

2007 IEEE Radar Conference.

**Waltham, MA
17-20 April 2007**

Volume 1 of 2



**IEEE Catalog Number:
ISBN:**

**07CH37790
1-4244-0283-2**

TECHNICAL PROGRAM

Scroll to the title and select a **Blue** link to open a paper. After viewing the paper, use the bookmark “Go to Previous Document” to return to the same page in the Table of Contents.

Plenary

Chairs: **Dr. Ellen Ferraro**, *Raytheon Company, USA*
Mr. David K. Barton, *Consultant, USA*

Army Radar Requirements for the 21st Century	1
<i>Jay M. Loomis</i>	
Next Generation Intelligent Radar	7
<i>Joseph R. Guerci</i>	
Future of RF Technology and Radars	11
<i>Mark E. Russell</i>	
Haystack Ultra-Wideband Satellite Imaging Radar (HUSIR)	17
<i>Joseph M. Usoff</i>	
Distributed Weather Radar using X-Band Active Arrays	23
<i>David J. McLaughlin, Eric A. Knapp, Y. Wang, V. Chandrasekar</i>	
A System for the Measurement of the Amazon	28
<i>Paul B. Ferraro, Mark Bauersachs, John Burns, Gary Bataller</i>	
Phased-Array and Radar Breakthroughs	37
<i>Eli Brookner</i>	
UWB Radars: Recent Technological Advances and Applications	43
<i>A.G. Yarovoy, L.P. Lighthart</i>	

Session 1: Radar Systems and System Issues

Chairs: **Mr. Harold Ward**, *Raytheon Company (ret'd), USA*
Dr. Eli Brookner, *Raytheon Company, USA*

Future Surface Radar Technology: From Air Defence to Air and Missile Defence	49
<i>Odile Adrian</i>	
High-Dynamic-Range Receivers for Digital Beam Forming Radar Systems	55
<i>Keir C. Lauritzen, Joseph E. Sluz, Matthew E. Gerwell, Albert K. Wu, Salvador H. Talisa</i>	
Nanosecond Gigawatt Radar: Indication of Small Targets Moving Among Heavy Clutter	61
<i>A. Blyakhman, D. Clunie, R. Harris, G. Mesyats, M. Petelin, G. Postoenko, B. Wardrop</i>	
Next-Generation W-Band Radar Testbed	65
<i>Robert F. Holloway, William H. Weedon, Bijan Houshmand, Alan Roll</i>	
Radar Core Electronics for the European Radar SOSTAR-X - Recent Results	72
<i>M. Kirscht</i>	

Radar Performance Degradation due to the Presence of Wind Turbines	75
<i>Arne Theil, Lucas J. van Ewijk</i>	
Statistics of Clutter Residue in MTI Radars with IF Limiting	81
<i>Thomas M. Hall, Willaim W. Shrader</i>	
Target Height Estimation using Multipath Over Land	88
<i>Christopher D. Berube, Paul R. Felcyn, Ken Hsu, James H. Latimer II, David B. Swanay</i>	
Wind Farm Clutter Mitigation in Air Surveillance Radar	93
<i>James Perry, Andrew Biss</i>	

Session 2: Waveforms

Chairs: **Dr. Marvin N. Cohen**, *Georgia Tech Research Institute / IRTA, Inc., USA*
Prof. Nadav Levanon, *Tel Aviv University, Israel*

Ambiguity and Sidelobe Behavior of CAZAC Coded Waveforms	99
<i>Andrew Kebo, Ioannis Konstantinidis, John J. Benedetto, Michael R. Dellomo, Jeffrey M. Sieracki</i>	
Compression Waveforms for Non-Coherent Radar	104
<i>Uri Peer, Nadav Levanon</i>	
Performance of Pulse Compression Code and Filter Pairs Optimized for Loss and Integrated Sidelobe Level	110
<i>Carroll Nunn, Frank F. Kretschmer</i>	
Achieving Real-Time Efficiency for Adaptive Radar Pulse Compression	116
<i>Shannon D. Blunt, Thomas Higgins</i>	
A Comprehensive Review of Quasi-Orthogonal Waveforms	122
<i>Byron M. Keel, J. Mike Baden, Ted H. Heath</i>	
Compressive Radar Imaging	128
<i>Richard Baraniuk, Philippe Steeghs</i>	
Characterization of Range Resolution as a Function of Bandwidth and Frequency	134
<i>Stephen Welstead</i>	

Session 3a: Mechanical Engineering in Radar

Chairs: **Mr. Alan B. Rohwer**, *Raytheon Company, USA*
Mr. Lucian N. Lemnios, *Raytheon Company, USA*

Mechanical Engineering's Role in Multi-Disciplinary Radar Design	139
<i>William C. Dawson, Alan B. Rohwer</i>	
Analysis of the Variation in the Main Beam Characteristics of Phase Array Radars when Introduced to a Shock Environment	145
<i>Nicholas J. Manzi, Dung N. Tran, Eugene Ngai</i>	
Thermal Management of Active Electronically Scanned Array Transmit/Receive LRU (Line Replaceable Unit)	150
<i>Brian A. Pluymers, Robert M. Reese</i>	

The New Haystack Antenna – Structural Design, Optimization, and Performance Overview 156
Gene Rhoades, Apostle G. Cardiasmenos, Joseph Antebi, Frank W. Kan, Daniel P. Valentine, Andrew T. Sarawit, Michael Brenner

The New Haystack Antenna – Reflector Surface Design and Metrology 165
Michael Brenner, Apostle G. Cardiasmenos, Gene Rhoades, Joseph Antebi, Frank W. Kan

Session 3b: Tracking

Chairs: **Dr. W. Dale Blair**, *Georgia Tech Research Institute, USA*
Dr. Lisa Ehrman, *Georgia Tech Research Institute, USA*

The New Haystack Antenna – Control System, Pointing and Tracking 171
Gregory Maglathlin, Ted Peregrin, Gene Rhoades, Apostle G. Cardiasmenos

Automated Optimization of Tracking Algorithms using Simulated Annealing 177
Peter J. Kajenski

Detection of an Unknown Number of Targets via Track-Before-Detect Procedures 180
Stefano Buzzi, Marco Lops, Luca Venturino, Maurizio Ferri

RCS-Aided Tracking: Does it Always Improve Data Association? 186
Lisa M. Ehrman, W. Dale Blair

Target Tracking in Sensor Networks: Criteria for Sensor Selection 192
U.D. Ramdaras, F.G.J. Absil

Poster Session 1: Radar Systems and System Issues

Chairs: **Dr. Roger Reed**, *Raytheon Company, USA*
Ms. Talia Kohen, *Raytheon Company, USA*

Comparison of Efficient Design Techniques for Surveillance Radars 197
Taniza Roy, Meena. D, L.G.M. Prakasam

Design of Multi-Level Radar Target Simulator 203
Meena. D, Taniza Roy, L.G.M. Prakasam

MonoPulse Angle Measurement for an Airborne Side-Looking Phased Array PD Radar 209
Fan Mingyi, Ge Jianjun, Qiu Wei, Wu Manqing

The Frequency Selection Consideration for the Low Orbit Space based Radar 212
Lin Tang, Zhongxian Chen

Use of a Rician Distribution for Modeling Aspect-Dependent RCS Amplitude and Scintillation 218
Chris D. Papanicolopoulos, William D. Blair, Donald L. Sherman, Maite Brandt-Pearce

A Robust Integrated Propagation and Site Specific Land Clutter Model 224
George LeFurjah, Donald de Forest Boyer, John H. Osborne, Terry L. Foreman

Poster Session 1: Waveforms

Chairs: **Dr. Roger Reed**, *Raytheon Company, USA*
Ms. Talia Kohen, *Raytheon Company, USA*

Tracking High-Speed Targets using a Pulse Doppler Stepped-Frequency Waveform 229
Geoffrey H. Goldman

Adaptive Pulse Compression: Preliminary Experimental Measurements 234
A.K. Shackelford, J. de Graaf, S. Talapatra, S.D. Blunt, K. Gerlach

Poster Session 1: Mechanical Engineering and Tracking

Chairs: **Dr. Roger Reed**, *Raytheon Company, USA*
Ms. Talia Kohen, *Raytheon Company, USA*

Track-Before-Detect of Multiple Slowly Moving Targets 238
Ross Deming, John Schindler, Leonid Perlovsky

Student Poster Session 1

Chairs: **Dr. Biao Chen**, *Syracuse University, EE/CS, USA*
Dr. James H. Michels, *JHM technologies LLC, USA*

2-D Angle of Arrival Estimation with Two Parallel Uniform Linear Arrays for Coherent Signals 244
T.Q. Xia, Y. Zheng, Q. Wan, X.G. Wang

A 94 GHz OFDM Frequency Scanning Radar for Autonomous Landing Guidance 248
Koen Van Caekenberghe, Karl F. Brakora, Kamal Sarabandi

A Co-Channel Signal Detector based on Phase Tracking for Pulse Doppler Radar 254
X. Lu, R.L. Kirlin, J. Wang

A Comparison of Long-Term Meridional Neutral Winds Extracted from Arecibo Incoherent Scatter Radar with the Neutral Winds Obtained via Fabry Perot Interferometry 259
Talia Kohen, Nestor Aponte, Michael J. Nicolls, Eva Robles, Craig A. Tepley, Sixto A. González

A New Doppler-Tolerant Polyphase Pulse Compression Codes based on Hyperbolic Frequency Modulation 265
Jie Yang, Tapan K. Sarkar

A New Strip Mode Synthetic Aperture Radar (SAR) Data Simulator 271
Ozan Doğan, Mesut Kartal, Sedef Kent

Adaptive MIMO Radar System in Clutter 276
P.F. Sammartino, C.J. Baker, H.D. Griffiths

Adaptive Regularized FOCUSS Algorithm 282
T.Q. Xia, Y. Zheng, Q. Wan, X.G. Wang

Artificial Neural Networks ANN Approach for the Synthesis of Patch Antennas 285
R. Ghayoula, A. Gharsallah, N. Fadlallah, M. Rammal

Atmospheric Refractivity Tracking from Radar Clutter using Kalman and Particle Filters 291
Caglar Yardim, Peter Gerstoft, William S. Hodgkiss

Cancellation of Doppler Distortion in Pulse Compression for Targets Moving in an Arbitrary Direction	297
<i>Jie Yang, Tapan K. Sarkar</i>	
Coherent Detection for MIMO Radars	302
<i>Abbas Sheikhi, Ali Zamani</i>	
Computer Simulation of an Integrated Multi-Sensor System for Maritime Border Control	308
<i>Sofia Giompapa, Alfonso Farina, Fulvio Gini, Antonio Graziano, Riccardo Di Stefano</i>	
Estimating Instantaneous False Alarm Rate in a CFAR System by Bayesian and Empirical Bayesian Methods	314
<i>Morten Stakkeland, X. Rong Li</i>	
 Session 4: Signal Processing: Detection and Estimation	
Chairs: Dr. Steven Kogon, MIT Lincoln Laboratory, USA	
Dr. James Ward, MIT Lincoln Laboratory, USA	
A Novel High Resolution ICA- Based TOA Estimation Technique	320
<i>M. Pourkhaatoun, Seyed A. Zekavat, J. Pourrostam</i>	
Adapting the CLEAN Deconvolver and CLEAN Detector to Doppler Uncertainty	325
<i>Terry L. Foreman</i>	
Algorithm Overview based on Image Processing with Electromagnetic (EM) Techniques in X Band and GA Approach for Depth Estimation of Shallow Buried Dummy Mines	331
<i>K.C. Tiwari, D. Singhb, M. Arora</i>	
Computationally Efficient Angle Estimation using Maximum Likelihood in a Digital Beam-Forming Radar	337
<i>Yong Liu, Catherine G. Wong, William Kennedy</i>	
Detection in Range-Heterogeneous Weibull Clutter	343
<i>Ulku Cilek Doyuran, Yalcin Tanik</i>	
Inverse Precision Velocity Update for Monopulse Calibration	348
<i>Kapriel V. Krikorian, Yu-Hong Kwong, Robert A. Rosen</i>	
Knowledge Aided Detection and Tracking	352
<i>Christopher T. Capraro, Gerard T. Capraro, Micheal C. Wicks</i>	
Short-Data-Record Adaptive Detection	357
<i>Dimitris A. Pados, Stella N. Batalama, George N. Karystinos, John D. Matyjas</i>	
 Session 5: OTH and Special Radars	
Chairs: Dr. Fred Earl, Riverside Research Institute, USA	
Dr. Ben Cantrell, US Navy Research Laboratory (ret'd) / SFA, USA	
Traveling Ionospheric Disturbance Mitigation for OTH Radar	362
<i>L.J. Nickisch, Mark A. Hausman, Sergey Fridman</i>	
Elevation Filtering in Wide-Aperture HF Skywave Radar	367
<i>Ben A. Johnson, Yuri I. Abramovich</i>	

Forward-Based Receiver Augmentation for OTHR	373
<i>Gordon Frazer</i>	
MUSIC-Enhanced CFAR for High Frequency Over-the-Horizon Radar	379
<i>J. Wang, R.J. Riddolls, A.M. Ponsford</i>	
Spatially Waveform Diverse Radar: Perspectives for High Frequency OTHR	385
<i>Gordon J. Frazer, Yuri I. Abramovich, Ben A. Johnson</i>	
An Analysis of Measurement Derived Sea Clutter Simulations at Very Low Grazing Angles, in the Presence of Surface based Ducting	391
<i>Donald de Forest Boyer, Bruce Spaulding, George LeFurjah</i>	
Modelling of Adaptive Multifunction Radars for Trials Planning and Acceptance	396
<i>W.N. Dawber, G.J. Hunter, J.A. Branson</i>	
Ultra-Wide Band Near-Field Imaging System	402
<i>Anatoliy O. Boryssenko, Christophe Craeye, Daniel H. Schaubert</i>	
Session 6: Phased Arrays and Antennas	
Chairs: Mr. Mark Mitchell , <i>Georgia Tech Research Institute, USA</i>	
Mr. Michael Sarcione , <i>Raytheon Company, USA</i>	
A Spectral Slope-Based Approach for Mitigating Bistatic STAP Clutter Dispersion	408
<i>Fabiola Colone, Marco Fornari, Pierfrancesco Lombardo</i>	
Affordable Navel Surveillance Radar Concept	414
<i>Ben Cantrell, Michael Pollock, James Alter</i>	
Air-Cooled, Active Transmit/Receive Panel Sub-Array	421
<i>Angelo Puzella, Roberto Alm</i>	
Frequency Diverse Array Antenna with Periodic Time Modulated Pattern in Range and Angle	427
<i>Mustafa Secmen, Simsek Demir, Altuncan Hizal, Taylan Eker</i>	
Geodesic Dome Phased Array Radars	431
<i>Gregg D. Ouder Kirk</i>	
MESAR, Sampson and Radar Technology for BMD	437
<i>W.K. Stafford</i>	
Microstrip Antenna Array Solution for Large Size Active Phased Array Aperture	443
<i>U.K. Revankar, K.S. Beenamole, N.S. Kutiya, Mahima Garg, V. Saravana Kumar, Ashutosh Kedar</i>	
Particle Swarm Optimization of Antenna Elements for Foliage Penetrating Radar	449
<i>Peter J. Kajenski</i>	
Phase-Only Transmit Beam Broadening for Improved Radar Search Performance	451
<i>J. Clayton Kerce, George C. Brown, Mark A. Mitchell</i>	
Ultra Low Side Lobe Electronically Steerable Multibeam Antenna System for Long Range 3-D Naval Surveillance Radar	457
<i>A.K. Singh, Shubba Elizabeth, P. Srinivasa, Preeti Dongaonkar</i>	

Poster Session 2: Signal Processing, Detection and Estimation

Chairs: **Dr. Roger Reed**, *Raytheon Company, USA*
Ms. Talia Kohen, *Raytheon Company, USA*

Clutter Rank of Multi-Dimensional Sparse Array Radar	463
<i>Yong Wu, Jun Tang, Yingning Peng</i>	
Comparison of Clutter and Multipath Cancellation Techniques for Passive Radar	469
<i>Roberta Cardinali, Fabiola Colone, Chiara Ferretti, Pierfrancesco Lombardo</i>	
DSP based Implementation of Direction of Arrival for Wideband Sources	475
<i>Mohsin M. Jamali, Abdel Affo, Nathan Wilkins, Philip D. Mumford, Ken Hahn</i>	
Signal Detection using the Correlation Coefficient in Fractal Geometry	481
<i>Seyed Ali Madanizadeh, Mohammad Mahdi Nayebi</i>	
Soft Decision M-Pulse CFAR Detection in Weibull Clutter	487
<i>Azadeh Sheikholeslami, Yaser Norouzi, Mohammad Mahdi Nayebi</i>	
Order Statistic and Maximum Likelihood Distributed CFAR Detectors in Weibull Background	491
<i>A. Zaimbashi, M.R. Taban, M.M. Nayebi</i>	
Wavelets: A Versatile Tool for the High Frequency Surface Wave Radar	497
<i>Florent Jangal, Stéphane Saillant, Marc Hélier</i>	

Poster Session 2: OTH and Special Radars

Chairs: **Dr. Roger Reed**, *Raytheon Company, USA*
Ms. Talia Kohen, *Raytheon Company, USA*

Polarization Dependence of Radar Contrast for Sea Surface Oil Slicks	503
<i>Iosif Fuks, Valery Zavorotny</i>	
An Experimental Study on using Electronically Scanning Microwave Radar Systems on Surface Mining Machines	509
<i>Karl Nienhaus, Reik Winkel, Winfried Mayer, Arnold Gronau, Wolfgang Menzel</i>	
Clutter Modeling and Characteristics Analysis for Bistatic SBR	513
<i>Hua Li, Jun Tang, Yingning Peng</i>	
Hitchhiking Bistatic Radar: Principles, Processing and Experimental Findings	518
<i>T. Johnsen, K.E. Olsen</i>	

Poster Session 2: Phased Arrays and Antennas

Chairs: **Dr. Roger Reed**, *Raytheon Company, USA*
Ms. Talia Kohen, *Raytheon Company, USA*

Application of the Neutral Network to the Synthesis of Multibeam Antennas Arrays	524
<i>Ridha Ghayoula, Traii Mbarek, Ali Gharsallah</i>	
Effect of an Ultra Wideband CPW Fed Monopole Antenna on Impulse Transmission	528
<i>Sachin Gupta, M. Ramesh, M. Lokesh, L. Ramakrishnan, A.T. Kalghatgi</i>	
Scattering and Receiving Characteristics of Waveguide Slot Array Antennas	532
<i>Sembiam R. Rengarajan</i>	

Time-Domain Planar Near-Field Measurement Simulation for Wideband RCS and Antenna	535
<i>Xian-Jun Shen, Xu Chen, Yong-Qing Zou, Yu-Mei Zhang</i>	

Student Poster Session 2

Chairs: **Dr. Biao Chen**, *Syracuse University, EE/CS, USA*
Dr. James H. Michels, *JHM Technologies LLC, USA*

Factored Multiplicative Mismatched Filters for Compound Barker Codes	541
<i>Indranil Sarkar, Adly T. Fam</i>	

Human Tracking using Doppler Processing and Spatial Beamforming	546
<i>Shobha Sundar Ram, Yang Li, Adrian Lin, Hao Ling</i>	

Imaging Algorithm of Missile-Borne MMW SAR for Ground Moving Target	552
<i>Wenchong Xie, Yongliang Wang</i>	

Ionospheric Clutter Mitigation with Knowledge Aided Pre-Whiten in High Frequency Surface Wave Radar	558
<i>Li Lei, Xu Rongqing, Li Gaopeng</i>	

New Solution to the Range-Dependence Problem in STAP Radar with HPRF	562
<i>Wenchong Xie, Yongliang Wang</i>	

Novel Direction-of-Arrival Estimation Techniques for Periodic-Sense Local Positioning Systems	568
<i>J. Pourrostam, Seyed A. Zekavat, Hui Tong</i>	

Obtaining a 35x Speedup in 2D Phase Unwrapping using Commodity Graphics Processors	574
<i>Peter A. Karasev, Daniel P. Campbell, Mark A. Richards</i>	

Range Migration Algorithm in Bistatic SAR based on Squint Mode	579
<i>Junjie Wu, Yulin Huang, Jintao Xiong, Jianyu Yang</i>	

Sample Size Analysis for Confidence Interval Estimation of Performance Metrics in ATR Evaluation	585
<i>Jun He, Hongzhong Zhao, Qiang Fu</i>	

SAR with Two-Dimensional Aperture Synthesis	590
<i>Jehanzeb Burki, Christopher F. Barnes</i>	

Self-Organizing Adaptive Radar Space-Time Adaptive Processing	596
<i>Shengchun Zhao</i>	

Solution to Linear Inverse Problem with MMV having Linearly varying Sparsity Structure	602
<i>Y. Zhang, Q. Wan, L. Yang</i>	

Spotlight SAR Raw Data Simulation using Frequency Scaling Algorithm	608
<i>Wang Yu, Zhang Zhi-min, Deng Yun-kai</i>	

Super-Resolution Direction-of-Arrival Estimation via Blind Signal Separation Methods	614
<i>J. Pourrostam, Seyed A. Zekavat, M. Pourkhaatoun</i>	

Super-Resolution Processing for Polarimetric Synthetic Aperture Radar Tomography	618
<i>Honglei Chen, Dayalan Kasilingham</i>	

Session 7: Adaptive Processing

Chairs: **Dr. Alfonso Farina**, *SELEX Sistemi Integrati, Italy*
Dr. Muralidhar Rangaswamy, *USAF Research laboratory, USA*

Adaptive Radar Detection: A Bayesian Approach	624
<i>Antonio De Maio, Alfonso Farina, Goffredo Foglia</i>	
An Adaptive Beamforming Technique for Countering Synthetic Aperture Radar (SAR) Jamming Threats	630
<i>Andrew S. Paine</i>	
Detection with Adaptive Arrays with Irregular Digital Subarrays	635
<i>Ulrich Nickel</i>	
Direction of Arrival and Angular Velocities (DOAV) Estimation using Minimum Variance Beamforming	641
<i>Webert Montlouis, Pierre-Richard J. Cornely</i>	
Enhancing GMTI Performance in Non-Stationary Clutter using 3-D STAP	647
<i>Phillip M. Corbell, Jimmie J. Perez, Muralidhar Rangaswamy</i>	
Time-Varying Autoregressive Adaptive Filtering for Airborne Radar Applications	653
<i>Yuri I. Abramovich, Muralidhar Rangaswamy, Ben A. Johnson, Phillip Corbell, Nicholas Spencer</i>	

Session 8: Emerging Technologies

Chairs: **Dr. Gerald Trunk**, *Johns Hopkins University APL, USA*
Dr. Michael Zatman, *DARPA, USA*

Si based UWB Radar Sensors	658
<i>Ian Gresham, Alan Jenkins, Noyan Kinayman, Rob Point, Yumin Lu, Ryosuke Ito, Andy Street</i>	
An X-Band SIGE Single-MMIC Transmit/Receive Module for Radar Applications	664
<i>Mark A. Mitchell, John D. Cressler, Wei-Min Lance Kuo, Jonathan Comeau, Joel Andrews</i>	
Solid State X-Band Airport Surface Surveillance Radar	670
<i>Paul Lanzkron, Eli Brookner</i>	
MEMS Electronically Steerable Antennas for Fire Control Radars	677
<i>John J. Maciel, John F. Slocum, John K. Smith, John Turtle</i>	
Aspects of Radar Range Super-Resolution	683
<i>Shannon D. Blunt, Karl Gerlach, Thomas Higgins</i>	
Bistatic Radar based on DAB Illuminators: The Evolution of a Practical System	688
<i>Heath J. Yardley</i>	
High Resolution Frequency MIMO Radar	693
<i>Xi-Zeng Dai, Jia Xu, Ying-Ning Peng</i>	
Adaptive WEighting of Signals via One Matrix Entity (AWESOME)	699
<i>Yao Xie, Jian Li, James Ward</i>	

Session 9: SAR

Chairs: **Prof. Hugh Griffiths**, *Cranfield University, UK*
Dr. Leslie Novak, *Consultant, USA*

Model-Based Correction of Through-Wall SAR Imagery via Raytracing	706
<i>Peter J. Shargo, James W. Melody</i>	
Bistatic Synthetic Aperture Radar Imaging for Arbitrary Flight Trajectories and Non-Flat Topography	712
<i>Can Evren Yarman, Birsen Yazici, Margaret Cheney</i>	
InSAR Remote Sensing Over Decorrelating Terrains: Persistent Scattering Methods	717
<i>Howard Zebker, Piyush Shankar, Andrew Hooper</i>	
Tracking Moving Ground Targets from Airborne SAR via Keystoning and Multiple Phase Center Interferometry	723
<i>P.K. Sanyal, D.M. Zasada, R.P. Perry</i>	
Point Spread Function Characterization of a Radially Displaced Scatterer using Circular Synthetic Aperture Radar	729
<i>U.K. Majumder, M.A. Temple, M.J. Minardi, E.G. Zelnio</i>	
Developments in Modern Synthetic Aperture Radar	734
<i>H.D. Griffiths</i>	
Perspectives on Worldwide Spaceborne Radar Programs	740
<i>Paul A. Rosen, Gina M. Buccolo</i>	
Poster Session 3: Adaptive Processing	
Chairs: Dr. Roger Reed , <i>Raytheon Company, USA</i> Ms. Talia Kohen , <i>Raytheon Company, USA</i>	
A Two Stage GPS Anti-Jamming Processor for Interference Suppression and Multipath Mitigation	746
<i>Dan Lu, Renbiao Wu, Zhigang Su, Wei Huang</i>	
Angle-Tracking Adaptive Array – Adaptive-Adaptive Array Processing	750
<i>Huajjin Gu</i>	
Fast-Converging Adaptive Cascaded Cancellers using a Novel Soft-Weighting and Reiteration (SWR) Technique	756
<i>Michael L. Picciolo, Karl Gerlach</i>	
Map-Aided Secondary Data Selection	762
<i>Scott D. Berger, William L. Melvin, Gregory A. Showman</i>	
Multiple Constraint Space-Time Adaptive Processing using Direct Data Domain Least Squares (D3LS) Approach	768
<i>Santana Burintramart, Nuri Yilmazer, Tapan K. Sarkar</i>	
Maximum-Likelihood based Range-Dependence Compensation for Coherent Multistatic STAP Radar	772
<i>Xavier Neyt, Marco Acheroy, Jacques G. Verly</i>	

Poster Session 3: SAR

Chairs: **Dr. Roger Reed**, *Raytheon Company, USA*
Ms. Talia Kohen, *Raytheon Company, USA*

A New Method for Compensation of SAR Range Cell Migration based on the Pulse Z-Transform	778
<i>Ø. Overrein</i>	
Adaptive Detection of Moving Target based on Velocity Synthetic Aperture Radar	783
<i>Jia Xu, Gang Li, Ying-Ning Peng, Xiang-Gen Xia, Yong-liang Wang</i>	
Automatic Detection of Power Transmission Series in Full Polarimetric SAR Imagery	789
<i>Wen Yang, Haijian Zhang, Jiayu Chen, Hong Sun</i>	
Characterization of Vessel Heave and Horizontal Velocities with Airborne SAR	794
<i>Michael D. Henschel, Marina V. Dragošević, Charles E. Livingstone</i>	
Characterization of Zero-Doppler Clutter Removal Techniques for ISAR Applications	800
<i>J.D. Fowler, M.A. Temple, M.J. Havrilla, J.J. Akerson</i>	
Data Collection Eclipsing Effects in the Inverse Polar Format Algorithm (IPFA) for Turntable Spotlight Inverse Synthetic Aperture Radar (ISAR) Imaging Systems	805
<i>Scott D. Fisher, Mark A. Richards, James H. McClellan</i>	
Extracting Global 3D Scattering Center Model of Radar Target from Multiple HRR Profiles	811
<i>Zhou Jianxiong, Zhao Hongzhong, Shi Zhiguang, Fu Qiang</i>	
Fisher Ratio Optimization under Volterra Filtering Model for Identification of Polarimetric Air/Air Range Profiles of Aircrafts	817
<i>Cyrille J. Enderli</i>	
Model-Based Classification of Aircraft Range Profiles using Data Association Algorithms	822
<i>Laurent Savy, Christophe Gaie</i>	
Polarization Diversity using Mutual Information	828
<i>Jaime R. Roman, John W. Garnham, Paul Antonik</i>	
Restriction Analysis of SAR Azimuth Resolution based on Cubic Phase Error	834
<i>Guoqi Hu, Jiabin Xiang, Jia Xu</i>	

Session 10: Signal and Data Processing

Chairs: **Dr. Steven Kogon**, *MIT Lincoln Laboratory, USA*
Dr. James Ward, *MIT Lincoln Laboratory, USA*

A New Approach to Achieving High-Performance Power Amplifier Linearization	840
<i>Joel Goodman, Benjamin Miller, Gil Raz, Matthew Herman</i>	
An ECCM Scheme for Orthogonal Independent Range-Focusing of Real and False Targets	846
<i>Jabran Akhtar</i>	
Dynamic Logic Applied to SAR Data for Parameter Estimation Behind Walls	850
<i>Robert Linnehan, John Schindler, David Brady, Robert Kozma, Ross Deming, Leonid Perlovsky</i>	
Challenging Issues in Multichannel Radar Array Processing	856
<i>A. De Maio, G.A. Fabrizio, A. Farina, W.L. Melvin, L. Timmoneri</i>	

Coherent Integration with Range Migration using Keystone Formatting	863
<i>R.P. Perry, R.C. DiPietro, R.L. Fante</i>	
Extensions of the Chernoff Importance Sampling Method	869
<i>Karl Gerlach, Kevin Wagner</i>	
Training Method for Ground Bounce Removal with Ground Penetrating Radar	875
<i>Jiaxue Liu, Renbiao Wu</i>	
Signal Processing Challenges for HUSIR	879
<i>Earl C. Burt</i>	
Successive Target Cancellation in Pulse Compression Radars	885
<i>Onur Haliloğlu, A. Özgür Yilmaz</i>	
 Session 11: Radar Coverage and Propagation	
Chairs: Dr. Pierre-Richard Cornely, Raytheon Company, USA	
Mr. Dan Dockery, Johns Hopkins University APL, USA	
Advanced Refractive Effects Prediction System (AREPS)	891
<i>W.L. Patterson</i>	
An Overview of Recent Advances for the TEMPER Radar Propagation Model	896
<i>G. Daniel Dockery, Ra'id S. Awadallah, David E. Freund, Jonathan Z. Gehman, Michael H. Newkirk</i>	
Clustering Analysis of Refractive Index Profiles: Toward a Ducting Climatology	906
<i>Ruth S. Belmonte, Stephen A. Fast, George S. Young, Brandon G. Katz</i>	
Four Dimensional System Engineering Demands on Radar Operating in a Coastal Sub-Refractive Environment	910
<i>Robert E. Marshall, Tracy Haack</i>	
Ionospheric Propagation Effects on Ground and Space based Radar	916
<i>Dennis L. Knepp, Mark A. Hausman</i>	
Mitigation of Ionospheric Propagation Errors with GPS	922
<i>Anthea J. Coster</i>	
Radar Path Attenuation Statistics Employing a Rain Field Visualization Methodology	927
<i>Julius Goldhirsh</i>	
Radar Scattering from Partially-Submerged Objects in Ducting Environments	932
<i>Ra'id S. Awadallah, Hwar C. Ku, Chad R. Sprouse</i>	
Statistical Estimation of Refractivity from Radar Sea Clutter	938
<i>Caglar Yardim, Peter Gerstoft, William S. Hodgkiss, Ted Rogers</i>	
 Session 12a: Transmit/Receive Modules	
Chairs: Mr. Zachary J. Lemnios, MIT Lincoln Laboratory, USA	
Mr. Frank Sullivan, Raytheon Company, USA	
Technologies for Next Generation T/R Modules	944
<i>Mark J. Rosker</i>	

S- and X-Band Radar Transmit/Receive Module Overview	948
<i>Bruce A. Kopp</i>	
Additive Functions Provide a Powerful Tool for T/R Module Modeling	954
<i>T.R. Turlington</i>	
SiC and GaN Wide Bandgap Device Technology Overview	960
<i>J.W. Milligan, S. Sheppard, W. Pribble, Y.-F. Wu, St.G. Müller, J.W. Palmour</i>	
RF Photonics for Radar Front-Ends	965
<i>S.A. Pappert, B. Krantz</i>	
 Session 12b: Electronic Devices	
Chairs: Dr. John K. Smith, Consultant, USA	
Dr. L. Cole Howard, SAIC, USA	
Vacuum Electronics: Status and Trends	971
<i>Baruch Levush, David K. Abe, Jeffrey P. Calame, Bruce G. Danly, Khanh T. Nguyen, E. Joseph Dutkowski, Richard H. Abrams, Jr., Robert K. Parker</i>	
Transmitter Development for the Haystack Ultra-Wideband Satellite Imaging Radar (HUSIR)	977
<i>Michael E. MacDonald, James P. Anderson, Richard Campbell, Nicholas J. Conway, David A. Gordon, Raymond J. Landry, Roy K. Lee, G. Neal McGrew</i>	
Development and Demonstration of Broadband W-Band Gyro-Amplifiers for Radar Applications	983
<i>M. Blank, P. Borchard, S. Cauffman, K. Felch</i>	
W-Band Transmitter Upgrade for the Haystack Ultra-Wideband Satellite Imaging Radar (HUSIR)	988
<i>Robert A. Phillips, Michael A. Kempkes, Timothy J. Hawkey, Marcel P.J. Gaudreau</i>	
Multiplexer Development for the Haystack Ultra-Wideband Satellite Imaging Radar	993
<i>Roy K. Lee, Michael T. Clarke</i>	
 Poster Session 4: Radar Coverage and Propagation	
Chairs: Dr. Roger Reed, Raytheon Company, USA	
Ms. Talia Kohen, Raytheon Company, USA	
A Computer Code for Calculating Tropospheric and Ionospheric Refraction Effects on Radar Systems	999
<i>Robert E. Daniell, Jr., Charles S. Carrano, Gina M. Gugliotti Fishman, Nelson A. Bonito</i>	
A Kirchhoff Integral Approach to Radar Propagation Modelling and its Application to the Estimation of Clutter	1004
<i>Christopher Coleman</i>	
Atmospheric Phase Error Measurement and Correction for the Haystack Ultra-Wideband Satellite Imaging Radar	1008
<i>E. Weber Hoen, Robert L. Morrison</i>	
Flexible Prior Model, Four Dimensional Electron Density, Total Electron Content (TEC) and Applications to Radar Tracking in Real Time	1014
<i>Pierre-Richard Cornely</i>	

GO Method for Reflection from Convex and Concave Surfaces in an Irregular Terrain Model 1023
Orhan Sengul, Altunkan Hizal

MF/HF/VHF Radar Observations of Polar Mesosphere Summer Echoes (PMSE) 1029
Camilo Ramos, Michael c. Kelley, Frank Djuth, Keith Groves, Yasuhiro Murayama

AREPS and TEMPER – Getting Familiar with these Powerful Propagation Software Tools 1034
Eli Brookner, Pierre-Richard Cornely, Yuchoi Francis Lok

Poster Session 4: Electronic Devices

Chairs: **Dr. Roger Reed**, *Raytheon Company, USA*
Ms. Talia Kohen, *Raytheon Company, USA*

**2.7 - 3.1 GHz, 1.5 kW Pulsed Solid-State Power Amplifier with Automatic Gain Equalization
Circuit for Radar Application 1044**
Ki Ho Kim, Yu Ri Lee, Ji Han Joo, Gil Woong Choi, Hyung Jong Kim, Jin Joo Choi, Dong Min Park

Digital Signal Generator and Receiver Design for S-Band Radar 1049
L.G.M. Prakasam, Taniza Roy, Meena. D