

# Open Literature, Conference, Workshop, and Patents by ISL Surveillance and Communication Research Operations

## Personnel

September, 2009

### Adaptive Signal Processing

J. S. Bergin, P. M. Techau, and J. R. Guerci, "Knowledge-aided adaptive radar: a new architecture for complex radar environments," *Proceedings of the 2007 Military Radar Symposium*, Arlington, VA, June 25-27, 2007 (invited talk).

J. S. Bergin, D. R. Kirk, G. C. Chaney, S. C. McNeil, P. A. Zulch, "Evaluation of knowledge-aided STAP using experimental data," *Proceedings of the 2007 IEEE Aerospace Conference, Big Sky*, MT, March 4-9, 2007.

J. S. Bergin, C. M. Teixeira, P. M. Techau, and J. R. Guerci, "Improved clutter mitigation performance using knowledge-aided space-time adaptive processing," *IEEE Transactions on Aerospace and Electronic Systems*, vol. 42, pp. 997-1009, July, 2006.

J. S. Bergin, G. C. Chaney, and P. M. Techau, "Performance evaluation of knowledge-aided adaptive processing architectures," *Proceedings of the Adaptive Sensor Array Processing Workshop*, MIT Lincoln Laboratory, Lexington, MA, June 6-7, 2006.

J. S. Bergin and P. M. Techau, "Evaluation of antenna architectures for angle estimation of endo-clutter targets in airborne adaptive radars," *Proceedings of the 2006 IEEE Radar Conference*, Verona, NY, April 24 - 27, 2006.

P. M. Techau and J. S. Bergin, "Knowledge-Aided STAP algorithms," Workshop on Knowledge-aided Signal Processing at the 2005 Tri-Service Radar Symposium, Monterey, CA, June 20-24, 2005 (invited talk).

J. S. Bergin, P. M. Techau, and J. E. Don Carlos, and J. R. Guerci, "Radar waveform optimization for colored noise mitigation," *Proceedings of the 2005 IEEE International Radar Conference*, Alexandria, VA, May 9-12, 2005.

J. S. Bergin, C. M. Teixeira, P. M. Techau, and J. R. Guerci, "STAP with knowledge-aided pre-whitening," *Proceedings of the 2004 Tri-Service Radar Symposium*, Albuquerque, NM, June 21-24, 2004.

J. S. Bergin, C. M. Teixeira, P. M. Techau, "Data domain STAP with knowledge-aided pre-whitening," *Proceedings of the 2004 KASSPER Workshop*, Clearwater, FL, April 4-7, 2004.

J. S. Bergin, C. M. Teixeira, P. M. Techau, and J. R. Guerci, "Reduced degree-of-freedom STAP with knowledge-aided data pre-whitening," *Proceedings of the 2004 IEEE Radar Conference*, Philadelphia, PA, April 26-29, 2004.

C. M. Teixeira, J. S. Bergin, and P. M. Techau, "Adaptive thresholding of nonhomogeneity detection for STAP applications," *Proceedings of the 2004 IEEE Radar Conference*, Philadelphia, PA, April 26-29, 2004.

C. M. Teixeira, J. S. Bergin, and P. M. Techau, "Adaptive thresholding of the GIP statistic to remove ground target returns from the training data for STAP applications," *Proceedings of the Adaptive Sensor Array Processing Workshop*, MIT Lincoln Laboratory, Lexington, MA, March 16-18, 2004.

C. M. Teixeira, J. S. Bergin, and P. M. Techau, "Reduced degree-of-freedom STAP with knowledge-aided data pre-whitening," *Proceedings of the 2003 KASSPER Workshop*, Las Vegas, NV, April 14-16, 2003.

J. S. Bergin, C. M. Teixeira, P. M. Techau, and J. R. Guerci, "Space-time beamforming with knowledge-aided constraints," *Proceedings of the Adaptive Sensor Array Processing Workshop*, MIT Lincoln Laboratory, Lexington, MA, March 11-13, 2003.

J. S. Bergin, P. M. Techau, W. L. Melvin, and J. R. Guerci, "GMTI STAP in target-rich environments: site-specific analysis," *Proceedings of the 2002 IEEE Radar Conference*, Long Beach, CA, April 22-25, 2002.

J. R. Guerci and J. S. Bergin, "Principal components, covariance matrix tapers, and the subspace leakage problem," *IEEE Transactions on Aerospace and Electronic Systems*, vol. 38, pp. 152-162, January, 2002.

P. M. Techau, J. S. Bergin, and J. R. Guerci, "Effects of internal clutter motion on STAP in a heterogeneous environment," *Proceedings of the 2001 IEEE Radar Conference*, Atlanta, GA, May 1-3, 2001.

J. R. Guerci and J. S. Bergin, "Rapid adaptation in subspace leakage environments via covariance matrix tapering," *Record of the Thirty-Fourth Asilomar Conference on Signals, Systems, and Computers*, pages 283-286, November 2000.

L. J. Griffiths, P. M. Techau, J. S. Bergin, and K. L. Bell, "Space-time adaptive processing in airborne radar systems," *Proceedings of the 2000 IEEE International Radar Conference*, Alexandria, VA, May 7-12, 2000 (invited talk).

P. M. Techau, J. R. Guerci, T. H. Slocumb, and L. J. Griffiths, "Performance bounds for hot and cold clutter mitigation in airborne radar systems," *IEEE Transactions on Aerospace and Electronic Systems*, vol. 35, pp. 1253-1265, October, 1999.

P. M. Techau, J. R. Guerci, T. H. Slocumb, and L. J. Griffiths, "Performance bounds for interference mitigation in radar systems," *Proceedings of the 1999 IEEE Radar Conference*, Waltham, MA, April 20-22, 1999.

P. M. Techau, "Receiver filter effects on hot clutter mitigation," *Proceedings of the 1999 IEEE Radar Conference*, Waltham, MA, April 20-22, 1999.

J. R. Guerci and J. S. Bergin, "Principal components, covariance matrix tapers, and the interference modulation problem," *Proceedings of the Adaptive Sensor Array Processing (ASAP) Workshop*, MIT Lincoln Laboratory, Lexington, MA, March 10-11, 1999.

P. M. Techau, J. R. Guerci, T. H. Slocumb, and L. J. Griffiths, "Site-specific performance bounds for interference mitigation in airborne radar systems," *Proceedings of the Adaptive Sensor Array Processing (ASAP) Workshop*, March 10-11, 1999, MIT Lincoln Laboratory, Lexington, MA.

J. R. Guerci, J. Scott Goldstein, I. S. Reed, H. Nguyen, P. M. Techau, and J. S. Bergin, "Optimal reduced-rank STAP for circular adaptive arrays," Workshop on Space-Time Adaptive Processing Methods for Circular Ring Arrays with Application to Navy Airborne Surveillance Radar, sponsored by Office of Naval Research Surveillance, Communications, and Electronic Combat Division, George Mason University, Fairfax, VA, February 22-23, 1999.

T. H. Slocumb, J. R. Guerci, and P. M. Techau, "Hot and cold clutter mitigation using deterministic and adaptive filters," *Proceedings of the 5<sup>th</sup> DARPA Advanced Signal Processing Hot Clutter Technical Interchange Meeting*, September 10-11, 1997, Rome Laboratory, Rome, NY.

P. M. Techau, "Degrees of freedom analysis in hot clutter mitigation," *Proceedings of the 4th DARPA Advanced Signal Processing Hot Clutter Technical Interchange Meeting*, Rome Laboratory, NY, August 7-8, 1996.

P. M. Techau, "Performance evaluation of hot clutter mitigation architectures using the Splatter, Clutter, and Target Signal (SCATS) model," *Proceedings of the 3<sup>rd</sup> ARPA Mountaintop Hot Clutter Technical Interchange Meeting*, Rome Laboratory, August 23-24, 1995.

## **Computer Systems and Technology**

C. Hulbert, J. S. Bergin, P. M. Techau, "Radar data simulation for signal processing algorithm development," DoD HPCMP Users Group Conference, Seattle, WA, July 14-17, 2008.

C. C. Hulbert, J. S. Bergin, and P. M. Techau, "Applying advanced computing to improve high-fidelity radar data simulations," *Proceedings of the High Performance Embedded Computing (HPEC) Workshop*, MIT Lincoln Laboratory, Lexington, MA, September 19-21, 2006.

R. Giannaris, J. E. Don Carlos, and J. S. Bergin, "Case study: real-time demonstration of a knowledge-aided STAP algorithm using PVL," *Proceedings of the High Performance Embedded Computing (HPEC) Workshop*, MIT Lincoln Laboratory, September 20-22, 2006.

D. R. Kirk, L. Bessette, and D. Nobles, "Case study in parallel processing technology for large scale production of synthetic aperture radar imagery," *Proceedings of the SPIE Aerosense 1999 Conference*, Orlando, FL, April, 1999.

M. Davis and D. R. Kirk "Parallel processing development needs for foliage penetration (FOPEN) radar," *Proceeding of the 1st Annual High Performance Embedded Computing Workshop*, MIT Lincoln Laboratory, Lexington, MA, September, 1997.

K. Ohnishi and R T Milton, "A new optimization technique for adaptive antenna arrays," *IEEE Transactions on Antenna and Propagation*, vol. 41, pp. 525-533, May, 1992.

### **Phenomenology, Modeling, and Simulation**

P. M. Techau and J. S. Bergin, "Advanced modeling and simulation of complex RF systems," *Military Antennas 2007*, Washington, DC, September 26-28, 2007.

S. C. McNeil, J. S. Bergin, and P. M. Techau, "Modeling the impact of discrete clutter on airborne adaptive radar systems," *Proceedings of the 2006 IEEE Radar Conference*, Verona, NY, April 24 - 27, 2006.

J. S. Bergin, P. M. Techau, and J. T. Godfrey, "Analysis of clutter distributions using a site-specific radar simulator," *Proceedings Of The 2005 MSS Tri-service Radar Symposium*, Monterey, CA, June 20-23, 2005.

K.-Y. Choi, V. Gnezdilov, B. C. Watson, M. W. Meisel, D. R. Talham, and P. Lemmens, "Raman scattering measurements of the spin ladder compound  $(C_5H_{12}N)_2CuBr_4$ ," *Journal of Physics: Condensed Matter*, vol. 17, pp. 4237-4244, July, 2005.

K. Ohnishi, J. S. Bergin, P. M. Techau, and C. M. Teixeira, "Site-specific modeling tools for predicting the impact of corrupting mainbeam targets on STAP," *Proceedings of the 2005 IEEE International Radar Conference*, Alexandria, VA, May 9-12, 2005.

B. C. Watson, V. N. Kotov, M. W. Meisel, D. W. Hall, G. E. Granroth, W. T. Montfrooij, D. A. Jensen, R. Backov, M. A. Petruska, G. E. Fanucci, and D. R. Talham, "Magnetic spin ladder  $(C_5H_{12}N)_2CuBr_4$ : high-field magnetization and scaling near quantum criticality," *Physical Review Letters*, vol. 86, pp. 5168-5171, May 28, 2001.

B. C. Watson and N. Ali, "The B-Axis magnetic phase diagram of erbium," *Journal of Physics: Condensed Matter*, vol. 8, pp. 1797-1803, March 11, 1996.

B. C. Watson and N. Ali, "Magnetic transitions in single-crystal erbium," *Journal of Physics: Condensed Matter*, vol. 7, 4713 (1995)

B. C. Watson and N. Ali, "Splitting of the longitudinal neel transition in erbium in a C-axis magnetic field," *Journal of Physics: Condensed Matter*, vol. 8, pp. 361-366, January 15, 1996.

P. M. Techau, D. E. Barrick, and A. Schnittman, "The two-scale bistatic rough surface scattering model," *Proceedings of the 2<sup>nd</sup> ARPA Mountaintop Hot Clutter Technical Interchange Meeting, Rome Laboratory*, September 27-28, 1994.

P. M. Techau, "Preliminary data matching using RSTER hot clutter measurements taken at WSMR," *Proceedings of the ARPA Mountaintop Hot Clutter Technical Interchange Meeting, Rome Laboratory*, October 5-6, 1993.

## **Radar Systems**

D. R. Kirk, K. Ohnishi, J. S. Bergin, J. Reynolds, and J. R. Guerci, "Detection of suspicious activity in wide-area surveillance radar data by exploiting normalcy maps," *Proceedings of the 2009 Tri-Service Radar Symposium*, Boulder, CO, June 22-26, 2009.

J. S. Bergin, S. C. McNeil, L. K. Fomundam, P. A. Zulch, "MIMO phased-array for SMTI radar," *Proceedings of the IEEE International Waveform Diversity and Design Conference*, Special session on MIMO Radar, Orlando, FL, February 8-13, 2009.

J. S. Bergin, P. M. Techau, and M. Greenspan, "MIMO phased-array for airborne radar," *Proceedings of the 2008 IEEE International Symposium on Antennas and Propagation*, San Diego, CA, July 5-12, 2008.

J. S. Bergin, P. M. Techau, J. R. Guerci, and M. Greenspan, "MIMO phased array for MTI radar," presented at the 2008 Tri-Service Radar Symposium Waveform Diversity Workshop, Monterey, CA, June 27, 2008.

J. R. Guerci, M. C. Wicks, J. S. Bergin, P. M. Techau, and S. U. Pillai, "Theory and application of optimum and adaptive MIMO radar," *Proceedings of the 2008 IEEE Radar Conference*, Rome, Italy, May 26-30, 2008

J. S. Bergin, S. C. McNeil, L. K. Fomundam, and P. A. Zulch, "MIMO phased-array for SMTI radar," *Proceedings of the 2008 IEEE Aerospace Conference, Big Sky, MT*, March 2-7, 2008.

D. R. Kirk, J. S. Bergin, P. M. Techau, and J. E. Don Carlos, "Multi-static coherent sparse aperture approach to precision target detection and engagement." *Proceedings of the 2005 IEEE International Radar Conference*, Alexandria, VA, May 9-12, 2005.

J. E. Don Carlos, D. R. Kirk, J. S. Bergin, P. M. Techau, and J. D. Halsey, "Detecting system having a coherent sparse aperture," U.S. Patent Number 6,724,340 B1, April 20, 2004.

D. R. Kirk, C. Y. Chong, D. Garren, and T. Grayson, "AMSTE precision fire control tracking overview," *Proceedings of the 2000 IEEE Aerospace Conference*, Big Sky, MT, March 2000.

D. R. Kirk, R. P. Maloney, and M. Davis, "Impact of platform motion on wide-angle synthetic aperture radar (SAR) image quality," *Proceedings of the 1999 IEEE Radar Conference*, Waltham, MA, April 20-22, 1999.

R. R. Clark, and J. S. Bergin "Bispectral analysis of mesosphere winds," *Journal of Atmospheric and Solar-Terrestrial Physics*, vol. 59, no. 6, 1997.

J. S. Bergin, "Confidence intervals and spectral analysis revisited", 11th CEDAR Conference, Boulder, CO, June, 1996

J. D. Halsey, "Radar systems considerations for photonic antenna control," *Proceedings of the Sixth Annual ARPA Symposium on Photonic Systems for Antenna Applications (PSAA-6)*, Monterey, CA, March 5-7, 1996.

### **Signal and Array Processing**

J. S. Bergin, P. M. Techau, J. R. Guerci, and P. A. Zulch, "Advanced air surveillance radar modes and tactics," *Proceedings of the 2009 Tri-Service Radar Symposium*, Boulder, CO, June 22-26, 2009.

M. A. Ferrara, J. S. Bergin, and P. M. Techau, "Practical radar waveform optimization techniques for colored noise mitigation," in *Practical Radar*, M. C. Wicks, ed., in preparation.

J. S. Bergin and P. M. Techau, "Multi-resolution signal processing techniques for ground-moving target detection using airborne radar," *EURASIP Journal on Applied Signal Processing*, vol. 2006, article ID 47534, 2006.

M. A. Ferrara, J. S. Bergin, and P. M. Techau, "Practical radar waveform optimization techniques for colored noise mitigation," *Proceedings of the 2006 International Waveform Diversity & Design Conference*, Kauai HI, January 22-27, 2006

J. S. Bergin, P. M. Techau, and J. E. Don Carlos, and J. R. Guerci, "Radar waveform optimization for colored noise mitigation," *Proceedings of the Third Annual Tri-Service Waveform Diversity Workshop*, Huntsville, AL, March, 2005.

J. S. Bergin, C. M. Teixeira, and P. M. Techau, "Multi-resolution signal processing techniques for airborne radar," *Proceedings of the 2004 IEEE Radar Conference*, Philadelphia, PA, April 26-29, 2004.

J. S. Bergin, C. M. Teixeira, and P. M. Techau, "Multi-resolution signal processing techniques for airborne radar," *Proceedings of the 2003 KASSPER Workshop*, Las Vegas, NV, April 14-16, 2003.

J. S. Bergin and K. L. Bell, "Wideband direction-of-arrival (DoA) estimation for multiple aeroacoustic sources," *Proceedings of the 2000 Meeting of the MSS Specialty Group on Battlefield Acoustic and Seismic Sensing*, Applied Physics Laboratory, Johns Hopkins University, Laurel, MD, October 17-19, 2000.

D. R. Kirk, R. P. Maloney, and G. Twigg, "Analysis of features in FOPEN SAR automatic detection algorithms," *Proceedings of the Automatic Target Recognizer Working Group Systems and Technology Symposium*, Monterrey, CA, March, 1999.

G. Twigg, D. R. Kirk, and R. P. Maloney, "Performance of RADCON automatic target detection algorithms for vehicles under foliage," *Proceedings of the Automatic Target Recognizer Working Group Systems and Technology Symposium*, Monterrey, CA, March, 1999.

E. J. Greene and P.-H. Lo "Method for measuring RF pulse rise time, fall time and pulse width," U.S. Patent Number 5,805,460, September 8, 1998.

P.-H. Lo, P. Halatyn, E. Geoca, Eric and A. B. James, "Gyroscope noise reduction and drift compensation," U.S. Patent Number 5,795,988, August 18, 1998.

D. R. Kirk, and R. P. Maloney, "Autofocus techniques for wide-band, wide-angle synthetic aperture radar," *Proceedings of the SPIE, vol. 3370*, Orlando, FL, April, 1998.

E. J. Greene and P.-H. Lo, "Method for measuring the frequency of continuous wave and wide pulse RF signals," U.S. Patent Number 5,519,399, May 21, 1996.

P.-H. Lo and E. J. Greene, "Method for measuring RF pulse frequency," U.S. Patent Number 5,508,605, April 16, 1996.

K. Ohnishi, "An identification algorithm for rigid body mode systems," *Proceedings of the 34th Conference on Decision and Control*, New Orleans, LA, December, 1995.

P.-H. Lo, "Method for measuring frequency modulation rate characteristics for a swept frequency signal," U.S. Patent Number 5,291,200, March 1, 1994.

L. J. Griffiths, P. M. Techau, and J. E. Don Carlos, "Effective sidelobe control in HF random arrays," OTH Technology Conference, sponsored by the Air Force Electronic Systems Division and Rome Laboratories, November, 1991.

P.-H. Lo J. M. Sokolich, and A. M. Matesich, "Digital AM/FM/.phi.M demodulator," U.S. Patent Number 4,853,944, August 1, 1989.

P.-H. Lo and T. Thong, "Method and apparatus for digital compensation and digital equalization," U.S. Patent Number 4,789,952, December 6, 1988.

P.-H. Lo, D. Siebert, H. Califano, "Low cost fiber optic rate sensor inertial measurement unit," *Proceedings of the 1988 Position, Location and Navigation Symposium*.

P.-H. Lo, "A novel digital technique for the measurement of modulation signal," *Proceedings of the 1986 IEEE International Automatic Testing Conference*, San Antonio, CA, September, 1986.

P.-H. Lo, "On all-zero modelling of a recursive digital filter," *Proceedings of the 1984 IEEE International Conference on Acoustics, Speech, and Signal Processing*, vol. 9, March, 1984.

P.-H. Lo; Y.-C. Jenq, "Minimum sensitivity realization of second order recursive digital filter," *IEEE Transactions on Signal Processing*, vol. 30, no. 6, December, 1982.

P.-H. Lo and Y.-C. Jenq, "An  $\ell_2$  norm bound for state variables in second-order recursive digital filter," *IEEE Transactions on Circuits and Systems*, vol. 28, no. 12, December, 1981.

P.-H. Lo; Y.-C. Jenq, "On the overflow problem in a second order digital filter," *Proceedings of the 1981 IEEE International Conference on Acoustics, Speech, and Signal Processing*, vol. 6, April, 1981.

K. Ohnishi, *Direct Recursive Estimation of Noise Statistics*, Control and Dynamic Systems Series, vol.-16, edited by C. T. Leondes, Academic Press, New York, 1980.

## Communication Systems

C.-C Kuo, S. H. Tsai, L. Tadjpour, and Y. H. Chang, *Precoding techniques for digital communication, Systems*, Springer, 2008 (319 pages).

L. Tadjpour and S. H. Tsai and C.-C. J. Kuo, "Complexity reduction of maximum-likelihood multiuser detection (ML-MUD) receivers with carrier interferometry codes in MC-CDMA," *Proceedings of the 2008 IEEE International Conference on Communications*, Beijing, China, May, 2008.

L. Tadjpour, S. H. Tsai and C.-C.-J. Kuo, "Simplified multiaccess interference reduction for MC-CDMA with carrier frequency offsets (CFO)," Submitted to *IEEE Transactions on Vehicular Technology*.

L. Tadjpour, S. H. Tsai, and C.-C.-J. Kuo, "An approximately MAI-free multiaccess OFDM system in fast time-varying channels," *IEEE Transactions on Signal Processing*, vol. 55, pp. -3799, July 2007.

L. Tadjpour, S. H. Tsai, and C.-C. J. Kuo, "Orthogonal codes for MAI-free MC-CDMA with carrier frequency offsets (CFO)," *Proceedings of IEEE Globecom*, San Francisco, CA, November-December, 2006.

L. Tadjpour, S. H. Tsai and C.-C. J. Kuo, "Mobile multiuser access with approximately MAI-free PMUOFDM Transceiver Design", *Proceedings of the 2005 IEEE Asilomar Conference*, Pacific Grove, CA, November, 2005.

L. Tadjpour, S. H. Tsai, and C.-C. J. Kuo, "MAI-free performance of PMU-OFDM transceiver in time-variant environment," *Proceedings of the SPIE Defense and Security Symposium*, Orlando, Florida, March, 2005.

P. Kinman, S. Shambayati, L. Tadjpour, and J. Berner, "Turbo code performance with imperfect carrier synchronization," *Proceedings of the 2004 IEEE Aerospace Conference*, Big Sky, MT, March 2004.

L. Tadjpour and D. Bell, "Multipath mitigation on in-situ communication links," *Jet Propulsion Laboratory IPN Progress Report 42-151*, November 2002.

S. Shambayati, P. Kinman and L. Tadjpour, "Turbo code carrier synchronization losses (radio losses)," *Proceedings of the AAIA Conference*, Toulouse, France, March 2001.

### **Measurement Systems**

P.-H. Lo and H. Califano, "Dithering system and method for a laser diode light source for an optical gyroscope," U.S. Patent Number 6,657,729, December 2, 2003,

P.-H. Lo and J. E. Goodwin, "Open loop fiber optic gyroscope for measuring ultra-high rates of rotation," U.S. Patent Number 6,256,101, July 3, 2001.

N. Masuhara, B. C. Watson, and M. W. Meisel, "Pulsed Fourier-transform spectroscopy for ultra-low temperature applications," *Journal of Low Temperature Physics*, vol. 121, p. 815ff, 2000.

P.-H. Lo and R. A. Kovacs, "Fiber optic gyroscope with variable output period," U.S. Patent Number 5,949,545, September 7, 1999.

P.-H. Lo and R. A. Kovacs, "Fiber optic gyroscope with reduced non-linearity at low angular rates," U.S. Patent Number 5,684,591, November 4, 1997.

P.-H. Lo and T. Thong, "Digital storage oscilloscope with indication of aliased display," U.S. Patent Number 5,115,404, May 19, 1992.

### **Device Technology**

B. C. Watson, T. K. Fu, A. R. Houweling, D. J. Spencer, P. K. Das, and T. J. Sejnowski, "Analog to digital conversion using recurrent spiking neural networks," *Neuroscience Meeting*, San Diego, CA, October, 2004.

B. C. Watson, B. L. Shoop, E. K. Ressler, and P. K. Das, "Analog to digital conversion using single layer integrate and fire networks with inhibitory connections," *EURASIP Journal on Applied Signal Processing*, vol 2004, issue 13, pp. 2066-2075, 2004.

E. K. Ressler, B. L. Shoop, B. C. Watson, and P. Das, "Biologically inspired analog to digital converter," *Proceedings of the 48th International SPIE Conference*, vol. 5200, pp. 91-102, August 2003.