Dr. William A. Brown

Dr. William A. Brown (Ph.D. EE, MSEE, BSEE) has forty years of experience in signal processing research and development for communications, radar and sonar applications, including twenty years' experience specifically on signals intelligence applications. His professional experience includes:

NorthWest Research Associates, Monterey, CA, December 2018-present.
Dr. Brown is currently working on performance analysis of over-the-horizon (OTH) radar systems:

- Modeling and simulation of high-frequency radar antennas and arrays
- Modeling and simulation of ionospheric effects on radio propagation
- Prediction of OTH radar performance using the NWRA HiCIRF ray tracing code
- Analysis of OTH radar data and comparison with predictions

Lockheed Martin, Sunnyvale CA, May 2011-March 2017.
At Lockheed Martin Dr. Brown worked on multiple projects involving:

- Geolocation of radio emitters using multiple fast-moving sensors
- Joint demodulation of co-channel quadrature amplitude modulation signals
- Covert communications waveforms and systems
- Satellite communications special-purpose waveforms, protocols, error correction coding, and automatic repeat request algorithms
- Virtual resilient ground station network (Verge) concept development and simulation (Inventor, US Patent No. 9,979,462)

Statistical Signal Processing, Inc., Fremont CA, July 2006-April 2011.

- Geolocation of radio emitters: Dr. Brown developed from first principles an analytical solution for the problem of multi-sensor detection and geolocation of unknown or partially-known signals. He developed end-to-end mathematical models of specific collection systems in detail sufficient to support precision geolocation applications. He implemented several advanced geolocation algorithms, including high spatial resolution imaging techniques as well as conventional TDOA/FDOA techniques, and evaluated the performance of these systems with recorded field data.

- Joint demodulation of co-channel signals: Dr. Brown developed, implemented and tested an extension of the Viterbi algorithm that enables joint demodulation of low-excess-bandwidth co-channel quadrature amplitude modulation signals with different symbol rates and carrier frequencies. To support the joint demodulator, he also developed an adaptive synchronizer, based on per-survivor estimation of amplitude, phase and pulse shape, designed to provide initial estimates and tracking of these parameters, even in harsh signal-to-noise and signal-to-interference environments.

Monterey Signal Processing Corporation, Carmel CA, October 2004-June 2006

- Multipath channel modeling: Dr. Brown participated in all phases of the ionospheric scintillation field experiments used to develop the ionospheric component of the Mobile User Objective System (MUOS) propagation channel models and the related link performance requirements. Based on the MUOS channel specification, which includes terrestrial multipath for urban, forest, aircraft, and maritime terminal environments as well as ionospheric scintillation, he developed the software for generation of realizations of the complete set of MUOS UHF multipath channel models. These channel realizations continue to be used to support MUOS receiver acceptance tests, and analysis of link availability, power control performance and system capacity.
- Communication link power control: Dr. Brown designed the novel outer-loop transmit power control algorithm to assure efficient use of MUOS power resources (MILCOM, 2009).

Mission Research Corporation (now Northrop, Monterey), Monterey CA, October 1987-September 2004

- Signals intelligence applications: Dr. Brown worked for seven years as Principal Investigator on small projects involving development of advanced signal processing algorithms for signals intelligence and communications applications. The applications included cellular radio signal interception in the presence of co-channel interference, signal detection and classification in the presence of co-channel interference, low-probability-of-intercept communications system design, and applications of single- and multi-antenna frequency-shift filtering for interference mitigation.
- Ionospheric effects: Dr Brown's work also included ten years on the effects of ionospheric propagation on satellite communications and ground- and space-based radar detection, tracking and target discrimination systems. This work included analysis of natural and nuclear ionospheric effects on radio propagation, simulation of broadband signals corrupted by scintillation, dispersion, and ground multipath, and analysis and simulation of receiver systems including propagation-effects mitigation. Dr. Brown is inventor of a channel-equalization technique to combat ionospheric multipath effects on radar imaging of reentry vehicles (MILCOM, 1989);

University of California, Davis CA, 1981-1987

- Cyclostationary signals: Dr. Brown did his doctoral research on the theory of cyclostationary signals at the University of California, Davis. He is inventor of the two most computationally efficient algorithms for spectral correlation estimation (FFT Accumulation, and Strip Spectral Correlation Analyzer); and co-inventor with Dr. William A. Gardner of frequency-shift (FRESH) filtering for co-channel signal separation.

ARGOSystems, Inc., Sunnyvale CA, 1977-1981

- Adaptive arrays: Dr. Brown developed adaptive beamforming and inter-array adaptive noise cancelling for passive sonar applications and verified system performance with recorded sonar data.

Education:

Ph.D., Electrical Engineering, UC Davis, 1987
MS, Electrical Engineering, Illinois Institute of Technology, 1975
BS, Electrical Engineering, California State University, Chico, 1974

Publications:

1. "MUOS Point-to-Point Power Control," with G. Zunich, J. S. Sadowsky, N. Butts, Proceedings of the 28th IEEE Conference on Military Communications, Boston, MA, 2009.
2. "Channel modeling for UHF SATCOM systems," with D. L. Knepp, J. C. Thacker, and K. S. Shanmugan, Ionospheric Effects Symposium, Alexandria, Virginia, May 3-5, 2005.
3. "Wideband UHF Measurements of Equatorial Scintillation Activity," with D. L. Knepp and F. P. Sheetz, 2004 Military Communications Conference, MILCOM 2004, Monterey, CA October 31-November 3, 2004.
4. "Wideband Ionospheric Scintillation Experiment at 295 MHz – Analysis Results and Applications to Mobile User Objective System (MUOS)," with D. L. Knepp, P. A. Kullstam, K. M. Kumm, F. M. Tirpak, 2002 Military Communications Conference, MILCOM 2002, Anaheim, CA October 7-10, 2002.
5. "Automatic Radio-Frequency Environment Analysis," with C. M. Spooner and G. K. Yeung, Thirty-Fourth Asilomar Conference on Signals, Systems, and Computers, October 29–November 1, 2000.
6. "Maximum likelihood Estimates of the Time and Frequency Differences of Arrival of Weak Cyclostationary Digital Communications Signals," with D. A. Streight and G. K. Lott, MILCOM 2000: 21st Century Military Communications Conference Proceedings, Los Angeles, CA, October 2000.
7. "Average Received Signal Power after Two-Way Radar Propagation through Ionized Turbulence," with D. L. Knepp, Radio Science, July–August, 1997.
8. "Average Received Power After Two-Way Radar Propagation Through Ionized Turbulence," with D. L. Knepp, 1996 Antenna Propagation Society International Symposium and URSI Radio Science Meeting, Baltimore, Maryland, July 21-26, 1996.
9. "Average Received Signal Power After Two-way Radar Propagation Through Ionized Turbulence," with D. L. Knepp, 1996 Ionospheric Effects Symposium, Alexandria, VA, May 7-9, 1996.
10. "Signal Reconstruction After Severe Spectral Excision," with W. A. Gardner and G. K. Yeung, Proceedings of the 29th Asilomar Conference on Signals, Systems, and Computers, Pacific Grove, California, October 30–November 2, 1995.
11. "Ionospheric Propagation Effects on Cyclostationary Signals," with D. L. Knepp, URSI National Radio Science Meeting, Boulder, Colorado, 3-7 January 1995.

12. "A Review of Digital Spectral Correlation Analysis: Theory and Implementation," with R. S. Roberts and H. H. Loomis, Jr., in Cyclostationarity in Communications and Signal Processing, W. A. Gardner, ed., New York: IEEE Press, 1994.
13. "The Effect of Multipath Propagation on Cyclostationary Signals," with D. L. Knepp, in Proceedings of the Second Workshop on Cyclostationary Signals, Aug. 1–2, 1994, Monterey, CA.
14. "Digital Implementations of Spectral Correlation Analyzers," with H. H. Loomis, Jr., IEEE Transactions on Signal Processing, Feb. 1993.
15. "Fraction-of-Time Probability for Time-Series that Exhibit Cyclostationarity," with W. A. Gardner, Signal Processing, June 1991.
16. "Measurement of Spectral Correlation," with R. S. Roberts and H. H. Loomis, Jr., IEEE Signal Processing Magazine, April 1991.
17. "Frequency-Shift Filtering Theory for Adaptive Co-Channel Interference Removal," with W. A. Gardner, Proceedings of the Twenty-Third Asilomar Conference on Signals, Systems and Computers. Pacific Grove, CA, Oct. 30–Nov. 1, 1989.
18. "Nuclear Effects on GBR Imaging," with D. L. Knepp, 1989 IEEE Military Communications Conference Record, April 1989 (CONFIDENTIAL).
19. "Digital Implementations of Spectral Correlation Analyzers," with H. H. Loomis, Jr., Fourth ASSP Workshop on Spectrum Estimation and Modeling, Minneapolis, MN, August 3–5, 1988.
20. "A New Algorithm for Adaptive Arrays," with W. A. Gardner, IEEE Transactions on Acoustics, Speech, and Signal Processing, September 1987.
21. "Spectral Correlation of Modulated Signals, Part II – Digital Modulation," with W. A. Gardner and C. K. Chen, IEEE Transactions on Communications, June 1987.