless Communications. - 2009. - Vol. 8, No. 9. - P. 4450-4456.

J156. Baosheng Li. MIMO-OFDM for High-Rate Underwater Acoustic Communications. / Baosheng Li, Jie Huang, Shengli Zhou, Ball K., Stojanovic M., Freitag L., Willett P. // IEEE Journal of Oceanic Engineering. - 2009. - Vol. 34, No. 4. - P. 634-644.

J157. Scheiblhofer S. Modeling and performance analysis of SAW reader systems for delay-line sensors. / Scheiblhofer S., Schuster S., Stelzer A. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2009. - Vol. 56, No. 10. - P. 2292-2303.

J158. Emmer M. Radial modulation of single microbubbles. / Emmer M., Vos H., Versluis M., Jong N. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2009. - Vol. 56, No. 11. - P. 2370-2379.

J159. Dhaka R. S. Depth-resolved positron annihilation studies of argon nanobubbles in aluminum. / Dhaka R. S., Gururaj K., Abhaya S., Amarendra G., Amirthapandian S., Panigrahi B. K., Nair K. G. M., Lalla N. P., Barman S. R. // Journal of Applied Physics. - 2009. - Vol. 105, No. 5. - P. 054304-054304-5.

J160. Blunt S.D. Doppler Compensation & Single Pulse Imaging using Adaptive Pulse Compression. / Blunt S.D., Shackelford A.K., Gerlach K., Smith K.J. // IEEE Transactions on Aerospace and Electronic Systems. - 2009. - Vol. 45, No. 2. - P. 647-659.

J161. Li Wei. Atomic-scale structural evolution in amorphous Nd 9 Fe 85 B 6 subjected to severe plastic deformation at room temperature. / Li Wei, Li Xiaohong, Guo Defeng, Sato Kiminori, Gunderov Dmitry V., Stolyarov Vladimir V., Zhang Xiangyi. // Applied Physics Letters. - 2009. - Vol. 94, No. 23. - P. 231904-231904-3.

J162. Xiaoxiang Liu. Effects of Non-Uniform Motion in Through-the-Wall SAR Imaging. / Xiaoxiang Liu, Leung H., Lampropoulos G.A. // IEEE Transactions on Antennas and Propagation. - 2009. - Vol. 57, No. 11. - P. 3539-3548.

J163. Rogers A.J. 3-D ultrasound guidance of autonomous robot for location of ferrous shrapnel. / Rogers A.J., Light E.D., Smith S.W. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2009. - Vol. 56, No. 7. - P. 1301-1303.

J164. Steflekova V. Influence of thin porous Al 2 O 3 layer on aluminum cathode to the H alpha line shape in glow discharge. / Steflekova V., Sisovic N. M., Konjevic N. // Journal of Applied Physics. - 2009. - Vol. 105, No. 11. - P. 116106-116106-3.

J165. Cunge G. Gas temperature measurement in C F 4, S F 6, O 2, Cl 2, and HBr inductively coupled plasmas. / Cunge G., Ramos R., Vempaire D., Touzeau M., Neijbauer M., Sadeghi N. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2009. - Vol. 27, No. 3. - P. 471-478.

J166. Kent B.M. Dynamic Radar Cross Section and Radar Doppler Measurements of Commercial General Electric Windmill Power Turbines Part 1: Predicted and Measured Radar Signatures. / Kent B.M., Hill K.C., Buterbaugh A., Zelinski G., Hawley R., Cravens L., Tri-Van, Vogel C., Coveyou T. // IEEE Antennas and Propagation Magazine. - 2008. - Vol. 50, No. 2. - P. 211-219.

J167. Razavi A. Carrier loop architectures for tracking weak GPS signals. / Razavi A., Gebre-Egziabher D., Akos D.M. // IEEE Transactions on Aerospace and Electronic Systems. - 2008. - Vol. 44, No. 2. - P. 697-710.

J168. Amar A. Localization of Narrowband Radio Emitters Based on Doppler Frequency Shifts. / Amar A., Weiss A.J. // IEEE Transactions on Signal Processing. - 2008. - Vol. 56, No. 11. - P. 5500-5508.

J169. Ahlstrom C. Assessing Aortic Stenosis Using Sample Entropy of the Phonocardiographic Signal in Dogs. / Ahlstrom C., Hoglund K., Hult P., Haggstrom J., Kvart C., Ask P. // IEEE Transactions on Biomedical Engineering. - 2008. - Vol. 55, No. 8. - P. 2107-2109.

J170. Pesatori A. Optical Frequency Standard by HI Doppler-Broadened Absorption and External-Cavity Laser Diode at 1.541. / Pesatori A., Norgia M., Calabrese V., Galzerano G., Bava E., Svelto C. // IEEE Transactions on Instrumentation and Measurement. - 2008. - Vol. 57, No. 8. - P. 1708-1712.

J171. Feng Li. Focusing Azimuth-Invariant Bistatic SAR Data With Chirp Scaling. / Feng Li, Shu Li, Yigong Zhao. // IEEE Geoscience and Remote Sensing Letters. - 2008. - Vol. 5, No. 3. - P. 484-486.

J172. Zhili Long. Study of Temperature Parameter in Au-Ag Wire Bonding. / Zhili Long, Lei Han, Yunxin Wu, Jue Zhong. // IEEE Transactions on Electronics Packaging Manufacturing. - 2008. - Vol. 31, No. 3. - P. 221-226.

J173. Baosheng Li. Multicarrier Communication Over Underwater Acoustic Channels With Nonuniform Doppler Shifts. / Baosheng Li, Shengli Zhou, Stojanovic M., Freitag L., Willett P. // IEEE Journal of Oceanic Engineering. - 2008. - Vol. 33, No. 2. - P. 198-209.

J174. Goes W. Charging and Discharging of Oxide Defects in Reliability Issues. / Goes W., Karner M., Sverdlov V., Grasser T. // IEEE Transactions on Device and Materials Reliability. - 2008. - Vol. 8, No. 3. - P. 491-500.

J175. Berdai A. Adaptation of turbo coding and equalization in turbo equalization for time-varying and frequency-selective channels. / Berdai A., Chouinard J.-Y., Huu Tue Huynh. // Canadian Journal of Electrical and Computer Engineering. - 2008. - Vol. 33, No. 2. - P. 99-108.

J176. Thayaparan T. Motion compensation in ISAR imaging using the registration-restoration-fusion approach. / Thayaparan T., Lampropoulos G., Stankovic L. // IET Signal Processing. - 2008. - Vol. 2, No. 3. - P. 223-236.

J177. Dimas M.T. Space-Time Code Selection for Transmit Antenna Diversity Systems. / Dimas M.T., Torres R.P. // IEEE Transactions on Vehicular Technology. - 2008. - Vol. 57, No. 1. - P. 620-629.

J178. Misiurewicz J. Stretch processing for masking effect removal in noise radar. / Misiurewicz J., Kulpa K. // IET Radar, Sonar & Navigation. - 2008. - Vol. 2, No. 4. - P. 274-283.

J179. Lee B.-S. Doppler effect compensation scheme based on constellation estimation for OFDM system. Electronics Letters. - 2008. - Vol. 44, No. 1. - P. 38-40.

J180. Rigling B.D. Urban RF multipath mitigation. IET Radar, Sonar & Navigation. - 2008. - Vol. 2, No. 6. - P. 419-425.

J181. Poggioni M. A Novel Simulation Model for Coded OFDM in Doppler Scenarios. / Poggioni M., Rugini L., Banelli P. // IEEE Transactions on Vehicular Technology. - 2008. - Vol. 57, No. 5. - P. 2969-2980.

J182. Matrosov S.Y. Assessment of Radar Signal Attenuation Caused by the Melting Hydrometeor Layer. IEEE Transactions on Geoscience and Remote Sensing. - 2008. - Vol. 46, No. 4. - P. 1039-1047.

J183. Swadley S.D. Analysis and Characterization of the SSMIS Upper Atmosphere Sounding Channel Measurements. / Swadley S.D., Poe G.A., Bell W., Ye Hong, Kunkee D.B., McDermid I.S., Leblanc T. // IEEE Transactions on Geoscience and Remote Sensing. - 2008. - Vol. 46, No. 4. - P. 962-983.

J184. Ho-Ryung Jeong. Application of Subarray Averaging and Entropy Minimization Algorithm to Stepped-Frequency ISAR Autofocus. / Ho-Ryung Jeong, Hyo-Tae Kim, Kyung-Tae Kim. // IEEE Transactions on Antennas and Propagation. - 2008. - Vol. 56, No. 4. - P. 1144-1154.

J185. Hurtado M. Polarimetric Detection of Targets in Heavy Inhomogeneous Clutter. / Hurtado M., Nehorai A. // IEEE Transactions on Signal Processing. - 2008. - Vol. 56, No. 4. - P. 1349-1361.

J186. Zhao M. Numerical Study of Microwave Scattering in Breast Tissue via Coupled Dielectric and Elastic Contrasts. / Zhao M., Shea J.D., Hagness S.C., van der Weide D.W., Van Veen B.D., Varghese T. // IEEE Antennas and Wireless Propagation Letters. - 2008. - Vol. 7, {no data available}. - P. 247-250.

J187. Smadi M.A. Performance Analysis of Optimum Diversity Combining for Partially Coherent Frequency-Selective Fading Channel With Intersymbol Interference. / Smadi M.A., Prabhu V.K., Al-Bayati A.K.S. // IEEE Transactions on Vehicular Technology. - 2008. - Vol. 57, No. 6. - P. 3589-3597.

J188. Lamont-Smith T. Azimuth dependence of Doppler spectra of sea clutter at low grazing angle. IET Radar, Sonar & Navigation. - 2008. - Vol. 2, No. 2. - P. 97-103.

J189. Deparis N. UWB in Millimeter Wave Band With Pulsed ILO. / Deparis N., Loyez C., Rolland N., Rolland P.-A. // IEEE Transactions on Circuits and Systems II: Express Briefs. - 2008. - Vol. 55, No. 4. - P. 339-343.

J190. Hai Deng. Reply to "Comments on 'Discrete Frequency-Coding Waveform Design for Netted Radar Systems'". IEEE Signal Processing Letters. - 2008. - Vol. 15, {no data available}. - P. 452.

J191. Ozdemir S.K. A Comparative Study for the Assessment on Blood Flow Measurement Using Self-Mixing Laser Speckle Interferometer. / Ozdemir S.K., Ohno I., Shinohara S. // IEEE Transactions on Instrumentation and Measurement. - 2008. - Vol. 57, No. 2. - P. 355-363.

J192. Gennian Ge. A Systematic Construction for Radar Arrays. / Gennian Ge, Ling A.C.H., Ying Miao. // IEEE Transactions on Information Theory. - 2008. - Vol. 54, No. 1. - P. 410-414.

J193. Le Yang. Doppler-Bearing Tracking in the Presence of Observer Location Error. / Le Yang, Ming Sun, Ho K.C. // IEEE Transactions on Signal Processing. - 2008. - Vol. 56, No. 8. - P. 4082-4087.

J194. Gill E. The Effect of the Bistatic Scattering Angle on the High-Frequency Radar Cross Sections of the Ocean Surface. / Gill E., Weimin Huang, Walsh J. // IEEE Geoscience and Remote Sensing Letters. - 2008. - Vol. 5, No. 2. - P. 143-146.

J195. Oddershede N. Multi-frequency encoding for fast color flow or quadroplex imaging. / Oddershede N., Gran F., Jensen J.A. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2008. - Vol. 55, No. 4. - P. 778-786.

J196. Kannu A.P. Design and Analysis of MMSE Pilot-Aided Cyclic-Prefixed Block Transmissions for Doubly Selective Channels. / Kannu A.P., Schniter P. // IEEE Transactions on Signal Processing. - 2008. - Vol. 56, No. 3. - P. 1148-1160.

J197. Braun N. Sea-Surface Current Features Observed by Doppler Radar. / Braun N., Ziemer F., Bezuglov A., Cysewski M., Schymura G. // IEEE Transactions on Geoscience and Remote Sensing. - 2008. - Vol. 46, No. 4. - P. 1125-1133.

J198. Neidhardt Jorg. Experiment and simulation of the compositional evolution of Ti-B thin films deposited by sputtering of a compound target. / Neidhardt Jorg, Mraz Stanislav, Schneider Jochen M., Strub Erik, Bohne Wolfgang, Liedke Bartosz, Moller Wolfhard, Mitterer Christian. // Journal of Applied Physics. - 2008. - Vol. 104, No. 6. - P. 063304-063304-10.

J199. Nishida Shuhei. Photothermal excitation and laser Doppler velocimetry of higher cantilever vibration modes for dynamic atomic force microscopy in liquid. / Nishida Shuhei, Kobayashi Dai, Sakurada Takeo, Nakazawa Tomonori, Hoshi Yasuo, Kawakatsu Hideki. // Review of Scientific Instruments. - 2008. - Vol. 79, No. 12. - P. 123703-123703-4.

J200. Wang Guiji. The compact capacitor bank CQ-1.5 employed in magnetically driven isentropic compression and high velocity flyer plate experiments. / Wang Guiji, Sun Chengwei, Tan Fuli, Zhao Jianheng, Zhang Ning, Liu Cangli, Mo Jianjun, Wang Ganghua, Wang Xiaosong. // Review of Scientific Instruments. - 2008. - Vol. 79, No. 5. - P. 053904-053904-6.

J201. Nornberg M. D. A liquid metal flume for free surface magnetohydrodynamic experiments. / Nornberg M. D., Ji H., Peterson J. L., Rhoads J. R. // Review of Scientific Instruments. - 2008. - Vol. 79, No. 9. - P. 094501-094501-7.

J202. Doisy Y. Reverberation Suppression Using Wideband Doppler-Sensitive Pulses. / Doisy Y., Deruaz L., van IJsselmuide S.P., Beerens S.P., Been R. // IEEE Journal of Oceanic Engineering. - 2008. - Vol. 33, No. 4. - P. 419-433.

J203. Galushko V. Self-scattering of the HF heater emissions observed at geographically dispersed receiving sites. / Galushko V., Koloskov A., Paznukhov V., Reinisch B., Sales G., Yampolski Y., Zalizovsky A. // IEEE Antennas and Propagation Magazine. - 2008. - Vol. 50, No. 6. - P. 155-161.

J204. Ustun Teoman E. Real-time processing for Fourier domain optical coherence tomography using a field programmable gate array. / Ustun Teoman E., Iftimia Nicusor V., Ferguson R. Daniel, Hammer Daniel X. // Review of Scientific Instruments. - 2008. - Vol. 79, No. 11. - P. 114301-114301-10.

J205. Fang Hui. Erratum: "photoacoustic Doppler flow measurement in optically scattering media" [Appl. Phys. Lett. 91, 264103 (2007)]. / Fang Hui, Maslov Konstantin, Wang Lihong V. // Applied Physics Letters. - 2008. - Vol. 92, No. 6. - P. 069901-069901-1.

J206. Buttler W. T. Comment on "Accuracy limits and window corrections for photon Doppler velocimetry" [J. Appl. Phys. 101, 013523 (2007)]. Journal of Applied Physics. - 2008. - Vol. 103, No. 4. - P. 046102-046102-2.

J207. Kuritsyn A. Probes for measuring fluctuation-induced Maxwell and Reynolds stresses in the edge of the Madison Symmetric Torus reversed field pinch. / Kuritsyn A., Fiksel G., Miller M. C., Almagri A. F., Reyfman M., Sarff J. S. // Review of Scientific Instruments. - 2008. - Vol. 79, No. 10. - P. 10F127-10F127-3.

J208. Schmitz L. Detection of zonal flow spectra in DIII-D by a dual-channel Doppler backscattering system. / Schmitz L., Wang G., Hillesheim J. C., Rhodes T. L., Peebles W. A., White A. E., Zeng L., Carter T. A., Solomon W. // Review of Scientific Instruments. - 2008. - Vol. 79, No. 10. - P. 10F113-10F113-3.

J209. Yuh Howard Y. Simulation of the motional Stark effect diagnostic gas-filled torus calibration. / Yuh Howard Y., Levinton F. M., Scott S. D., Ko J. // Review of Scientific Instruments. - 2008. - Vol. 79, No. 10. - P. 10F523-10F523-4.

J210. Levinton F. M. The motional Stark effect diagnostic on NSTX. / Levinton F. M., Yuh H. // Review of Scientific Instruments. - 2008. - Vol. 79, No. 10. - P. 10F522-10F522-5.

J211. Xu B. X. Thermal effect on slider flight height in heat assisted magnetic recording. / Xu B. X., Yuan H. X., Zhang J., Yang J. P., Ji R., Chong T. C. // Journal of Applied Physics. - 2008. - Vol. 103, No. 7. - P. 07F525-07F525-3.

J212. Ionascut-Nedelcescu A. Calculation of the gas temperature in a throughflow atmospheric pressure dielectric barrier discharge torch by spectral line shape analysis. / Ionascut-Nedelcescu A., Carlone C., Kogelschatz U., Gravelle D. V., Boulos M. I. // Journal of Applied Physics. - 2008. - Vol. 103, No. 6. - P. 063305-063305-9.

J213. Cavazzana Roberto. Robust measurement of group delay in the presence of density fluctuations by means of ultrafast swept reflectometry. / Cavazzana Roberto, Moresco Maurizio. // Review of Scientific Instruments. - 2008. - Vol. 79, No. 10. - P. 10F105-10F105-4.

J214. Kim Tae-Seong. Calculation of extracted ion beam particle distribution including within-extractor collisions from H-alpha Doppler shift measurements. / Kim Tae-Seong, Kim Jinchoon, In Sang Ryul, Jeong Seung Ho. // Review of Scientific Instruments. - 2008. - Vol. 79, No. 2. - P. 02A704-02A704-4.

J215. Rinaldi G. Dynamic Synthesis of Microsystems Using the Segment Rayleigh-Ritz Method. / Rinaldi G., Packirisamy M., Stiharu I. // Journal of Microelectromechanical Systems. - 2008. - Vol. 17, No. 6. - P. 1468-1480.

J216. Guccione P. Comparison of Processing Algorithms for a Delay/Doppler Altimeter. IEEE Geoscience and Remote Sensing Letters. - 2008. - Vol. 5, No. 4. - P. 764-768.

J217. Kon S. A High-Resolution MEMS Piezoelectric Strain Sensor for Structural Vibration Detection. / Kon S., Horowitz R. // IEEE Sensors Journal. - 2008. - Vol. 8, No. 12. - P. 2027-2035.

J218. Pillai U.S. Cramer-Rao bounds for target parameters in space-based radar applications. / Pillai U.S., Ke Yong Li, Himed B. // IEEE Transactions on Aerospace and Electronic Systems. - 2008. - Vol. 44, No. 4. - P. 1356-1370.

J219. Saligheh Rad H. Effects of mobile rotational movements in wireless propagation channels. / Saligheh

Rad H., Gazor S. // IET Communications. - 2008. - Vol. 2, No. 9. - P. 1109-1117.

J220. Ghaleb A. Micro-Doppler analysis of wheels and pedestrians in ISAR imaging. / Ghaleb A., Vignaud L., Nicolas J.M. // IET Signal Processing. - 2008. - Vol. 2, No. 3. - P. 301-311.

J221. Marchan-Hernandez J.F. Correction of the Sea State Impact in the L-Band Brightness Temperature by Means of Delay-Doppler Maps of Global Navigation Satellite Signals Reflected Over the Sea Surface. / Marchan-Hernandez J.F., Rodriguez-Alvarez N., Camps A., Bosch-Lluis X., Ramos-Perez I., Valencia E. // IEEE Transactions on Geoscience and Remote Sensing. - 2008. - Vol. 46, No. 10. - P. 2914-2923.

J222. Shi Jun. Principle and Methods on Bistatic SAR Signal Processing via Time Correlation. / Shi Jun, Xiaoling Zhang, Jianyu Yang. // IEEE Transactions on Geoscience and Remote Sensing. - 2008. - Vol. 46, No. 10. - P. 3163-3178.

J223. Changzhi Li. Random Body Movement Cancellation in Doppler Radar Vital Sign Detection. / Changzhi Li, Jenshan Lin. // IEEE Transactions on Microwave Theory and Techniques. - 2008. - Vol. 56, No. 12. - P. 3143-3152.

J224. Bin Xia. Performance analysis of MMSE detectors for high speed VSF-OFCDM. / Bin Xia, Jiangzhou Wang, Sawahashi M. // IEEE Transactions on Communications. - 2008. - Vol. 56, No. 12. - P. 2013-2019.

J225. Tao Feng. Statistical analysis of mobile radio reception: an extension of clarke's model. / Tao Feng, Field T.R. // IEEE Transactions on Communications. - 2008. - Vol. 56, No. 12. - P. 2007-2012.

J226. Feng Tao. A state-space model for flat fading channels with a novel method of rational function filter design. / Feng Tao, Field T.R. // IEEE Transactions on Wireless Communications. - 2008. - Vol. 7, No. 12. - P. 5316-5325.

J227. Baltag O. Microwaves Doppler Transducer for Noninvasive Monitoring of the Cardiorespiratory Activity. IEEE Transactions on Magnetics. - 2008. - Vol. 44, No. 11. - P. 4484-4487.

J228. Taehyuk Kang. Iterative Carrier Frequency Offset and Channel Estimation for Underwater Acoustic OFDM Systems. / Taehyuk Kang, Iltis R.A. // IEEE Journal on Selected Areas in Communications. - 2008. - Vol. 26, No. 9. - P. 1650-1661.

J229. Burt E.A. A compensated multi-pole linear ion trap mercury frequency standard for ultra-stable timekeeping. / Burt E.A., Diener W.A., Tjoelker R.L. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2008. - Vol. 55, No. 12. - P. 2586-2595.

J230. Cattivelli F.S. Carrier Recovery Enhancement for Maximum-Likelihood Doppler Shift Estimation in Mars Exploration Missions. / Cattivelli F.S., Estabrook P., Satorius E.H., Sayed A.H. // IEEE Journal of Selected Topics in Signal Processing. - 2008. - Vol. 2, No. 5. - P. 658-669.

J231. Sung-Jun Hwang. Efficient Multicarrier Communication for Highly Spread Underwater Acoustic Channels. / Sung-Jun Hwang, Schniter P. // IEEE Journal on Selected Areas in Communications. - 2008. - Vol. 26, No. 9. - P. 1674-1683.

J232. Cilliers J.E. Pulse Compression Sidelobe Reduction by Minimization of Lp -Norms. / Cilliers J.E., Smit J.C. // IEEE Transactions on Aerospace and Electronic Systems. - 2007. - Vol. 43, No. 3. - P. 1238-1247.

J233. Savage C.O. Waveform Selection for Maneuvering Targets Within an IMM Framework. / Savage C.O., Moran B. // IEEE Transactions on Aerospace and Electronic Systems. - 2007. - Vol. 43, No. 3. - P. 1205-1214.

J234. Gerlach K. Radar Pulse Compression Repair. / Gerlach K., Blunt S.D. // IEEE Transactions on Aerospace and Electronic Systems. - 2007. - Vol. 43, No. 3. - P. 1188-1195.

J235. Lin Yang. A Fault-Tolerant Channel-Allocation Algorithm for Cellular Networks With Mobile Base Stations. / Lin Yang, Alouini M.-S. // IEEE Transactions on Vehicular Technology. - 2007. - Vol. 56, No. 1. - P. 349-361.

J236. Ouyang Zhengbiao. Nonlinear analysis of a large-orbit coaxial-waveguide cyclotron autoresonance maser amplifier. / Ouyang Zhengbiao, Zhang Shi-Chang. // Journal of Applied Physics. - 2007. - Vol. 102, No. 7.

- P. 074516-074516-7.

J237. Margetts A.R. Joint scale-lag diversity in wideband mobile direct sequence spread spectrum systems. / Margetts A.R., Schniter P., Swami A. // IEEE Transactions on Wireless Communications. - 2007. - Vol. 6, No. 12. - P. 4308-4319.

J238. Karami E. Tracking Performance of Least Squares MIMO Channel Estimation Algorithm. IEEE Transactions on Communications. - 2007. - Vol. 55, No. 11. - P. 2201-2209.

J239. Santalla del Rio V. Least Squares Estimation of Doppler and Polarimetric Parameters for Weather Targets. IEEE Transactions on Geoscience and Remote Sensing. - 2007. - Vol. 45, No. 11. - P. 3760-3772.

J240. Jingxian Wu. Performance Analysis of Wireless Systems With Doubly Selective Rayleigh Fading. / Jingxian Wu, Chengshan Xiao. // IEEE Transactions on Vehicular Technology. - 2007. - Vol. 56, No. 2. - P. 721-730.

J241. Wei Bai. Effects of Correlative Coding on OFDM Systems for Intercarrier-Interference Suppression. / Wei Bai, Younghak Kim. // IEEE Transactions on Vehicular Technology. - 2007. - Vol. 56, No. 6. - P. 3732-3738.

J242. Pan-Mook Lee. Simulation of an Inertial Acoustic Navigation System With Range Aiding for an Autonomous Underwater Vehicle. / Pan-Mook Lee, Bong-Huan Jun, Kihun Kim, Jihong Lee, Aoki T., Hyakudome T. // IEEE Journal of Oceanic Engineering. - 2007. - Vol. 32, No. 2. - P. 327-345.

J243. Kinsey J.C. In Situ Alignment Calibration of Attitude and Doppler Sensors for Precision Underwater Vehicle Navigation: Theory and Experiment. / Kinsey J.C., Whitcomb L.L. // IEEE Journal of Oceanic Engineering. - 2007. - Vol. 32, No. 2. - P. 286-299.

J244. Jouffroy J. Underwater Vehicle Navigation Using Diffusion-Based Trajectory Observers. / Jouffroy J., Opderbecke J. // IEEE Journal of Oceanic Engineering. - 2007. - Vol. 32, No. 2. - P. 313-326.

J245. Ruegg M. Vibration and Rotation in Millimeter-Wave SAR. / Ruegg M., Meier E., Nuesch D. // IEEE Transactions on Geoscience and Remote Sensing. - 2007. - Vol. 45, No. 2. - P. 293-304.

J246. Valenzuela A. R. Photonic Doppler velocimetry of laser-ablated ultrathin metals. / Valenzuela A. R., Rodriguez G., Clarke S. A., Thomas K. A. // Review of Scientific Instruments. - 2007. - Vol. 78, No. 1. - P. 013101-013101-7.

J247. Acosta-Marum G. Six time- and frequency- selective empirical channel models for vehicular wireless LANs. / Acosta-Marum G., Ingram M.A. // IEEE Vehicular Technology Magazine. - 2007. - Vol. 2, No. 4. - P. 4-11.

J248. Tang Hong. Direct experimental verification of the sound-induced tunable resonance on a flexible electrorheological layer. / Tang Hong, Lee Seung-Yop. // Journal of Applied Physics. - 2007. - Vol. 101, No. 8. - P. 084913-084913-6.

J249. Humeau Anne. Laser Doppler flowmetry signals to quantify effects of isoflurane on the peripheral cardiovascular system of healthy rats. / Humeau Anne, Fizanne Lionel, Roux Jerome, Asfar Pierre, Cales Paul, Rousseau David, Chapeau-Blondeau Francois. // Applied Physics Letters. - 2007. - Vol. 91, No. 26. - P. 263901-263901-3.

J250. Fang Hui. Photoacoustic Doppler flow measurement in optically scattering media. / Fang Hui, Maslov Konstantin, Wang Lihong V. // Applied Physics Letters. - 2007. - Vol. 91, No. 26. - P. 264103-264103-3.

J251. Cretin B. Sensitive ultrasonic vibrometer for very low frequency applications. / Cretin B., Vairac P., Jachez N., Pergaud J. // Review of Scientific Instruments. - 2007. - Vol. 78, No. 8. - P. 085112-085112-5.

J252. Finkel P. Stress dependence and effect of plastic deformation on magnetic hysteresis and anhysteretic magnetization of FeNi32% films. / Finkel P., Lofland S. // Journal of Applied Physics. - 2007. - Vol. 101, No. 9. - P. 09C508-09C508-3.

J253. Macumber D.L. Noise Control Due to the Stator Wake Blade Interaction via Tail Articulation. / Macumber D.L., Annaswamy A., Beal D.N., Huyer S. // IEEE Journal of Oceanic Engineering. - 2007. - Vol. 32, No. 3. - P.

551-564.

J254. Cumming I. G. Adding Sensitivity to the MLBF Doppler Centroid Estimator. / Cumming I. G., Li S. // IEEE Transactions on Geoscience and Remote Sensing. - 2007. - Vol. 45, No. 2. - P. 279-292.

J255. Sanchez-Fernandez M. Performance Analysis and Parameter Optimization of DLL and MEDLL in Fading Multipath Environments for Next Generation Navigation Receivers. / Sanchez-Fernandez M., Aguilera-Forero M., Garcia-Armada A. // IEEE Transactions on Consumer Electronics. - 2007. - Vol. 53, No. 4. - P. 1302-1308.

J256. Kong Ling-Bao. Instability of relativistic electron-beam-dielectric system as a mechanism for microwave generation. / Kong Ling-Bao, Du Chao-Hai, Liu Pu-Kun, Xiao Liu. // Journal of Applied Physics. - 2007. - Vol. 102, No. 10. - P. 103305-103305-3.

J257. Nogues-Correig O. A GPS-Reflections Receiver That Computes Doppler/Delay Maps in Real Time. / Nogues-Correig O., Cardellach Gali E., Sanz Campderros J., Rius A. // IEEE Transactions on Geoscience and Remote Sensing. - 2007. - Vol. 45, No. 1. - P. 156-174.

J258. Martin L. Peter. Application of tape-cast graded impedance impactors for light-gas gun experiments. / Martin L. Peter, Patterson J. Reed, Orlikowski Daniel, Nguyen Jeffrey H. // Journal of Applied Physics. - 2007. - Vol. 102, No. 2. - P. 023507-023507-10.

J259. Gran F. Designing Waveforms for Temporal Encoding Using a Frequency Sampling Method. / Gran F., Jensen J.A. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2007. - Vol. 54, No. 10. - P. 2070-2081.

J260. Jie Liu. SNR Comparisons of Beamforming Strategies. / Jie Liu, Kang-Sik Kim, Insana M.F. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2007. - Vol. 54, No. 5. - P. 1010-1017.

J261. Urazghildiiev I. High-Resolution Estimation of Ranges Using Multiple-Frequency CW Radar. / Urazghildiiev I., Ragnarsson R., Rydberg A. // IEEE Transactions on Intelligent Transportation Systems. - 2007. - Vol. 8, No. 2. - P. 332-339.

J262. Lin J.-C. A Frequency Offset Estimation Technique Based on Frequency Error Characterization for OFDM Communications on Multipath Fading Channels. IEEE Transactions on Vehicular Technology. - 2007. - Vol. 56, No. 3. - P. 1209-1222.

J263. Tadjpour L. An Approximately MAI-Free Multiaccess OFDM System in Fast Time-Varying Channels. / Tadjpour L., Shang-Ho Tsai, Kuo C.-C.J. // IEEE Transactions on Signal Processing. - 2007. - Vol. 55, No. 7. - P. 3787-3799.

J264. Sharawi M.S. Null Steering Approach With Minimized PCV and GD for Large Aperture Vertical Antenna Arrays. / Sharawi M.S., Aloi D.N. // IEEE Transactions on Antennas and Propagation. - 2007. - Vol. 55, No. 7. - P. 2120-2123.

J265. Buerkle A.M. Analysis of Acousto-Electromagnetic Wave Interaction Using Sheet Boundary Conditions and the Finite-Difference Time-Domain Method. / Buerkle A.M., Sarabandi K. // IEEE Transactions on Antennas and Propagation. - 2007. - Vol. 55, No. 7. - P. 1991-1998.

J266. Wan-Jin Kim. Coded Decision-Directed Channel Estimation for Coherent Detection in Terrestrial DMB Receivers. / Wan-Jin Kim, Young-Jun Lee, Hyoung-Nam Kim, Hyoungsoo Lim, Jong Soo Lim. // IEEE Transactions on Consumer Electronics. - 2007. - Vol. 53, No. 2. - P. 319-326.

J267. Axelsson S.R.J. Random Noise Radar/Sodar With Ultrawideband Waveforms. IEEE Transactions on Geoscience and Remote Sensing. - 2007. - Vol. 45, No. 5. - P. 1099-1114.

J268. Hua Jingyu. An Adaptive Doppler Shift Estimator in Mobile Communication Systems. / Hua Jingyu, Zhao Xiaomin, Xu Zhijiang, Meng Limin. // IEEE Antennas and Wireless Propagation Letters. - 2007. - Vol. 6, {no data available}. - P. 117-121.

J269. Bank M. System free of channel problems inherent in changing mobile communication systems. Electronics Letters. - 2007. - Vol. 43, No. 7. - P. 401-402.

J270. Hang-yong Chen. Mathematics of Synthesizing Range Profile. / Hang-yong Chen, Yong-xiang Liu, Xiang Li, Gui-rong Guo. // IEEE Transactions on Signal Processing. - 2007. - Vol. 55, No. 5. - P. 1950-1955.

J271. San Antonio G. MIMO Radar Ambiguity Functions. / San Antonio G., Fuhrmann D.R., Robey F.C. // IEEE Journal of Selected Topics in Signal Processing. - 2007. - Vol. 1, No. 1. - P. 167-177.

J272. Luminati J.E. Doppler aliasing reduction in SAR imagery using stepped-frequency waveforms. / Luminati J.E., Hale T.B., Temple M.A., Havrilla M.J., Oxley M.E. // IEEE Transactions on Aerospace and Electronic Systems. - 2007. - Vol. 43, No. 1. - P. 163-175.

J273. Zijian Tang. Pilot-Assisted Time-Varying Channel Estimation for OFDM Systems. / Zijian Tang, Cannizzaro R.C., Leus G., Banelli P. // IEEE Transactions on Signal Processing. - 2007. - Vol. 55, No. 5. - P. 2226-2238.

J274. Miller D.L. Doppler Mode Pulse Sequences Mitigate Glomerular Capillary Hemorrhage in Contrast-Aided Diagnostic Ultrasound of Rat Kidney. / Miller D.L., Chunyan Dou, Wiggins R.C. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2007. - Vol. 54, No. 9. - P. 1802-1810.

J275. Fronheiser M.P. Analysis of a Vibrating Interventional Device to Improve 3-D Colormark Tracking. / Fronheiser M.P., Smith S.W. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2007. - Vol. 54, No. 8. - P. 1700-1707.

J276. Li P.-C. Photoacoustic Imaging of Multiple Targets Using Gold Nanorods. / Li P.-C., Wei C.-W., Liao C.-K., Chen C.-D., Pao K.-C., Wang C.-R.C., Wu Y.-N., Shieh D.-B. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2007. - Vol. 54, No. 8. - P. 1642-1647.

J277. Peng Tan. Precise BER analysis of π/4-DQPSK OFDM with carrier frequency offset over frequency selective fast fading channels. / Peng Tan, Beaulieu N.C. // IEEE Transactions on Wireless Communications. - 2007. - Vol. 6, No. 10. - P. 3770-3780.

J278. Kalgaonkar K. Ultrasonic Doppler Sensor for Voice Activity Detection. / Kalgaonkar K., Rongquiang Hu, Raj B. // IEEE Signal Processing Letters. - 2007. - Vol. 14, No. 10. - P. 754-757.

J279. Olyaee S. Nonlinearity and frequency-path modelling of three-longitudinal-mode nanometric displacement measurement system. / Olyaee S., Nejad M. // IET Optoelectronics. - 2007. - Vol. 1, No. 5. - P. 211-220.

J280. Dogan H. Iterative Channel Estimation and Decoding of Turbo Coded SFBC-OFDM Systems. / Dogan H., Cirpan H.A., Panayirci E. // IEEE Transactions on Wireless Communications. - 2007. - Vol. 6, No. 8. - P. 3090-3101.

J281. Limin Yu. Optimum Receiver Design for Broadband Doppler Compensation in Multipath/Doppler Channels With Rational Orthogonal Wavelet Signaling. / Limin Yu, White L.B. // IEEE Transactions on Signal Processing. - 2007. - Vol. 55, No. 8. - P. 4091-4103.

J282. Yonghong Zeng. Time, Frequency Synchronization, and Equalization for Asynchronous Multiuser MIMO Systems. / Yonghong Zeng, Leyman A.R. // IEEE Transactions on Wireless Communications. - 2007. - Vol. 6, No. 7. - P. 2593-2601.

J283. Zhi-Hong Jiang. A Chirp Transform Algorithm for Processing Squint Mode FMCW SAR Data. / Zhi-Hong Jiang, Kan Huang-Fu, Jian-Wei Wan. // IEEE Geoscience and Remote Sensing Letters. - 2007. - Vol. 4, No. 3. - P. 377-381.

J284. Verschuur G.L. On the Critical Ionization Velocity Effect in Interstellar Space and Possible Detection of Related Continuum Emission. IEEE Transactions on Plasma Science. - 2007. - Vol. 35, No. 4. - P. 759-766.

J285. Goodman N.A. Optimum and decentralized detection for multistatic airborne radar. / Goodman N.A., Bruyere D. // IEEE Transactions on Aerospace and Electronic Systems. - 2007. - Vol. 43, No. 2. - P. 806-813.

J286. Haspert K. Template-Based Target Identification and Confusion Matrices [AESS Tutorial IV]. / Haspert K., Heagy J., Sullivan R. // IEEE Aerospace and Electronic Systems Magazine. - 2007. - Vol. 22, No. 9. - P. 53-67.

J287. Ye Jiang. Discrete time-scale characterization of wideband time-varying systems. / Ye Jiang, Papandreou-Suppappola A. // IEEE Transactions on Signal Processing. - 2006. - Vol. 54, No. 4. - P. 1364-1375.

J288. Jin Zhang. Performance of multicarrier DS/SSMA over fast Rayleigh fading channels with Doppler diversity. / Jin Zhang, Lehnert J.S. // IEEE Transactions on Communications. - 2006. - Vol. 54, No. 2. - P. 273-283.

J289. Bedicks G. Jr. Results of the ISDB-T system tests, as part of digital TV study carried out in Brazil. / Bedicks G. Jr., Yamada F., Sukys F., Dantas C.E.S., Raunheitte L.T.M., Akamine C. // IEEE Transactions on Broadcasting. - 2006. - Vol. 52, No. 1. - P. 38-44.

J290. Chen V.C. Micro-Doppler effect in radar: phenomenon, model, and simulation study. / Chen V.C., Li F., Ho S.-S., Wechsler H. // IEEE Transactions on Aerospace and Electronic Systems. - 2006. - Vol. 42, No. 1. - P. 2-21.

J291. Hai Deng. Image feature-based space-time processing for ground moving target detection. / Hai Deng, Himed B., Wicks M.C. // IEEE Signal Processing Letters. - 2006. - Vol. 13, No. 4. - P. 216-219.

J292. Chua-Chin Wang. High-sensitivity and high-mobility compact DVB-T receiver for in-car entertainment. / Chua-Chin Wang, Tzung-Je Lee, Hoi Kam Lo, Shih-Ping Lin, Ron Hu. // IEEE Transactions on Consumer Electronics. - 2006. - Vol. 52, No. 1. - P. 21-25.

J293. Toledo A.L. A cross-layer TCP modelling framework for MIMO wireless systems. / Toledo A.L., Xiaodong Wang, Lu B. // IEEE Transactions on Wireless Communications. - 2006. - Vol. 5, No. 4. - P. 920-929.

J294. Geng-Shi Jeng. Vector-velocity estimation in swept-scan using a K-space approach. / Geng-Shi Jeng, Pai-Chi Li. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2006. - Vol. 53, No. 5. - P. 947-958.

J295. Hsiao-Chun Wu. Analysis and characterization of intercarrier and interblock interferences for wireless mobile OFDM systems. IEEE Transactions on Broadcasting. - 2006. - Vol. 52, No. 2. - P. 203-210.

J296. Kageyama K. Doppler effect in flexible and expandable light waveguide and development of new fiber-optic vibration/acoustic sensor. / Kageyama K., Murayama H., Uzawa K., Ohsawa I., Kanai M., Akematsu Y., Nagata K., Ogawa T. // Journal of Lightwave Technology. - 2006. - Vol. 24, No. 4. - P. 1768-1775.

J297. Barhumi I. Equalization for OFDM over doubly selective channels. / Barhumi I., Leus G., Moonen M. // IEEE Transactions on Signal Processing. - 2006. - Vol. 54, No. 4. - P. 1445-1458.

J298. Yu A.C.H. Transit-time broadening in pulsed Doppler ultrasound: a generalized amplitude modulation model. / Yu A.C.H., Steinman A.H., Cobbold R.S.C. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2006. - Vol. 53, No. 3. - P. 530-541.

J299. Falletti E. A novel blind adaptive space-time receiver for multi-code DS-CDMA. / Falletti E., Micciche M., Sellone F. // IEEE Transactions on Wireless Communications. - 2006. - Vol. 5, No. 2. - P. 323-338.

J300. Ho K.C. An asymptotically unbiased estimator for bearings-only and Doppler-bearing target motion analysis. / Ho K.C., Chan Y.T. // IEEE Transactions on Signal Processing. - 2006. - Vol. 54, No. 3. - P. 809-822.

J301. Lotte Ph. Design of the Tore Supra motional Stark effect diagnostic. / Lotte Ph., Echard B., Hess W., Migozzi J. B. // Review of Scientific Instruments. - 2006. - Vol. 77, No. 10. - P. 10E503-10E503-4.

J302. Kuldkepp M. Motional Stark effect diagnostic pilot experiment for MAST. / Kuldkepp M., Walsh M. J., Carolan P. G., Conway N. J., Hawkes N. C., McCone J., Rachlew E., Wearing G. // Review of Scientific Instruments. - 2006. - Vol. 77, No. 10. - P. 10E905-10E905-3.

J303. Soukhanovskii V. A. Electron density measurements in the National Spherical Torus Experiment detached divertor region using Stark broadening of deuterium infrared Paschen emission lines. / Soukhanovskii V. A., Johnson D. W., Kaita R., Roquemore A. L. // Review of Scientific Instruments. - 2006. - Vol. 77, No. 10. - P. 10F127-10F127-4.

J304. Hooks Daniel E. Isentropic compression of cyclotetramethylene tetranitramine (HMX) single crystals to 50 GPa. / Hooks Daniel E., Hayes D. B., Hare D. E., Reisman David B., Vandersall Kevin S., Forbes Jerry W., Hall Clint A. // Journal of Applied Physics. - 2006. - Vol. 99, No. 12. - P. 124901-124901-6.

J305. Uedono A. Vacancy-impurity complexes in polycrystalline Si used as gate electrodes of HfSiON-based metal-oxide-semiconductors probed using monoenergetic positron beams. / Uedono A., Ikeuchi K., Otsuka T., Yamabe K., Eguchi K., Takayanagi M., Ishibashi S., Ohdaira T., Muramatsu M., Suzuki R. // Journal of Applied Physics. - 2006. - Vol. 100, No. 3. - P. 034509-034509-6.

J306. Hooks Daniel E. Elastic-plastic shock wave profiles in oriented single crystals of cyclotrimethylene trinitramine (RDX) at 2.25 GPa. / Hooks Daniel E., Ramos Kyle J., Martinez A. Richard. // Journal of Applied Physics. - 2006. - Vol. 100, No. 2. - P. 024908-024908-7.

J307. Herdier Romain. Laser Doppler vibrometry for evaluating the piezoelectric coefficient d33 on thin film. / Herdier Romain, Jenkins David, Dogheche Elhadj, Remiens Denis, Sulc Miroslav. // Review of Scientific Instruments. - 2006. - Vol. 77, No. 9. - P. 093905-093905-5.

J308. Itoh N. HDTV Mobile Reception in Automobiles. / Itoh N., Tsuchida K. // Proceedings of the IEEE. - 2006. - Vol. 94, No. 1. - P. 274-280.

J309. Mingtsu Ho. Numerical Simulation of scattering of electromagnetic waves from traveling and/or vibrating perfect conducting planes. IEEE Transactions on Antennas and Propagation. - 2006. - Vol. 54, No. 1. - P. 152-156.

J310. de Wit J.J.M. Modified range-Doppler processing for FM-CW synthetic aperture radar. / de Wit J.J.M., Meta A., Hoogeboom P. // IEEE Geoscience and Remote Sensing Letters. - 2006. - Vol. 3, No. 1. - P. 83-87.

J311. Rinnerbauer Veronika. Effect of quantum confinement on higher transitions in HgTe nanocrystals. / Rinnerbauer Veronika, Hingerl Kurt, Kovalenko Maksym, Heiss Wolfgang. // Applied Physics Letters. - 2006. - Vol. 89, No. 19. - P. 193114-193114-3.

J312. Wang Ruikang K. Tissue Doppler optical coherence elastography for real time strain rate and strain mapping of soft tissue. / Wang Ruikang K., Ma Zhenhe, Kirkpatrick Sean J. // Applied Physics Letters. - 2006. - Vol. 89, No. 14. - P. 144103-144103-3.

J313. Matt G. J. Switching in C 60 -fullerene based field effect transistors. / Matt G. J., Singh Th. B., Sariciftci N. S., Montaigne Ramil A., Sitter H. // Applied Physics Letters. - 2006. - Vol. 88, No. 26. - P. 263516-263516-3.

J314. Lin Yang. Performance Analysis of Multiuser Selection Diversity. / Lin Yang, Alouini M.-S. // IEEE Transactions on Vehicular Technology. - 2006. - Vol. 55, No. 6. - P. 1848-1861.

J315. Lim C.H. Training strategies for joint domain localised-space-time adaptive processing in a bistatic environment. / Lim C.H., Aboutanios E., Mulgrew B. // IEE Proceedings Radar, Sonar and Navigation. - 2006. - Vol. 153, No. 6. - P. 516-524.

J316. Castoldi A. A Novel Scatter Detector for High-Resolution SPECT Imaging With Compton Telescopes. / Castoldi A., Galimberti A., Guazzoni C., Strder L., Walenta A. H. // IEEE Transactions on Nuclear Science. - 2006. - Vol. 53, No. 6. - P. 3912-3917.

J317. Marabissi D. Robust Multiuser Interference Cancellation for OFDM Systems With Frequency Offset. / Marabissi D., Fantacci R., Papini S. // IEEE Transactions on Wireless Communications. - 2006. - Vol. 5, No. 11. - P. 3068-3076.

J318. Zhou H. Range/Doppler ambiguity elimination in high-frequency chirp radars. / Zhou H., Wen B., Ma Z., Wu S. // IEE Proceedings - Radar, Sonar and Navigation. - 2006. - Vol. 153, No. 6. - P. 467-472.

J319. Kapseok Chang. Reduction of Doppler effects in OFDM systems. / Kapseok Chang, Keunyoung Kim, Dong-Hoi Kim. // IEEE Transactions on Consumer Electronics. - 2006. - Vol. 52, No. 4. - P. 1159-1166.

J320. Jootar J. Performance of convolutional codes with finite-depth interleaving and noisy channel estimates. / Jootar J., Zeidler J.R., Proakis J.G. // IEEE Transactions on Communications. - 2006. - Vol. 54, No. 10. - P. 1775-1786.

J321. Feipeng Wang. Piezoelectric properties and charge dynamics in poly(vinylidene fluoride-hexafluoropropylene) copolymer films with different content of HEP. / Feipeng Wang, Zhongfu Xia, Xunlin Qiu, Jun Shen, Xiaoqing Zhang, Zhenlian An. // IEEE Transactions on Dielectrics and Electrical Insulation. - 2006. - Vol. 13, No. 5. - P. 1132-1139.

J322. Josh T. Kohut. Characterizing Observed Environmental Variability With HF Doppler Radar Surface Current Mappers and Acoustic Doppler Current Profilers: Environmental Variability in the Coastal Ocean. / Josh T. Kohut, Hugh J. Roarty, Scott M. Glenn. // IEEE Journal of Oceanic Engineering. - 2006. - Vol. 31, No. 4. - P. 876-884.

J323. Idemen M. Relativistic Scattering of a Plane-Wave by a Uniformly Moving Half-Plane. / Idemen M., Alkumru A. // IEEE Transactions on Antennas and Propagation. - 2006. - Vol. 54, No. 11. - P. 3429-3440.

J324. Xu J.F. Effect of Disk Topography on Slider Dynamics. / Xu J.F., Kiely J.D., Hsia Y.-T., Talke F.E. // IEEE Transactions on Magnetics. - 2006. - Vol. 42, No. 10. - P. 2519-2521.

J325. Damiani R. A High-Resolution Dual-Doppler Technique for Fixed Multiantenna Airborne Radar. / Damiani R., Haimov S. // IEEE Transactions on Geoscience and Remote Sensing. - 2006. - Vol. 44, No. 12. - P. 3475-3489.

J326. Denisov G.G. Experimental Setup for Studying Induced Backward Scattering of Microwaves by a Subnanosecond High-Current Electron Beam. / Denisov G.G., Ginzburg N.S., Shpak V.G., Yalandin M.I. // IEEE Transactions on Plasma Science. - 2006. - Vol. 34, No. 5. - P. 1777-1781.

J327. Ju-yeun Kim. Optimal beam-selection algorithm to improve reception performance of ATSC 8-VSB DTV. / Ju-yeun Kim, Jae-hwui Bae, Jong-soo Lim, Soo-in Lee. // IEEE Transactions on Consumer Electronics. - 2006. - Vol. 52, No. 3. - P. 797-801.

J328. Pirak C. Adaptive Channel Estimation Using Pilot-Embedded Data-Bearing Approach for MIMO-OFDM Systems. / Pirak C., Wang Z.J., Liu K.J.R., Jitapunkul S. // IEEE Transactions on Signal Processing. - 2006. - Vol. 54, No. 12. - P. 4706-4716.

J329. Yang L. Performance Analysis of Multiuser Selection Diversity. / Yang L., Alouini M.-S. // IEEE Transactions on Vehicular Technology. - 2006. - Vol. 55, No. 6. - P. 1848-1861.

J330. Qi Qu. QoS guarantee and provisioning for realtime digital video over mobile ad hoc cdma networks with cross-layer design. / Qi Qu, Appuswamy R., Yee Sin Chan. // IEEE Wireless Communications. - 2006. - Vol. 13, No. 5. - P. 82-88.

J331. Zhixi Li. Doppler visibility of coherent ultrawideband random noise radar systems. / Zhixi Li, Narayanan R.M. // IEEE Transactions on Aerospace and Electronic Systems. - 2006. - Vol. 42, No. 3. - P. 904-916.

J332. Pillai S.U. Effect of earth's rotation and range foldover on space-based radar performance. / Pillai S.U., Himed B., Ke Yong Li. // IEEE Transactions on Aerospace and Electronic Systems. - 2006. - Vol. 42, No. 3. - P. 917-932.

J333. Oria C. Optimum Doppler compensation scheme for DVB-H receivers. / Oria C., Baena-Lecuyer V., Granado J., Chavez J., Torralba A., Pardo C. // Electronics Letters. - 2006. - Vol. 42, No. 13. - P. 767-768.

J334. Siderius M. Modeling techniques for marine-mammal risk assessment. / Siderius M., Porter M.B. // IEEE Journal of Oceanic Engineering. - 2006. - Vol. 31, No. 1. - P. 49-60.

J335. Karols P. Mass transit power traction networks as communication channels. / Karols P., Dostert K., Griepentrog G., Huettinger S. // IEEE Journal on Selected Areas in Communications. - 2006. - Vol. 24, No. 7. - P. 1339-1350.

J336. Jueping Cai. Time-variant Doppler frequency estimation and compensation for mobile OFDM systems. / Jueping Cai, Zan Li, Yue Hao, Jeuting Cai. // IEEE Transactions on Consumer Electronics. - 2006. - Vol. 52, No. 2. - P. 336-340.

J337. Yiqing Zhou. Downlink transmission of broadband OFCDM Systems-part II: effect of Doppler shift. / Yiqing Zhou, Jiangzhou Wang, Sawahashi M. // IEEE Transactions on Communications. - 2006. - Vol. 54, No. 6.

- P. 1097-1108.

J338. Tiejun Wang. Performance degradation of OFDM systems due to Doppler spreading. / Tiejun Wang, Proakis J.G., Masry E., Zeidler J.R. // IEEE Transactions on Wireless Communications. - 2006. - Vol. 5, No. 6. - P. 1422-1432.

J339. Po-Ying Chen. An iterative algorithm for Doppler spread estimation in LOS environments. / Po-Ying Chen, Hsueh-Jyh Li. // IEEE Transactions on Wireless Communications. - 2006. - Vol. 5, No. 6. - P. 1223-1228.

J340. Zhenfang Li. Performance improvement for constellation SAR using signal processing techniques. / Zhenfang Li, Zheng Bao, Hongyang Wang, Guisheng Liao. // IEEE Transactions on Aerospace and Electronic Systems. - 2006. - Vol. 42, No. 2. - P. 436-452.

J341. Rossi M. SR ARQ delay statistics on N-state Markov channels with non-instantaneous feedback. / Rossi M., Badia L., Zorzi M. // IEEE Transactions on Wireless Communications. - 2006. - Vol. 5, No. 6. - P. 1526-1536.

J342. Soriano G. Doppler Spectra From a Two-Dimensional Ocean Surface at L-Band. / Soriano G., Joelson M., Saillard M. // IEEE Transactions on Geoscience and Remote Sensing. - 2006. - Vol. 44, No. 9. - P. 2430-2437.

J343. Ljubisa Stankovic. Separation of target rigid body and micro-doppler effects in ISAR imaging. / Ljubisa Stankovic, Igor Djurovic, Thayananthan Thayaparan. // IEEE Transactions on Aerospace and Electronic Systems. - 2006. - Vol. 42, No. 4. - P. 1496-1506.

J344. Jootar J. Performance of Convolutional Codes With Finite-Depth Interleaving and Noisy Channel Estimates. / Jootar J., Zeidler J.R., Proakis J.G. // IEEE Transactions on Communications. - 2006. - Vol. 54, No. 9. - P. 1703.

J345. Serov A.N. Integrated Optoelectronic Probe Including a Vertical Cavity Surface Emitting Laser for Laser Doppler Perfusion Monitoring. / Serov A.N., Nieland J., Oosterbaan S., de Mul F.F.M., van Kranenburg H., Bekman H.H.P.T., Steenbergen W. // IEEE Transactions on Biomedical Engineering. - 2006. - Vol. 53, No. 10. - P. 2067-2074.

J346. Sterian C.E.D. Super-orthogonal space-time codes with rectangular constellations and two transmit antennas for high data rate wireless communications. / Sterian C.E.D., Singh H., Patzold M., Hogstad B.O. // IEEE Transactions on Wireless Communications. - 2006. - Vol. 5, No. 7. - P. 1857-1865.

J347. Hang-yong Chen. A new approach for synthesizing the range profile of moving targets via stepped-frequency waveforms. / Hang-yong Chen, Yong-xiang Liu, Wei-dong Jiang, Gui-rong Guo. // IEEE Geoscience and Remote Sensing Letters. - 2006. - Vol. 3, No. 3. - P. 406-409.

J348. Lawrence D.E. Electromagnetic scattering from vibrating penetrable objects using a general class of time-varying sheet boundary conditions. / Lawrence D.E., Sarabandi K. // IEEE Transactions on Antennas and Propagation. - 2006. - Vol. 54, No. 7. - P. 2054-2061.

J349. Zhi Wang. Performance of correlation-based frequency estimation methods in the presence of multiplicative noise. / Zhi Wang, Abeysekera S.S. // IEEE Transactions on Vehicular Technology. - 2006. - Vol. 55, No. 4. - P. 1281-1290.

J350. Tao Cui. Analysis and optimization of pilot symbol-assisted Rake receivers for DS-CDMA systems. / Tao Cui, Tellambura C. // IEEE Transactions on Vehicular Technology. - 2006. - Vol. 55, No. 4. - P. 1159-1170.

J351. Hombs B. Multiple-access interference suppression for MC-CDMA by frequency-domain oversampling. / Hombs B., Lehnert J.S. // IEEE Transactions on Communications. - 2005. - Vol. 53, No. 4. - P. 677-686.

J352. Shiwen Yang. Linear antenna arrays with bidirectional phase center motion. / Shiwen Yang, Gan Y.-B., Peng Khiang Tan. // IEEE Transactions on Antennas and Propagation. - 2005. - Vol. 53, No. 5. - P. 1829-1835.

J353. Choi Jong-woon. Laser Doppler velocimetry based on the photoacoustic effect in a C O 2 laser. / Choi Jong-woon, Yu Moon-jong, Kopica Mirek, Woo Sam-yong, Choi Yong-Seok. // Review of Scientific Instruments. -

2005. - Vol. 76, No. 2. - P. 023109-023109-3.

J354. Montoya Juan C. Doppler writing and linewidth control for scanning beam interference lithography. / Montoya Juan C., Chang Chih-Hao, Heilmann Ralf K., Schattenburg Mark L. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2005. - Vol. 23, No. 6. - P. 2640-2645.

J355. Duffy Liam M. Photodissociation dynamics in "hyper-rovibronic" detail: Exploring the potential of millimeter/submillimeter-wave spectroscopy in molecular reaction dynamics experiments. Review of Scientific Instruments. - 2005. - Vol. 76, No. 9. - P. 093104-093104-11.

J356. Kawai Shigeki. An ultrahigh vacuum dynamic force microscope for high resonance frequency cantilevers. / Kawai Shigeki, Kobayashi Dai, Kitamura Shin-ichi, Meguro Sakae, Kawakatsu Hideki. // Review of Scientific Instruments. - 2005. - Vol. 76, No. 8. - P. 083703-083703-5.

J357. Monsterleet A. Optically generated arbitrary waveforms for radar applications. / Monsterleet A., Tonda-Goldstein S., Dolfi D., Huignard J.P., Sape P., Chazelas J. // Electronics Letters. - 2005. - Vol. 41, No. 6. - P. 332-334.

J358. Herbert G.M. Effects of platform rotation on STAP performance. IEE Proceedings - Radar, Sonar and Navigation. - 2005. - Vol. 152, No. 1. - P. 2-8.

J359. Fusco V. Analysis and characterization of PLL-based retrodirective array. / Fusco V., Chee Binn Soo, Buchanan N. // IEEE Transactions on Microwave Theory and Techniques. - 2005. - Vol. 53, No. 2. - P. 730-738.

J360. Kyoung-Su Park. Improvement of loading/unloading performance using control input position and considering disk vibration characteristics. / Kyoung-Su Park, Jeong-Il Chun, Yong-Hyun Lee, No-Cheol Park, Hyun-Seok Yang, Young-Pil Park. // IEEE Transactions on Magnetics. - 2005. - Vol. 41, No. 2. - P. 819-824.

J361. Savery D. Effect of red cell clustering and anisotropy on ultrasound blood backscatter: a Monte Carlo study. / Savery D., Cloutier G. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2005. - Vol. 52, No. 1. - P. 94-103.

J362. Johnson J.A. Coherent array imaging using phased subarrays. Part II: simulations and experimental results. / Johnson J.A., Oralkan O., Ergun S., Demirci U., Karaman M., Khuri-Yakub B.T. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2005. - Vol. 52, No. 1. - P. 51-64.

J363. Yang Jun. Daytime interference ing of OSMAR. / Yang Jun, Wen Biyang, Shicai W. // IEEE Signal Processing Letters. - 2005. - Vol. 12, No. 1. - P. 71-74.

J364. Bor-Sen Chen. Robust adaptive MMSE/DFE multiuser detection in multipath fading channel with impulse noise. / Bor-Sen Chen, Chang-Lan Tsai, Chia-Sheng Hsu. // IEEE Transactions on Signal Processing. - 2005. - Vol. 53, No. 1. - P. 306-317.

J365. Gang Hong. Potential to estimate the canting angle of tilted structures in clouds from microwave radiances around 183 GHz. / Gang Hong, Heygster G., Jungang Miao, Kunzi K. // IEEE Geoscience and Remote Sensing Letters. - 2005. - Vol. 2, No. 1. - P. 40-44.

J366. Vogel C. The impact of combined channel mismatch effects in time-interleaved ADCs. IEEE Transactions on Instrumentation and Measurement. - 2005. - Vol. 54, No. 1. - P. 415-427.

J367. Jing Tang. Estimation of gravity wave momentum flux with spectroscopic imaging. / Jing Tang, Kamalabadi F., Franke S.J., Liu A.Z., Swenson G.R. // IEEE Transactions on Geoscience and Remote Sensing. - 2005. - Vol. 43, No. 1. - P. 103-109.

J368. Niederhauser J.J. Combined ultrasound and optoacoustic system for real-time high-contrast vascular imaging in vivo. / Niederhauser J.J., Jaeger M., Lemor R., Weber P., Frenz M. // IEEE Transactions on Medical Imaging. - 2005. - Vol. 24, No. 4. - P. 436-440.

J369. Xiaodai Dong. Symbol error probability of two-dimensional signaling in Ricean fading with imperfect channel estimation. / Xiaodai Dong, Lei Xiao. // IEEE Transactions on Vehicular Technology. - 2005. - Vol. 54, No. 2. - P. 538-549.

J370. Sun-Mog Hong. Optimization of waveform and detection threshold for range and range-rate tracking in clutter. / Sun-Mog Hong, Evans R.J., Han-Seop Shin. // IEEE Transactions on Aerospace and Electronic Systems. - 2005. - Vol. 41, No. 1. - P. 17-33.

J371. Oliner A.A. Guest Editorial. IEEE Transactions on Microwave Theory and Techniques. - 2005. - Vol. 53, No. 4. - P. 1413-1417.

J372. Hyunkyu Yu. SNR-independent methods for estimating maximum Doppler frequency. / Hyunkyu Yu, Goohyun Park, Hangyu Cho, Changeon Kang, Daesik Hong. // IEEE Signal Processing Letters. - 2005. - Vol. 12, No. 5. - P. 384-386.

J373. Hsiao-Chun Wu. Pilot-free dynamic phase and amplitude estimations for wireless ICI self-cancellation coded OFDM systems. / Hsiao-Chun Wu, Xiaozhou Huang, Dongxin Xu. // IEEE Transactions on Broadcasting. - 2005. - Vol. 51, No. 1. - P. 94-105.

J374. Rabinowitz M. A new positioning system using television synchronization signals. / Rabinowitz M., Spilker J.J. Jr. // IEEE Transactions on Broadcasting. - 2005. - Vol. 51, No. 1. - P. 51-61.

J375. Young-Kyun Kong. Ambiguity-free Doppler centroid estimation technique for airborne SAR using the Radon transform. / Young-Kyun Kong, Byung-Lae Cho, Young-Soo Kim. // IEEE Transactions on Geoscience and Remote Sensing. - 2005. - Vol. 43, No. 4. - P. 715-721.

J376. Uedono A. Vacancy-type defects in Si-doped InN grown by plasma-assisted molecular-beam epitaxy probed using monoenergetic positron beams. / Uedono A., Chichibu S. F., Higashiwaki M., Matsui T., Ohdaira T., Suzuki R. // Journal of Applied Physics. - 2005. - Vol. 97, No. 4. - P. 043514-043514-5.

J377. Zhou Chunlan. Positron beam studies of argon-irradiated polycrystal alpha -Zr. / Zhou Chunlan, Liu Xiaoyang, Ma Chuangxin, Wang Baoyi, Zhang Zhiming, Wei Long. // Journal of Applied Physics. - 2005. - Vol. 97, No. 6. - P. 063511-063511-7.

J378. Xiaoming Peng. Performance of a VSF-OFCDM system using a symbol relocated scheme during retransmission. / Xiaoming Peng, Chin F.P.S., Madhukumar A.S. // IEE Proceedings- Communications. - 2005. - Vol. 152, No. 2. - P. 215-220.

J379. Moon J. Rapid slot synchronization in the presence of large frequency offset and Doppler spread in WCDMA systems. / Moon J., Yong-Hwan Lee. // IEEE Transactions on Wireless Communications. - 2005. - Vol. 4, No. 4. - P. 1325-1330.

J380. Jalloul L.M.A. Data-aided channel estimation for wideband CDMA. / Jalloul L.M.A., Misra R.M. // IEEE Transactions on Wireless Communications. - 2005. - Vol. 4, No. 4. - P. 1622-1634.

J381. Tao Zeng. Generalized approach to resolution analysis in BSAR. / Tao Zeng, Cherniakov M., Teng Long. // IEEE Transactions on Aerospace and Electronic Systems. - 2005. - Vol. 41, No. 2. - P. 461-474.

J382. Chi-Hung Huang. Resonant vibration investigations for piezoceramic disks and annuli by using the equivalent constant method. IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2005. - Vol. 52, No. 8. - P. 1217-1228.

J383. Tobias M. Probability hypothesis density-based multitarget tracking with bistatic range and Doppler observations. / Tobias M., Lanterman A.D. // IEE Proceedings - Radar, Sonar and Navigation. - 2005. - Vol. 152, No. 3. - P. 195-205.

J384. Baker C.J. Passive coherent location radar systems. Part 2: waveform properties. / Baker C.J., Griffiths H.D., Papoutsis I. // IEE Proceedings - Radar, Sonar and Navigation. - 2005. - Vol. 152, No. 3. - P. 160-168.

J385. Djeddou M. Maximum likelihood angle-frequency estimation in partially known correlated noise for low-elevation targets. / Djeddou M., Belouchrani A., Aouada S. // IEEE Transactions on Signal Processing. - 2005. - Vol. 53, No. 8. - P. 3057-3064.

J386. Chan Y.T. Joint time-scale and TDOA estimation: analysis and fast approximation. / Chan Y.T., Ho K.C. // IEEE Transactions on Signal Processing. - 2005. - Vol. 53, No. 8. - P. 2625-2634.

J387. Chi-Hung Huang. Theoretical, numerical, and experimental investigation on resonant vibrations of piezoceramic annular disks. / Chi-Hung Huang, Chien-Ching Ma, Yu-Chih Lin. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2005. - Vol. 52, No. 8. - P. 1204-1216.

J388. Roy Sukesh. Time-resolved dynamics of resonant and nonresonant broadband picosecond coherent anti-Stokes Raman scattering signals. / Roy Sukesh, Meyer Terrence R., Gord James R. // Applied Physics Letters. - 2005. - Vol. 87, No. 26. - P. 264103-264103-3.

J389. Harris G.R. Progress in medical ultrasound exposimetry. IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2005. - Vol. 52, No. 5. - P. 717-736.

J390. Tortoli P. Different effects of microbubble destruction and translation in Doppler measurements. / Tortoli P., Boni E., Corsi M., Arditi M., Frinking P. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2005. - Vol. 52, No. 7. - P. 1183-1188.

J391. Ahn J.H. Adaptive Hybrid Beamformer for Mobile Reception of ATSC DTV. / Ahn J.H., Lim C.-H., Han D.S., Oh H.-S. // IEEE Transactions on Broadcasting. - 2005. - Vol. 51, No. 3. - P. 296-304.

J392. Fernandez D.E. IWRAP: the Imaging Wind and Rain Airborne Profiler for remote sensing of the ocean and the atmospheric boundary layer within tropical cyclones. / Fernandez D.E., Kerr E.M., Castells A., Carswell J.R., Frasier S.J., Chang P.S., Black P.G., Marks F.D. // IEEE Transactions on Geoscience and Remote Sensing. - 2005. - Vol. 43, No. 8. - P. 1775-1787.

J393. Christensen J.K. Mm wavelengths complex Doppler analysis using dark field illumination. / Christensen J.K., Underhill M.J. // IEEE Aerospace and Electronic Systems Magazine. - 2005. - Vol. 20, No. 7. - P. 21-27.

J394. Zemen T. Time-Variant Channel Estimation Using Discrete Prolate Spheroidal Sequences. / Zemen T., Mecklenbrauker C.F. // IEEE Transactions on Signal Processing. - 2005. - Vol. 53, No. 9. - P. 3597-3607.

J395. Ying Y. Optimal pilot placement for frequency offset estimation and data detection in burst transmission systems. / Ying Y., Ghogho M. // IEEE Communications Letters. - 2005. - Vol. 9, No. 6. - P. 549-551.

J396. Baddour K.E. Robust Doppler spread estimation in nonisotropic fading channels. / Baddour K.E., Beaulieu N.C. // IEEE Transactions on Wireless Communications. - 2005. - Vol. 4, No. 6. - P. 2677-2682.

J397. Shnidman D.A. Radar detection in clutter. IEEE Transactions on Aerospace and Electronic Systems. - 2005. - Vol. 41, No. 3. - P. 1056-1067.

J398. Capoglu I.R. Effect of Doppler spread in OFDM-based UWB systems. / Capoglu I.R., Ye Li, Swami A. // IEEE Transactions on Wireless Communications. - 2005. - Vol. 4, No. 5. - P. 2559-2567.

J399. Salberg A.-B. Doppler and frequency-offset synchronization in wideband OFDM. / Salberg A.-B., Swami A. // IEEE Transactions on Wireless Communications. - 2005. - Vol. 4, No. 6. - P. 2870-2881.

J400. Noor L. Direct conversion receiver for radio communication systems. / Noor L., Alagan Anpalagan. // IEEE Potentials. - 2005. - Vol. 24, No. 5. - P. 32-35.

J401. Sadeghi P. Capacity analysis for finite-state Markov mapping of flat-fading channels. / Sadeghi P., Rapajic P. // IEEE Transactions on Communications. - 2005. - Vol. 53, No. 5. - P. 833-840.

J402. Thurai M. Absolute calibration of C-band weather radars using differential propagation phase in rain. / Thurai M., Hanado H. // Electronics Letters. - 2005. - Vol. 41, No. 25. - P. 1405-1406.

J403. Cianca E. Truncated power control for improving TCP/IP performance over CDMA wireless links. / Cianca E., Mauro De Sanctis, Ruggieri M., Prasad R. // IEEE Transactions on Wireless Communications. - 2005. - Vol. 4, No. 4. - P. 1704-1714.

J404. Fredriksson D.W. Moored fish cage dynamics in waves and currents. / Fredriksson D.W., Swift M.R., Eroshkin O., Tsukrov I., Irish J.D., Celikkol B. // IEEE Journal of Oceanic Engineering. - 2005. - Vol. 30, No. 1. - P. 28-36.

J405. Gleason S. Detection and Processing of bistatically reflected GPS signals from low Earth orbit for the purpose of ocean remote sensing. / Gleason S., Hodgart S., Yiping Sun, Gommenginger C., Mackin S., Adjrad

M., Unwin M. // IEEE Transactions on Geoscience and Remote Sensing. - 2005. - Vol. 43, No. 6. - P. 1229-1241.

J406. Plew D.R. Hydrodynamic implications of large offshore mussel farms. / Plew D.R., Stevens C.L., Spigel R.H., Hartstein N.D. // IEEE Journal of Oceanic Engineering. - 2005. - Vol. 30, No. 1. - P. 95-108.

J407. Kun Lu. Ionospheric decontamination and sea clutter suppression for HF skywave Radars. / Kun Lu, Xingzhao Liu, Yongtan Liu. // IEEE Journal of Oceanic Engineering. - 2005. - Vol. 30, No. 2. - P. 455-462.

J408. White J. Transcranial ultrasound focus reconstruction with phase and amplitude correction. / White J., Clement G.T., Hynynen K. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2005. - Vol. 52, No. 9. - P. 1518-1522.

J409. De Witte E. Improved ultra-low range sidelobe pulse compression waveform design. / De Witte E., Griffiths H.D. // Electronics Letters. - 2004. - Vol. 40, No. 22. - P. 1448-1450.

J410. Huaizu You. Stochastic voltage model and experimental measurement of ocean-scattered GPS signal statistics. / Huaizu You, Garrison J.L., Heckler G., Zavorotny V.U. // IEEE Transactions on Geoscience and Remote Sensing. - 2004. - Vol. 42, No. 10. - P. 2160-2169.

J411. Wulf E.A. Thick silicon strip detector Compton imager. / Wulf E.A., Phlips B.F., Johnson W.N., Kurfess J.D., Novikova E.I. // IEEE Transactions on Nuclear Science. - 2004. - Vol. 51, No. 5. - P. 1997-2003.

J412. Hai Deng. Polyphase code design for Orthogonal Netted Radar systems. IEEE Transactions on Signal Processing. - 2004. - Vol. 52, No. 11. - P. 3126-3135.

J413. Hongxing Zou. Steady-motion-based Dopplerlet transform: application to the estimation of range and speed of a moving sound source. / Hongxing Zou, Yongqiang Chen, Jihong Zhu, Qionghai Dai, Guoqing Wu, Li Y. // IEEE Journal of Oceanic Engineering. - 2004. - Vol. 29, No. 3. - P. 887-905.

J414. Kshetrimayum R.S. A brief intro to metamaterials. IEEE Potentials. - 2004-Jan. 2005. - Vol. 23, No. 5. - P. 44-46.

J415. Lamont-Smith T. Investigation of the variability of Doppler spectra with radar frequency and grazing angle. IEE Proceedings - Radar, Sonar and Navigation. - 2004. - Vol. 151, No. 5. - P. 291-298.

J416. Seoktae Kim. On the development of a multifunction millimeter-wave sensor for displacement sensing and low-velocity measurement. / Seoktae Kim, Cam Nguyen. // IEEE Transactions on Microwave Theory and Techniques. - 2004. - Vol. 52, No. 11. - P. 2503-2512.

J417. Napolitano A. Doppler-channel blind identification for noncircular transmissions in multiple-access systems. / Napolitano A., Tanda M. // IEEE Transactions on Communications. - 2004. - Vol. 52, No. 12. - P. 2073-2078.

J418. Digham F.F. Variable-rate noncoherent M-FSK modulation for power limited systems over Nakagami-fading channels. / Digham F.F., Alouini M.-S. // IEEE Transactions on Wireless Communications. - 2004. - Vol. 3, No. 4. - P. 1295-1304.

J419. Kadous T.A. An integrated framework for MC-CDMA reception in the presence of frequency offsets, phase noise, and fast fading. / Kadous T.A., Sayeed A.M. // IEEE Transactions on Wireless Communications. - 2004. - Vol. 3, No. 4. - P. 1224-1235.

J420. Shaoping Chen. Intercarrier interference suppression and channel estimation for OFDM systems in time-varying frequency-selective fading channels. / Shaoping Chen, Tianren Yao. // IEEE Transactions on Consumer Electronics. - 2004. - Vol. 50, No. 2. - P. 429-435.

J421. Aglyamov S. Model-based reconstructive elasticity imaging of deep venous thrombosis. / Aglyamov S., Skovoroda A.R., Rubin J.M., O'Donnell M., Emelianov S.Y. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2004. - Vol. 51, No. 5. - P. 521-531.

J422. Wu Z. Model of independent Rayleigh faders. Electronics Letters. - 2004. - Vol. 40, No. 15. - P. 949-951.

J423. Doisy Y. Theoretical accuracy of Doppler navigation sonars and acoustic Doppler current profilers. IEEE Journal of Oceanic Engineering. - 2004. - Vol. 29, No. 2. - P. 430-441.

J424. Oestges C. Propagation modeling of MIMO multipolarized fixed wireless channels. / Oestges C., Erceg V., Paulraj A.J. // IEEE Transactions on Vehicular Technology. - 2004. - Vol. 53, No. 3. - P. 644-654.

J425. Droitcour A.D. Range correlation and I/Q performance benefits in single-chip silicon Doppler radars for noncontact cardiopulmonary monitoring. / Droitcour A.D., Boric-Lubecke O., Lubecke V.M., Lin J., Kovacs G.T.A. // IEEE Transactions on Microwave Theory and Techniques. - 2004. - Vol. 52, No. 3. - P. 838-848.

J426. Hsiao-Chun Wu. Joint phase/amplitude estimation and symbol detection for wireless ICI self-cancellation coded OFDM systems. / Hsiao-Chun Wu, Xiaozhou Huang. // IEEE Transactions on Broadcasting. - 2004. - Vol. 50, No. 1. - P. 49-55.

J427. Sagias N.C. Channel capacity and second-order statistics in Weibull fading. / Sagias N.C., Zogas D.A., Karagiannidis G.K., Tombras G.S. // IEEE Communications Letters. - 2004. - Vol. 8, No. 6. - P. 377-379.

J428. Ruoskanen J. A practical millimeter-wave radar calibration target. / Ruoskanen J., Eskelinen P., Heikkila H., Kuosmanen P., Kiuru T. // IEEE Antennas and Propagation Magazine. - 2004. - Vol. 46, No. 2. - P. 94-97.

J429. Chow Y.C. Error-bound formulation for multichannel reception of M-DPSK and pilot-aided M-PSK over Rayleigh-fading channels with postdetection combining. / Chow Y.C., McGeehan J.P. // IEEE Transactions on Vehicular Technology. - 2004. - Vol. 53, No. 3. - P. 747-757.

J430. Vaananen R. Advanced AudioBIFS: virtual acoustics modeling in MPEG-4 scene description. / Vaananen R., Huopaniemi J. // IEEE Transactions on Multimedia. - 2004. - Vol. 6, No. 5. - P. 661-675.

J431. Yu Zhang. Time-scale removal of "wall thump" in Doppler ultrasound signals: a simulation study. / Yu Zhang, Cardoso J.C., Yuanyuan Wang, Fish P.J., Bastos C.A.C., Weiqi Wang. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2004. - Vol. 51, No. 9. - P. 1187-1192.

J432. Hirono Y. Flow-induced vibration reduction in HDD by using a spoiler. / Hirono Y., Arisaka T., Nishijima N., Shimizu T., Nakamura S., Masuda H. // IEEE Transactions on Magnetics. - 2004. - Vol. 40, No. 4. - P. 3168-3170.

J433. Touzi R. On the use of permanent symmetric scatterers for ship characterization. / Touzi R., Raney R.K., Charbonneau F. // IEEE Transactions on Geoscience and Remote Sensing. - 2004. - Vol. 42, No. 10. - P. 2039-2045.

J434. Chengshan Xiao. A discrete-time model for triply selective MIMO Rayleigh fading channels. / Chengshan Xiao, Jingxian Wu, Leong S.-Y., Yahong Rosa Zheng, Letaief K.B. // IEEE Transactions on Wireless Communications. - 2004. - Vol. 3, No. 5. - P. 1678-1688.

J435. Perillo R. Effects of discontinuous transmission on the performance of a WCDMA cellular system. / Perillo R., Tralli V., Zorzi M. // IEEE Transactions on Vehicular Technology. - 2004. - Vol. 53, No. 5. - P. 1387-1399.

J436. Plantier G. Real-time tracking of time-varying velocity using a self-mixing laser diode. / Plantier G., Servagent N., Bosch T., Sourice A. // IEEE Transactions on Instrumentation and Measurement. - 2004. - Vol. 53, No. 1. - P. 109-115.

J437. Uijt de Haag M. Influence of oscillator variations on the observed frequency behavior in software-based navigation receivers. / Uijt de Haag M., Kelly J.M. // IEEE Signal Processing Letters. - 2004. - Vol. 11, No. 3. - P. 390-392.

J438. Papandreou-Suppappola A. Sonar echo ranging using signals with nonlinear time-frequency characteristics. / Papandreou-Suppappola A., Suppappola S.B. // IEEE Signal Processing Letters. - 2004. - Vol. 11, No. 3. - P. 393-396.

J439. Qing Dai. Washboard effect at head-disk interface. / Qing Dai, Hendriks F., Marchon B. // IEEE Transactions on Magnetics. - 2004. - Vol. 40, No. 4. - P. 3159-3161.

J440. Yu-Chih Lin. Experimental measurement and numerical analysis on resonant characteristics of piezoelectric disks with partial electrode designs. / Yu-Chih Lin, Chien-Ching Ma. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2004. - Vol. 51, No. 8. - P. 937-947.

J441. Thompson R.S. Acoustic intensity for a long vessel with noncircular cross section. / Thompson R.S., Macaskill C., Fraser V.B., Farnell L. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2004. - Vol. 51, No. 5. - P. 566-575.

J442. Gupta Amit. Detection of bacterial cells and antibodies using surface micromachined thin silicon cantilever resonators. / Gupta Amit, Akin Demir, Bashir Rashid. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2004. - Vol. 22, No. 6. - P. 2785-2791.

J443. Matsuda Hirofumi. Uniform field-induced strain in a/b -axes-oriented Bi 3.9 Pr 0.1 Ti 3 O 12 thick films on IrO 2 /Si substrates for lead-free piezoelectric microdevice applications. / Matsuda Hirofumi, Ito Sachiko, Iijima Takashi. // Applied Physics Letters. - 2004. - Vol. 85, No. 7. - P. 1220-1222.

J444. Janson M. S. Vacancy-related defect distributions in 11 B -, 14 N -, and 27 Al -implanted 4H-SiC: Role of channeling. / Janson M. S., Slotte J., Kuznetsov A. Yu., Saarinen K., Hallen A. // Journal of Applied Physics. - 2004. - Vol. 95, No. 1. - P. 57-63.

J445. Gotte S. Test of collinear spectroscopy for precise high-voltage determination. / Gotte S., Knaak K.-M., Kotovski N., Kluge H.-J., Ewald G., Wendt K. D. A. // Review of Scientific Instruments. - 2004. - Vol. 75, No. 4. - P. 1039-1050.

J446. Casper T. A. Design aspects of a MSE diagnostic for ITER. / Casper T. A., Jayakumar J., Makowski M. A., Ellis R. // Review of Scientific Instruments. - 2004. - Vol. 75, No. 10. - P. 4193-4195.

J447. Hennequin P. Doppler backscattering system for measuring fluctuations and their perpendicular velocity on Tore Supra. / Hennequin P., Honore C., Truc A., Quemeneur A., Lemoine N., Chareau J.-M., Sabot R. // Review of Scientific Instruments. - 2004. - Vol. 75, No. 10. - P. 3881-3883.

J448. Di Sante Raffaella. A novel fiber optic sensor for multiple and simultaneous measurement of vibration velocity. / Di Sante Raffaella, Scalise Lorenzo. // Review of Scientific Instruments. - 2004. - Vol. 75, No. 6. - P. 1952-1958.

J449. Brusa R. S. Porosity in low dielectric constant SiOCH films depth profiled by positron annihilation spectroscopy. / Brusa R. S., Spagolla M., Karwasz G. P., Zecca A., Ottaviani G., Corni F., Bacchetta M., Carollo E. // Journal of Applied Physics. - 2004. - Vol. 95, No. 5. - P. 2348-2354.

J450. Jensen D.G. Targetmaspect-dependent RCS: the effect on assumed beam angle. IEEE Antennas and Propagation Magazine. - 2004. - Vol. 46, No. 3. - P. 75-78.

J451. Lian Zhao. Multistep closed-loop power control using linear receivers for DS-CDMA systems. / Lian Zhao, Mark J.W. // IEEE Transactions on Wireless Communications. - 2004. - Vol. 3, No. 6. - P. 2141-2155.

J452. Jensen D.G. Target-aspect-dependent RCS: the effect on assumed beam angle. IEEE Antennas and Propagation Magazine. - 2004. - Vol. 46, No. 4. - P. 75-78.

J453. Christensen J.K. Doppler measurements of smooth and rough surface high frequency scattering from spinning steel cylinders. / Christensen J.K., Underhill M.J. // IEEE Aerospace and Electronic Systems Magazine. - 2004. - Vol. 19, No. 12. - P. 11-14.

J454. Lian L. Stress effects in sol-gel derived ferroelectric thin films. / Lian L., Sottos N. R. // Journal of Applied Physics. - 2004. - Vol. 95, No. 2. - P. 629-634.

J455. Kawai Nobuaki. High-pressure phase transition of mullite under shock compression. / Kawai Nobuaki, Nakamura Kazutaka G., Kondo Ken-ichi. // Journal of Applied Physics. - 2004. - Vol. 96, No. 8. - P. 4126-4130.

J456. Wang Lei. Phase-resolved optical Doppler tomography for imaging flow dynamics in microfluidic channels. / Wang Lei, Xu Wei, Bachman Mark, Li G. P., Chen Zhongping. // Applied Physics Letters. - 2004. - Vol. 85, No. 10. - P. 1855-1857.

J457. Dong-Guk Paeng. Cyclic and radial variation of the Doppler power from porcine whole blood. / Dong-Guk Paeng, Shung K.K. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2003. - Vol. 50, No. 6. - P. 614-622.

J458. Yao Ma. Analysis of differentially coherent linear receivers over Rician-faded CDMA channels. / Yao Ma, Pasupathy S., Teng Joon Lim. // IEEE Transactions on Wireless Communications. - 2003. - Vol. 2, No. 4. - P. 758-772.

J459. Wu N.E. Aperture error mitigation via local-state estimation for frequency-based emitter location. / Wu N.E., Fowler M.L. // IEEE Transactions on Aerospace and Electronic Systems. - 2003. - Vol. 39, No. 2. - P. 414-429.

J460. Bares C. Effect of antenna phase centre displacement on FM-CW measurements: application to radar system. / Bares C., Brousseau C., Le Coq L., Bourdillon A. // Electronics Letters. - 2003. - Vol. 39, No. 11. - P. 867-868.

J461. Fengchao Xiao. Application of a six-port wave-correlator for a very low velocity measurement using the Doppler effect. / Fengchao Xiao, Ghannouchi F.M., Yakabe T. // IEEE Transactions on Instrumentation and Measurement. - 2003. - Vol. 52, No. 2. - P. 297-301.

J462. Ellingson S.W. Beamforming and interference canceling with very large wideband arrays. IEEE Transactions on Antennas and Propagation. - 2003. - Vol. 51, No. 6. - P. 1338-1346.

J463. Berger S.D. Digital radio frequency memory linear range gate stealer spectrum. IEEE Transactions on Aerospace and Electronic Systems. - 2003. - Vol. 39, No. 2. - P. 725-735.

J464. Mozeson E. Removing autocorrelation sidelobes by overlaying orthogonal coding on any train of identical pulses. / Mozeson E., Levanon N. // IEEE Transactions on Aerospace and Electronic Systems. - 2003. - Vol. 39, No. 2. - P. 583-603.

J465. Tjeng Thiang Tjhung. Analysis and measurement of FM click rate in fast Rician fading channel. / Tjeng Thiang Tjhung, Teck Chien Pek, Kuck Jong Yong, Leong L.C.K. // IEEE Transactions on Vehicular Technology. - 2003. - Vol. 52, No. 5. - P. 1281-1287.

J466. Femenias G. Reference-based dual switch and stay diversity systems over correlated Nakagami fading channels. IEEE Transactions on Vehicular Technology. - 2003. - Vol. 52, No. 4. - P. 902-918.

J467. Rinne J. Impulse burst position detection and channel estimation schemes for OFDM systems. / Rinne J., Hazmi A., Renfors M. // IEEE Transactions on Consumer Electronics. - 2003. - Vol. 49, No. 3. - P. 539-545.

J468. Thim H.W. Absence of the relativistic transverse Doppler shift at microwave frequencies. IEEE Transactions on Instrumentation and Measurement. - 2003. - Vol. 52, No. 5. - P. 1660-1664.

J469. Alabaster C.M. Medium PRF radar PRF selection using evolutionary algorithms. / Alabaster C.M., Hughes E.J., Matthew J.H. // IEEE Transactions on Aerospace and Electronic Systems. - 2003. - Vol. 39, No. 3. - P. 990-1001.

J470. Meng L.J. Feasibility study of using hybrid collimation for nuclear environmental imaging. / Meng L.J., Wehe D.K. // IEEE Transactions on Nuclear Science. - 2003. - Vol. 50, No. 4. - P. 1103-1110.

J471. Leus G. Orthogonal multiple access over time- and frequency-selective channels. / Leus G., Shengli Zhou, Giannakis G.B. // IEEE Transactions on Information Theory. - 2003. - Vol. 49, No. 8. - P. 1942-1950.

J472. Sarabandi K. Acoustic and electromagnetic wave interaction: estimation of Doppler spectrum from an acoustically vibrated metallic circular cylinder. / Sarabandi K., Lawrence D.E. // IEEE Transactions on Antennas and Propagation. - 2003. - Vol. 51, No. 7. - P. 1499-1507.

J473. Steel R. Sample volume misregistration in linear array-based dual beam Doppler ultrasound systems. / Steel R., Fish P.J. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2003. - Vol. 50, No. 7. - P. 836-847.

J474. Lamont-Smith T. An empirical model of EM scattering from steepening wave profiles derived from

numerical computations. IEEE Transactions on Geoscience and Remote Sensing. - 2003. - Vol. 41, No. 6. - P. 1447-1454.

J475. Strohmer T. Optimal OFDM design for time-frequency dispersive channels. / Strohmer T., Beaver S. // IEEE Transactions on Communications. - 2003. - Vol. 51, No. 7. - P. 1111-1122.

J476. Himed B. Effects of bistatic clutter dispersion on STAP systems. IEE Proceedings - Radar, Sonar and Navigation. - 2003. - Vol. 150, No. 1. - P. 28-32.

J477. Herbert G.M. Benefits of space-time adaptive processing (STAP) in bistatic airborne radar. / Herbert G.M., Richardson P.G. // IEE Proceedings - Radar, Sonar and Navigation. - 2003. - Vol. 150, No. 1. - P. 13-17.

J478. Dawber W.N. Comparison of Doppler clutter cancellation techniques for naval multi-function radars. / Dawber W.N., Harwood N.M. // IEE Proceedings - Radar, Sonar and Navigation. - 2003. - Vol. 150, No. 1. - P. 37-40.

J479. Jahangir M. Robust Doppler classification technique based on hidden Markov models. / Jahangir M., Ponting K.M., O'Loghlen J.W. // IEE Proceedings - Radar, Sonar and Navigation. - 2003. - Vol. 150, No. 1. - P. 33-36.

J480. Wen Gao. Diversity combining for DS/SS systems with time-varying, correlated fading branches. / Wen Gao, Tsai S., Lehnert J.S. // IEEE Transactions on Communications. - 2003. - Vol. 51, No. 2. - P. 284-295.

J481. Dobbe J.G.G. Syllectometry: the effect of aggregometer geometry in the assessment of red blood cell shape recovery and aggregation. / Dobbe J.G.G., Streekstra G.J., Strackee J., Rutten M.C.M., Stijnen J.M.A., Grimbergen C.A. // IEEE Transactions on Biomedical Engineering. - 2003. - Vol. 50, No. 1. - P. 97-106.

J482. Kay S.M. Rapid estimation of the range-Doppler scattering function. / Kay S.M., Doyle S.B. // IEEE Transactions on Signal Processing. - 2003. - Vol. 51, No. 1. - P. 255-268.

J483. Hansson A.A. Iterative diversity detection for correlated continuous-time Rayleigh fading channels. / Hansson A.A., Aulin T.M. // IEEE Transactions on Communications. - 2003. - Vol. 51, No. 2. - P. 240-246.

J484. Ghebrebrhan O. Subcomplementary code pairs: new codes for ST/MST radar observations. / Ghebrebrhan O., Luce H., Yamamoto M., Fukao S. // IEEE Transactions on Geoscience and Remote Sensing. - 2003. - Vol. 41, No. 1. - P. 111-122.

J485. Xiongwen Zhao. Characterization of Doppler spectra for mobile communications at 5.3 GHz. / Xiongwen Zhao, Kivinen J., Vainikainen P., Skog K. // IEEE Transactions on Vehicular Technology. - 2003. - Vol. 52, No. 1. - P. 14-23.

J486. Dinesh V. Error performance of BPSK in fast Rician fading channels. / Dinesh V., Leung C. // Electronics Letters. - 2003. - Vol. 39, No. 9. - P. 741-742.

J487. Carrasco R.A. Neural network space diversity combination and ring coding for multicarrier CDMA over fast fading channels. / Carrasco R.A., Uribeetxeberria R. // IEE Proceedings- Communications. - 2003. - Vol. 150, No. 2. - P. 121-128.

J488. Domazetovic A. Estimating the Doppler spectrum of a short-range fixed wireless channel. / Domazetovic A., Greenstein L.J., Mandayam N.B., Seskar I. // IEEE Communications Letters. - 2003. - Vol. 7, No. 5. - P. 227-229.

J489. Samil Yetik I. Beamforming using the fractional Fourier transform. / Samil Yetik I., Nehorai A. // IEEE Transactions on Signal Processing. - 2003. - Vol. 51, No. 6. - P. 1663-1668.

J490. Wyglinski A.M. On uplink CDMA cell capacity: mutual coupling and scattering effects on beamforming. / Wyglinski A.M., Blostein S.D. // IEEE Transactions on Vehicular Technology. - 2003. - Vol. 52, No. 2. - P. 289-304.

J491. Wee Teck Ng. Effect of employing directional antennas on mobile OFDM system with time-varying channel. / Wee Teck Ng, Dubey V.K. // IEEE Communications Letters. - 2003. - Vol. 7, No. 4. - P. 165-167.

J492. Xiaoli Ma. Optimal training for block transmissions over doubly selective wireless fading channels. / Xiaoli Ma, Giannakis G.B., Ohno S. // IEEE Transactions on Signal Processing. - 2003. - Vol. 51, No. 5. - P. 1351-1366.

J493. Jianming Wu. Forward-link soft-handoff in CDMA with multiple-antenna selection and fast joint power control. / Jianming Wu, Affes S., Mermelstein P. // IEEE Transactions on Wireless Communications. - 2003. - Vol. 2, No. 3. - P. 459-471.

J494. Fournier C. Optimization of attenuation estimation in reflection for in vivo human dermis characterization at 20 MHz. / Fournier C., Lori Bridal S., Coron A., Laugier P. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2003. - Vol. 50, No. 4. - P. 408-418.

J495. Moret-Bailly J. Propagation of light in low-pressure ionized and atomic hydrogen: application to astrophysics. IEEE Transactions on Plasma Science. - 2003. - Vol. 31, No. 6. - P. 1215-1222.

J496. Gallo C.F. Redshifts of cosmological neutrinos as definitive experimental test of Doppler versus non-Doppler redshifts. IEEE Transactions on Plasma Science. - 2003. - Vol. 31, No. 6. - P. 1230-1231.

J497. Kiptily V. G. Gamma-diagnostics of alpha-particles in 4 He and D-T plasmas. / Kiptily V. G., Popovichev S., Sharapov S. E., Bertalot L., Cecil F. E., Conroy S., Mantsinen M. J. // Review of Scientific Instruments. - 2003. - Vol. 74, No. 3. - P. 1753-1756.

J498. Men-Tzung Lo. Volume scattering of distributed microbubbles and its influence on blood flow estimation. / Men-Tzung Lo, Jenho Tsao, Darong Su. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2003. - Vol. 50, No. 12. - P. 1699-1710.

J499. Xiaodong Cai. Bounding performance and suppressing intercarrier interference in wireless mobile OFDM. / Xiaodong Cai, Giannakis G.B. // IEEE Transactions on Communications. - 2003. - Vol. 51, No. 12. - P. 2047-2056.

J500. Hirose A. Predictive self-organizing map for vector quantization of migratory signals and its application to mobile communications. / Hirose A., Nagashima T. // IEEE Transactions on Neural Networks. - 2003. - Vol. 14, No. 6. - P. 1532-1540.

J501. Yu R. S. Effects of coexistent pores and paramagnetic defects on positron annihilation in silicon oxide thin films. / Yu R. S., Ito K., Hirata K., Zheng W., Kobayashi Y. // Journal of Applied Physics. - 2003. - Vol. 93, No. 6. - P. 3340-3344.

J502. Brusa R. S. Structural evolution in Ar + implanted Si-rich silicon oxide. / Brusa R. S., Karwasz G. P., Mariotto G., Zecca A., Ferragut R., Folegati P., Dupasquier A., Ottaviani G., Tonini R. // Journal of Applied Physics. - 2003. - Vol. 94, No. 12. - P. 7483-7492.

J503. Fujinami M. Improved depth profiling with slow positrons of ion implantation-induced damage in silicon. / Fujinami M., Miyagoe T., Sawada T., Akahane T. // Journal of Applied Physics. - 2003. - Vol. 94, No. 7. - P. 4382-4388.

J504. Kramer Roban H. X-ray emission line profile modeling of hot stars. / Kramer Roban H., Tonnesen Stephanie K., Cohen David H., Owocki Stanley P., ud-Doula Asif, MacFarlane Joseph J. // Review of Scientific Instruments. - 2003. - Vol. 74, No. 3. - P. 1966-1968.

J505. Gomes R. B. High dispersion spectrometer for time resolved Doppler measurements of impurity lines emitted during ISTTOK tokamak discharges. / Gomes R. B., Varandas C. A. F., Cabral J. A. C., Sokolova E., Cortes S. Reyes. // Review of Scientific Instruments. - 2003. - Vol. 74, No. 3. - P. 2071-2074.

J506. Petculescu Andi G. Signal-to-noise ratio improvement by sideband intermixing: Application to Doppler ultrasound vibrometry. / Petculescu Andi G., Sabatier James M. // Review of Scientific Instruments. - 2003. - Vol. 74, No. 9. - P. 4191-4193.

J507. Zaknich A. An integrated sensory-intelligent system for underwater acoustic signal-processing applications. IEEE Journal of Oceanic Engineering. - 2003. - Vol. 28, No. 4. - P. 750-759.

J508. Flores B.C. Assessment of chaos-based FM signals for range-Doppler imaging. / Flores B.C., Solis E.A.,

Thomas G. // IEE Proceedings - Radar, Sonar and Navigation. - 2003. - Vol. 150, No. 4. - P. 313-22.

J509. Chen V.C. Analysis of micro-Doppler signatures. / Chen V.C., Li F., Ho S.-S., Wechsler H. // IEE Proceedings - Radar, Sonar and Navigation. - 2003. - Vol. 150, No. 4. - P. 271-6.

J510. Gray J.E. Effect of nonuniform target motion on radar backscattered waveforms. / Gray J.E., Addison S.R. // IEE Proceedings - Radar, Sonar and Navigation. - 2003. - Vol. 150, No. 4. - P. 262-70.

J511. Sparr T. Micro-Doppler analysis of vibrating targets in SAR. / Sparr T., Krane B. // IEE Proceedings - Radar, Sonar and Navigation. - 2003. - Vol. 150, No. 4. - P. 277-83.

J512. Wang G. Manoeuvring target detection in over-the-horizon radar using adaptive clutter rejection and adaptive chirplet transform. / Wang G., Xia X.-G., Root B.T., Chen V.C., Zhang Y., Amin M. // IEE Proceedings - Radar, Sonar and Navigation. - 2003. - Vol. 150, No. 4. - P. 292-8.

J513. Zhang Y. High-resolution time-frequency distributions for manoeuvring target detection in over-the-horizon radars. / Zhang Y., Amin M.G., Frazer G.J. // IEE Proceedings - Radar, Sonar and Navigation. - 2003. - Vol. 150, No. 4. - P. 299-304.

J514. Jackson J.I. Application of ultrasound-based velocity estimate statistics to strain-rate estimation. / Jackson J.I., Thomas L.J. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2003. - Vol. 50, No. 11. - P. 1464-1473.

J515. van Dorp P. Human walking estimation with radar. / van Dorp P., Groen F.C.A. // IEE Proceedings - Radar, Sonar and Navigation. - 2003. - Vol. 150, No. 5. - P. 356-365.

J516. Wong S.K. Distortion in the inverse synthetic aperture radar (ISAR) images of a target with time-varying perturbed motion. / Wong S.K., Duff G., Riseborough E. // IEE Proceedings - Radar, Sonar and Navigation. - 2003. - Vol. 150, No. 4. - P. 221-7.

J517. Chieh-Fu Chang. Frequency-coded waveforms for enhanced delay-Doppler resolution. / Chieh-Fu Chang, Bell M.R. // IEEE Transactions on Information Theory. - 2003. - Vol. 49, No. 11. - P. 2960-2971.

J518. Won-Gyu Song. Pilot-symbol aided channel estimation for OFDM with fast fading channels. / Won-Gyu Song, Jong-Tae Lim. // IEEE Transactions on Broadcasting. - 2003. - Vol. 49, No. 4. - P. 398-402.

J519. Barber B.C. Multichannel ATI-SAR with application to the adaptive Doppler filtering of ocean swell waves. IEE Proceedings - Radar, Sonar and Navigation. - 2003. - Vol. 150, No. 6. - P. 403-410.

J520. Bjaerum S. Clutter filters adapted to tissue motion in ultrasound color flow imaging. / Bjaerum S., Torp H., Kristoffersen K. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2002. - Vol. 49, No. 6. - P. 693-704.

J521. Chih-Kuang Yeh. Doppler angle estimation using AR modeling. / Chih-Kuang Yeh, Pai-Chi Li. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2002. - Vol. 49, No. 6. - P. 683-692.

J522. Ching-Chih Kuo. FPGA realization of a novel frontend signal processor for pager decoders. / Ching-Chih Kuo, Chi-Yuan Peng. // IEEE Transactions on Consumer Electronics. - 2002. - Vol. 48, No. 1. - P. 184-193.

J523. Ahn C.-J. The effects of modulation combination, target BER, Doppler frequency, and adaptation interval on the performance of adaptive OFDM in broadband mobile channel. / Ahn C.-J., Sasase I. // IEEE Transactions on Consumer Electronics. - 2002. - Vol. 48, No. 1. - P. 167-174.

J524. Zheng Y.R. Improved models for the generation of multiple uncorrelated Rayleigh fading waveforms. / Zheng Y.R., Chengshan Xiao. // IEEE Communications Letters. - 2002. - Vol. 6, No. 6. - P. 256-258.

J525. Thoen S. Modeling the channel time-variance for fixed wireless communications. / Thoen S., Van der Perre L., Engels M. // IEEE Communications Letters. - 2002. - Vol. 6, No. 8. - P. 331-333.

J526. Miller D.L. Diagnostic ultrasound-induced membrane damage in phagocytic cells loaded with contrast agent and its relation to Doppler-mode images. / Miller D.L., Quddus J. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2002. - Vol. 49, No. 8. - P. 1094-1102.

J527. Abdi A. Level crossing rate in terms of the characteristic function: a new approach for calculating the fading rate in diversity systems. / Abdi A., Kaveh M. // IEEE Transactions on Communications. - 2002. - Vol. 50, No. 9. - P. 1397-1400.

J528. Baissas M.-A.R. Pilot-based estimation of time-varying multipath channels for coherent CDMA receivers. / Baissas M.-A.R., Sayeed A.M. // IEEE Transactions on Signal Processing. - 2002. - Vol. 50, No. 8. - P. 2037-2049.

J529. Geudtner D. Interferometric alignment of the X-SAR antenna system on the space shuttle radar topography mission. / Geudtner D., Zink M., Gierull C., Shaffer S. // IEEE Transactions on Geoscience and Remote Sensing. - 2002. - Vol. 40, No. 5. - P. 995-1006.

J530. Lowe S.T. A delay/Doppler-mapping receiver system for GPS-reflection remote sensing. / Lowe S.T., Kroger P., Franklin G., LaBrecque J.L., Lerma J., Lough M., Marcin M.R., Muellerschoen R.J., Spitzmesser D., Young L.E. // IEEE Transactions on Geoscience and Remote Sensing. - 2002. - Vol. 40, No. 5. - P. 1150-1163.

J531. Kuang W.T. Using short-time Fourier transform and wavelet packet filter banks for improved frequency measurement in a Doppler robot tracking system. / Kuang W.T., Morris A.S. // IEEE Transactions on Instrumentation and Measurement. - 2002. - Vol. 51, No. 3. - P. 440-444.

J532. Yasotharan A. Strengths and limitations of the Fourier method for detecting accelerating targets by pulse Doppler radar. / Yasotharan A., Thayaparan T. // IEE Proceedings - Radar, Sonar and Navigation. - 2002. - Vol. 149, No. 2. - P. 83-88.

J533. Kougialis G.A. Analysis of observed Doppler fading signal in low-VHF band. / Kougialis G.A., Riley N.G. // Electronics Letters. - 2002. - Vol. 38, No. 7. - P. 302-304.

J534. Lu B. Iterative receivers for space-time block-coded OFDM systems in dispersive fading channels. / Lu B., Xiaodong Wang, Ye Li. // IEEE Transactions on Wireless Communications. - 2002. - Vol. 1, No. 2. - P. 213-225.

J535. Haas E. Aeronautical channel modeling. IEEE Transactions on Vehicular Technology. - 2002. - Vol. 51, No. 2. - P. 254-264.

J536. Nikolaev V.D. Results of small-signal gain measurements on a supersonic chemical oxygen iodine laser with an advanced nozzle bank. / Nikolaev V.D., Zagidullin M.V., Svistun M.I., Anderson B.T., Tate R.F., Hager G.D. // IEEE Journal of Quantum Electronics. - 2002. - Vol. 38, No. 5. - P. 421-428.

J537. Caire G. Initial synchronization of DS-CDMA via bursty pilot signals. / Caire G., Humblet P.A., Montalbano G., Nordio A. // IEEE Transactions on Communications. - 2002. - Vol. 50, No. 4. - P. 677-685.

J538. Abdi A. A space-time correlation model for multielement antenna systems in mobile fading channels. / Abdi A., Kaveh M. // IEEE Journal on Selected Areas in Communications. - 2002. - Vol. 20, No. 3. - P. 550-560.

J539. Fornaro G. Minimum mean square error space-varying filtering of interferometric SAR data. / Fornaro G., Guarnieri A.M. // IEEE Transactions on Geoscience and Remote Sensing. - 2002. - Vol. 40, No. 1. - P. 11-21.

J540. Mitchell T.B. Doppler velocimetry of cryogenic ion plasmas. / Mitchell T.B., Bollinger J.J., Itano W.M., Kriesel J.M., Dubin D.H.E. // IEEE Transactions on Plasma Science. - 2002. - Vol. 30, No. 1. - P. 16-17.

J541. Hale T.B. Performance characterisation of hybrid STAP architecture incorporating elevation interferometry. / Hale T.B., Temple M.A., Wicks M.C., Raquet J.F., Oxley M.E. // IEE Proceedings - Radar, Sonar and Navigation. - 2002. - Vol. 149, No. 2. - P. 77-82.

J542. Thornton B.H. The effects of disk morphology on flying-height modulation: experiment and simulation. / Thornton B.H., Bogy D.B., Bhatia C.S. // IEEE Transactions on Magnetics. - 2002. - Vol. 38, No. 1. - P. 107-111.

J543. Dogandzic A. Space-time fading channel estimation and symbol detection in unknown spatially correlated noise. / Dogandzic A., Nehorai A. // IEEE Transactions on Signal Processing. - 2002. - Vol. 50, No. 3. - P. 457-474.

J544. Jin-Kyu Han. A deterministic channel simulation model for spatially correlated Rayleigh fading. / Jin-Kyu Han, Jong-Gwan Yook, Han-Kyu Park. // IEEE Communications Letters. - 2002. - Vol. 6, No. 2. - P. 58-60.

J545. Stamoulis A. Intercarrier interference in MIMO OFDM. / Stamoulis A., Diggavi S.N., Al-Dhahir N. // IEEE Transactions on Signal Processing. - 2002. - Vol. 50, No. 10. - P. 2451-2464.

J546. Izzo L. Linear time-variant transformations of generalized almost-cyclostationary signals.II. Development and applications. / Izzo L., Napolitano A. // IEEE Transactions on Signal Processing. - 2002. - Vol. 50, No. 12. - P. 2962-2975.

J547. Brabec Christoph J. Effect of LiF/metal electrodes on the performance of plastic solar cells. / Brabec Christoph J., Shaheen Sean E., Winder Christoph, Sariciftci N. Serdar, Denk Patrick. // Applied Physics Letters. - 2002. - Vol. 80, No. 7. - P. 1288-1290.

J548. Gierull C.H. Minimal sample support space-time adaptive processing with fast subspace techniques. / Gierull C.H., Balaji B. // IEE Proceedings - Radar, Sonar and Navigation. - 2002. - Vol. 149, No. 5. - P. 209-220.

J549. Wee Teck Ng. Comments on "On the Doppler spectrum at the mobile unit employing a directional antenna". / Wee Teck Ng, Dubey V.K. // IEEE Communications Letters. - 2002. - Vol. 6, No. 11. - P. 472-474.

J550. Long Gary J. A Mossbauer spectral study of the magnetic properties of Ho 2 Fe 17 and Ho 2 Fe 17 D 3.8. / Long Gary J., Isnard Olivier, Grandjean Fernande. // Journal of Applied Physics. - 2002. - Vol. 91, No. 3. - P. 1423-1430.

J551. Jones P. H. A moving-mirror frequency modulator for cold atom spectroscopy. / Jones P. H., Saunders-Singer H., Bergamini S., Meacher D. R. // Review of Scientific Instruments. - 2002. - Vol. 73, No. 7. - P. 2549-2551.

J552. Paglamidis K.S. Thinking about energy matters. IEEE Potentials. - 2002/Jan 2003. - Vol. 21, No. 5. - P. 10-12.

J553. Moxom Jeremy. Characterization of Mg doped GaN by positron annihilation spectroscopy. / Moxom Jeremy, Xu Jun, Suzuki R., Ohdaira T., Brandes George, Flynn Jeffrey S. // Journal of Applied Physics. - 2002. - Vol. 92, No. 4. - P. 1898-1901.

J554. Jie Song. Robust progressive image transmission over OFDM systems using space-time block code. / Jie Song, Liu K.J.R. // IEEE Transactions on Multimedia. - 2002. - Vol. 4, No. 3. - P. 394-406.

J555. Xiao-Jiao Tao. Narrowband acoustic Doppler volume backscattering signal .I. Evolutionary spectral analysis. / Xiao-Jiao Tao, Claesson I., Grbic N. // IEEE Transactions on Signal Processing. - 2002. - Vol. 50, No. 11. - P. 2644-2655.

J556. Mar J. Doppler estimator operating with matched filter for vehicular spread spectrum radar. / Mar J., Hung-Ta Lin. // Electronics Letters. - 2002. - Vol. 38, No. 16. - P. 911-912.

J557. Yuping Cheng. Doppler compensation for binary phase-coded waveforms. / Yuping Cheng, Zheng Bao, Fufu Zhao, Zbeiping Lin. // IEEE Transactions on Aerospace and Electronic Systems. - 2002. - Vol. 38, No. 3. - P. 1068-1072.

J558. Qinfang Sun. Estimation of continuous flat fading MIMO channels. / Qinfang Sun, Cox D.C., Huang H.C., Lozano A. // IEEE Transactions on Wireless Communications. - 2002. - Vol. 1, No. 4. - P. 549-553.

J559. Ohno S. Average-rate optimal PSAM transmissions over time-selective fading channels. / Ohno S., Giannakis G.B. // IEEE Transactions on Wireless Communications. - 2002. - Vol. 1, No. 4. - P. 712-720.

J560. Xiao-Jiao Tao. Narrowband acoustic Doppler volume backscattering signal .II. Spectral centroid estimation. / Xiao-Jiao Tao, Claesson I., Grbic N. // IEEE Transactions on Signal Processing. - 2002. - Vol. 50, No. 11. - P. 2656-2660.

J561. Watanabe T. A study of the air bearing effect on the lubricant displacement using an optical surface analyzer. / Watanabe T., Bogy D.B. // IEEE Transactions on Magnetics. - 2002. - Vol. 38, No. 5. - P. 2138-2140.

J562. Kreyenkamp O. Doppler compensation in forward-looking STAP radar. / Kreyenkamp O., Klemm R. // IEE Proceedings - Radar, Sonar and Navigation. - 2001. - Vol. 148, No. 5. - P. 253-258.

J563. Grayver E. VLSI implementation of a 100-μW multirate FSK receiver. / Grayver E., Daneshrad B. // IEEE Journal of Solid-State Circuits. - 2001. - Vol. 36, No. 11. - P. 1821-1828.

J564. Valentin C. Microwave interrogation of cesium atoms cooled in isotropic light. / Valentin C., Guillot E., Guillemot C., Petit P., Dimarcq N. // IEEE Transactions on Instrumentation and Measurement. - 2001. - Vol. 50, No. 5. - P. 1224-1228.

J565. Eggen T.H. Communication over Doppler spread channels. II. Receiver characterization and practical results. / Eggen T.H., Preisig J.C., Baggeroer A.B. // IEEE Journal of Oceanic Engineering. - 2001. - Vol. 26, No. 4. - P. 612-621.

J566. Williams C. Chaotic communications over radio channels. IEEE Transactions on Circuits and Systems I: Fundamental Theory and Applications. - 2001. - Vol. 48, No. 12. - P. 1394-1404.

J567. Zakharov Y.V. Local spline approximation of time-varying channel model. / Zakharov Y.V., Tozer T.C. // Electronics Letters. - 2001. - Vol. 37, No. 23. - P. 1408-1409.

J568. Linnartz J.-P.M.G. Performance analysis of synchronous MC-CDMA in mobile Rayleigh channel with both delay and Doppler spreads. IEEE Transactions on Vehicular Technology. - 2001. - Vol. 50, No. 6. - P. 1375-1387.

J569. Nanzhi Jiang. Super resolution feature extraction of moving targets. / Nanzhi Jiang, Renbiao Wu, Jian Li. // IEEE Transactions on Aerospace and Electronic Systems. - 2001. - Vol. 37, No. 3. - P. 781-793.

J570. Holland T.K. Application of the linear dispersion relation with respect to depth inversion and remotely sensed imagery. IEEE Transactions on Geoscience and Remote Sensing. - 2001. - Vol. 39, No. 9. - P. 2060-2072.

J571. Durden S.L. Surface clutter due to antenna sidelobes for spaceborne atmospheric radar. / Durden S.L., Im E., Li F.K., Girard R., Pak K.S. // IEEE Transactions on Geoscience and Remote Sensing. - 2001. - Vol. 39, No. 9. - P. 1916-1921.

J572. Lombardo P. Impact of clutter spectra on radar performance prediction. / Lombardo P., Greco H., Gini F., Farina A., Billingsley J.B. // IEEE Transactions on Aerospace and Electronic Systems. - 2001. - Vol. 37, No. 3. - P. 1022-1038.

J573. Jie Lai. Minimum duration outages in Rayleigh fading channels. / Jie Lai, Mandayam N.B. // IEEE Transactions on Communications. - 2001. - Vol. 49, No. 10. - P. 1755-1761.

J574. Meneghini R. On the feasibility of a Doppler weather radar for estimates of drop size distribution using two closely spaced frequencies. / Meneghini R., Liao L., Bidwell S.W., Heymsfield G.M. // IEEE Transactions on Geoscience and Remote Sensing. - 2001. - Vol. 39, No. 10. - P. 2203-2216.

J575. Lawrence D.E. Acoustic and electromagnetic wave interaction: analytical formulation for acousto-electromagnetic scattering behavior of a dielectric cylinder. / Lawrence D.E., Sarabandi K. // IEEE Transactions on Antennas and Propagation. - 2001. - Vol. 49, No. 10. - P. 1382-1392.

J576. Howard J. Erratum: "Optical coherence techniques for plasma spectrometry" [Rev. Sci. Instrum. 72, 888 (2001)]. / Howard J., Michael C., Glass F., Cheetham A. D. // Review of Scientific Instruments. - 2001. - Vol. 72, No. 10. - P. 4008.

J577. Nakamura T. Ion dynamics and oscillation frequencies in a linear combined trap. / Nakamura T., Ohtani S., Wada M., Okada K., Katayama I., Schuessler H. A. // Journal of Applied Physics. - 2001. - Vol. 89, No. 5. - P. 2922-2931.

J578. Kawasuso A. Vacancies and deep levels in electron-irradiated 6H SiC epilayers studied by positron annihilation and deep level transient spectroscopy. / Kawasuso A., Redmann F., Krause-Rehberg R., Frank T., Weidner M., Pensl G., Sperr P., Itoh H. // Journal of Applied Physics. - 2001. - Vol. 90, No. 7. - P. 3377-3382.

J579. Michael C. A. The MOSS camera on H-1NF. / Michael C. A., Howard J., Blackwell B. D. // Review of Scientific Instruments. - 2001. - Vol. 72, No. 1. - P. 1034-1037.

J580. Howard J. Optical coherence techniques for plasma spectroscopy (invited). / Howard J., Michael C., Glass F., Cheetham A. D. // Review of Scientific Instruments. - 2001. - Vol. 72, No. 1. - P. 888-897.

J581. Sampsell M. B. Simulations of beam-emission spectroscopy on Alcator C-Mod (abstract). / Sampsell M. B., Bravenec R. V., Rowan W. L., Eisner E. C., Patterson D. M., Bretz N. L., Boivin R. L., Hubbard A. E., Irby J. H., Marmar E. S., Terry J. L. // Review of Scientific Instruments. - 2001. - Vol. 72, No. 1. - P. 987.

J582. Craig D. First charge exchange recombination spectroscopy and motional Stark effect results from the Madison Symmetric Torus reversed field pinch. / Craig D., Den Hartog D. J., Fiksel G., Davydenko V. I., Ivanov A. A. // Review of Scientific Instruments. - 2001. - Vol. 72, No. 1. - P. 1008-1011.

J583. Osadciw L.A. Synchronization improvements using traceability in spread spectrum signal design. / Osadciw L.A., Titlebaum E.L. // IEEE Transactions on Aerospace and Electronic Systems. - 2001. - Vol. 37, No. 4. - P. 1142-1154.

J584. Berizzi F. High-resolution ISAR imaging of maneuvering targets by means of the range instantaneous Doppler technique: modeling and performance analysis. / Berizzi F., Mese E.D., Diani M., Martorella M. // IEEE Transactions on Image Processing. - 2001. - Vol. 10, No. 12. - P. 1880-1890.

J585. Narasimhan R. Estimation of mobile speed and average received power in wireless systems using best basis methods. / Narasimhan R., Cox D.C. // IEEE Transactions on Communications. - 2001. - Vol. 49, No. 12. - P. 2172-2183.

J586. Dottling M. Two- and three-dimensional ray tracing applied to the land mobile satellite (LMS) propagation channel. / Dottling M., Jahn A., Didascalou D., Wiesbeck W. // IEEE Antennas and Propagation Magazine. - 2001. - Vol. 43, No. 6. - P. 27-37.

J587. Zhao Y. Three-dimensional reconstruction of in vivo blood vessels in human skin using phase-resolved optical Doppler tomography. / Zhao Y., Brecke K.M., Ren H., Ding Z., Nelson J.S., Chen Z. // IEEE Journal of Selected Topics in Quantum Electronics. - 2001. - Vol. 7, No. 6. - P. 931-935.

J588. Dunaevsky A. Spectroscopy of a ferroelectric plasma cathode. / Dunaevsky A., Chirko K., Krasik Ya. E., Felsteiner J., Bershtam V. // Journal of Applied Physics. - 2001. - Vol. 90, No. 8. - P. 4108-4114.

J589. Wong S.K. Analysis of distortion in the high range resolution profile from a perturbed target. / Wong S.K., Duff G., Riseborough E. // IEE Proceedings - Radar, Sonar and Navigation. - 2001. - Vol. 148, No. 6. - P. 353-362.

J590. Ye Li. Bounds on the interchannel interference of OFDM in time-varying impairments. / Ye Li, Cimini L.J. Jr. // IEEE Transactions on Communications. - 2001. - Vol. 49, No. 3. - P. 401-404.

J591. Senet C.M. The near-surface current velocity determined from image sequences of the sea surface. / Senet C.M., Seemann J., Ziemer F. // IEEE Transactions on Geoscience and Remote Sensing. - 2001. - Vol. 39, No. 3. - P. 492-505.

J592. Monti-Guarnieri A. Optimal “focusing” for low resolution ScanSAR. / Monti-Guarnieri A., Guccione P. // IEEE Transactions on Geoscience and Remote Sensing. - 2001. - Vol. 39, No. 3. - P. 479-491.

J593. Ghogho M. Frequency estimation in the presence of Doppler spread: performance analysis. / Ghogho M., Swami A., Durrani T.S. // IEEE Transactions on Signal Processing. - 2001. - Vol. 49, No. 4. - P. 777-789.

J594. Hoffelner J. Finite element simulation of nonlinear wave propagation in thermoviscous fluids including dissipation. / Hoffelner J., Landes H., Kaltenbacher M., Lerch R. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2001. - Vol. 48, No. 3. - P. 779-786.

J595. Seok Jun Ko. Performance of coherent DS-SS/QPSK for mobile communications in fast-fading multipath and high-frequency offset. / Seok Jun Ko, Kyung Ha Lee, Hyung Jin Choi. // IEEE Transactions on Vehicular Technology. - 2001. - Vol. 50, No. 1. - P. 250-266.

J596. Knigge B. Nonlinear dynamic effects at the head-disk interface. / Knigge B., Talke F.E. // IEEE Transactions on Magnetics. - 2001. - Vol. 37, No. 2. - P. 900-905.

J597. Wilderman S.J. Improved modeling of system response in list mode EM reconstruction of Compton scatter camera images. / Wilderman S.J., Fessler J.A., Clinthorne N.H., LeBlanc J.W., Rogers W.L. // IEEE Transactions on Nuclear Science. - 2001. - Vol. 48, No. 1. - P. 111-116.

J598. Chang Qing Xu. On the Doppler power spectrum at the mobile unit employing a directional antenna. / Chang Qing Xu, Choi Look Law, Yoshida S. // IEEE Communications Letters. - 2001. - Vol. 5, No. 1. - P. 13-15.

J599. Gresham I. A compact manufacturable 76-77-GHz radar module for commercial ACC applications. / Gresham I., Jain N., Budka T., Alexanian A., Kinayman N., Ziegner B., Brown S., Staecker P. // IEEE Transactions on Microwave Theory and Techniques. - 2001. - Vol. 49, No. 1. - P. 44-58.

J600. Hirata K. Defects in 30 keV Er + -implanted SiO 2 /Si studied by positron annihilation and cathodoluminescence. / Hirata K., Arai H., Kawasuso A., Sekiguchi T., Kobayashi Y., Okada S. // Journal of Applied Physics. - 2001. - Vol. 90, No. 1. - P. 237-242.

J601. Jian Li. Moving target feature extraction for airborne high-range resolution phased-array radar. / Jian Li, Guoqing Liu, Nanzhi Jiang, Stoica P. // IEEE Transactions on Signal Processing. - 2001. - Vol. 49, No. 2. - P. 277-289.

J602. Noneaker D.L. On the spectral efficiency of wideband CDMA systems. IEEE Journal on Selected Areas in Communications. - 2001. - Vol. 19, No. 1. - P. 33-47.

J603. Rosmansyah Y. Equivalence of flat and classical Doppler sample generators. / Rosmansyah Y., Saunders S.R., Sweeney P., Tafazolli R. // Electronics Letters. - 2001. - Vol. 37, No. 4. - P. 243-244.

J604. Aydin N. Time-scale analysis of quadrature Doppler ultrasound signals. / Aydin N., Markus H.S. // IEE Proceedings - Science, Measurement and Technology. - 2001. - Vol. 148, No. 1. - P. 15-22.

J605. Tepedelenlioglu C. On velocity estimation and correlation properties of narrow-band mobile communication channels. / Tepedelenlioglu C., Giannakis G.B. // IEEE Transactions on Vehicular Technology. - 2001. - Vol. 50, No. 4. - P. 1039-1052.

J606. Lo K.W. Flight path estimation using frequency measurements from a wide aperture acoustic array. / Lo K.W., Ferguson B.G. // IEEE Transactions on Aerospace and Electronic Systems. - 2001. - Vol. 37, No. 2. - P. 685-694.

J607. Myers L.J. Analytical solution for pulsatile axial flow velocity waveforms in curved elastic tubes. / Myers L.J., Capper W.L. // IEEE Transactions on Biomedical Engineering. - 2001. - Vol. 48, No. 8. - P. 864-873.

J608. Noneaker D.L. The effect of automatic gain control on serial, matched-filter acquisition in direct-sequence packet radio communications. / Noneaker D.L., Raghavan A.R., Baum C.W. // IEEE Transactions on Vehicular Technology. - 2001. - Vol. 50, No. 4. - P. 1140-1150.

J609. Gang Sheng. An experimental study of dimple separations and head-disk impacts of negative pressure slider in unload process. / Gang Sheng, Qisuo Chen, Wei Hua, Bo Liu. // IEEE Transactions on Magnetics. - 2001. - Vol. 37, No. 4. - P. 1859-1862.

J610. Tanaka H. Effect of air-bearing design on slider dynamics during unloading process. / Tanaka H., Kohira H., Matsumoto M. // IEEE Transactions on Magnetics. - 2001. - Vol. 37, No. 4. - P. 1818-1820.

J611. Baas N.J. Matched filter bounds for wireless communication over Rayleigh fading dispersive channels. / Baas N.J., Taylor D.P. // IEEE Transactions on Communications. - 2001. - Vol. 49, No. 9. - P. 1525-1528.

J612. Pai-Chi Li. On velocity estimation using speckle decorrelation [blood]. / Pai-Chi Li, Chong-Jing Cheng, Chih-Kuang Yeh. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2001. - Vol. 48, No. 4. - P. 1084-1091.

J613. Dogandzic A. Cramer-Rao bounds for estimating range, velocity, and direction with an active array. / Dogandzic A., Nehorai A. // IEEE Transactions on Signal Processing. - 2001. - Vol. 49, No. 6. - P. 1122-1137.

J614. Walker D. Doppler modelling of radar sea clutter. IEE Proceedings - Radar, Sonar and Navigation. - 2001. - Vol. 148, No. 2. - P. 73-80.

J615. Xie J. Experimental analysis of sea clutter in shipborne HFSWR. / Xie J., Yuan Y., Liu Y. // IEE Proceedings - Radar, Sonar and Navigation. - 2001. - Vol. 148, No. 2. - P. 67-71.

J616. Polycarpou A.C. Helicopter rotor-blade modulation of antenna radiation characteristics. / Polycarpou A.C., Balanis C.A., Stefanov A. // IEEE Transactions on Antennas and Propagation. - 2001. - Vol. 49, No. 5. - P. 688-696.

J617. Yuping Zhao. Intercarrier interference self-cancellation scheme for OFDM mobile communication systems. / Yuping Zhao, Haggman S.-G. // IEEE Transactions on Communications. - 2001. - Vol. 49, No. 7. - P. 1185-1191.

J618. Koch W. Ground target tracking with STAP radar. / Koch W., Klemm R. // IEE Proceedings - Radar, Sonar and Navigation. - 2001. - Vol. 148, No. 3. - P. 173-185.

J619. Chen V.C. Simulation of ISAR imaging of moving targets. / Chen V.C., Miceli W.J. // IEE Proceedings - Radar, Sonar and Navigation. - 2001. - Vol. 148, No. 3. - P. 160-166.

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