

# Edward A. Richley

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## SUMMARY

Electrical Engineer with strong background in Applied Physics, Physical Electronics, RF Design, and Analytical Methods. Held senior leadership role in development of commercial microwave wireless products. Held research position developing advanced display, printing, and wireless networking concepts. Good communication skills, both verbal and written. Demonstrated areas of expertise include:

- RF design
- High voltage design
- Instrumentation
- Analysis of ionized fluids
- Computational techniques
- Communication theory
- Quantitative analysis
- Micropower electronics
- C programming
- Linux

## PROFESSIONAL EXPERIENCE

**ZEBRA TECHNOLOGIES, INC.** (formerly *Multispectral Solutions, Inc.*), Germantown, MD 1999-present

**Chief Scientist** (1999-present)

Developed circuitry and architectures for a variety of communication and locating systems based on short-pulse electromagnetics. Assisted in the transition of several UWB-based systems from SBIR projects through to commercialization. Activities have included:

- Development of system architecture and initial software for the Dart commercial real-time locating system (RTLS). Dart uses time-difference-of-arrival (TDOA) principles to track positions of small low-power tags intended to be attached to various assets.
- Transmitter and receiver design from HF through K-band. Particular emphasis on C-band UWB electronics for the Dart RTLS tracking system. Developed extremely low power transmitters and cost-effective receivers down to the discrete component level. Particular emphasis on power consumption, noise figure, gain flatness, temperature compensation, and transmit power.
- Developed all antennas, both transmitting and receiving, used in Dart
- Obtaining FCC Part 15 certification for both intentional and unintentional emissions. Worked with test labs to perform certification measurements. Developed appropriate EMI suppression for both digital and RF circuitry.

**XEROX PALO ALTO RESEARCH CENTER**, Palo Alto, CA 1987-1999

**Member of Research Staff** (1987-1999)

- Developed processes and electronics for an electrophoretic display technology
- Developed RF electronics for several experimental wireless LAN technologies

- Developed instrumentation, high speed and high voltage electronics for various printing technologies

**PATENT DEVELOPMENT AND MARKETING CORPORATION**, Design of all electronics and software for a blood-pressure measurement instrument.

### EDUCATION

- *Carnegie-Mellon University*, Pittsburgh, PA Ph.D. Electrical Engineering, (May, 1984). Thesis: “A Computational Methodology for Modeling Non-Equilibrium Phenomena in High Pressure Electric Arcs”. Advisor: Dr. J. L. Lawless
- *Carnegie-Mellon University*, Pittsburgh, PA M.S. Electrical Engineering, 1981.
- *Carnegie-Mellon University*, Pittsburgh, PA B.S. (University Honors) Electrical Engineering, 1979.

### PRESENTED PAPERS

- Richley, E. and Mikkelsen, J., “Low Voltage Electrohydrodynamic Instabilities in Dielectric Liquids”, American Physical Society, 53rd Annual Meeting of the Division of Fluid Dynamics, 2000 Washington, DC, November 19 - 21.
- Richley, E., “An Elliptic Angular Moment Representation of the Boltzmann Equation”, presented at: *51st Annual Gaseous Electronics Conference*, Maui, HI, October 1998.
- Richley, E., “A Model of the D. C. Positive Column based on the Elliptic Representation of the Boltzmann Equation”, presented at: *51st Annual Gaseous Electronics Conference*, Maui, HI, October 1998.
- Preas, B., Richley, E., Vest, F., Sheridan, N. and Sprague, R. “A large area, Tiled Gyrotron Display”, presented at: *SID 1998*, Anaheim, CA, May 1998.
- Richley, E. “An energy-resolved self-consistent model of the DC positive column”, presented at: *50th Annual Gaseous Electronics Conference*, Madison, WI, October, 1997.
- Richley, E. and Tuma, D. T. “On the validity of the Saha Equation in Multi-temperature Plasmas”, presented at: *1982 IEEE International Conference on Plasma Science*, Ottawa, Ontario, Canada, 1982.

### PUBLICATIONS

- Fontana, R., Richley, E., “Observations on Low Data Rate, Short Pulse UWB Systems”, IEEE International Conference on Ultra-Wideband, 2007. ICUWB 2007.
- Ameti, A., Fontana, R., Knight E., Richley, E., “Ultra wideband technology for aircraft wireless intercommunications systems (AWICS) design”, IEEE Aerospace and Electronic Systems Magazine v19, n7, July 2004.
- Fontana, R. J., Richley E. A., Barney, J., “Commercialization of an ultra wideband precision asset location system”, IEEE Conference on Ultra Wideband Systems and Technologies, 2003, pp. 369-373.
- Fontana, R., Ameti, A., Richley, E. , Beard, L., Guy, D., “Recent advances in ultra wideband communications systems”. 2002 IEEE Conference on Ultra Wideband Systems and Technologies, 2002.
- Fontana, R., Richley, E., Marzullo, A., Beard L., Mulloy R., Knight E., “An ultra wideband radar for micro air vehicle applications”, Digest of Papers. 2002 IEEE Conference on Ultra Wideband Systems and Technologies, 2002.
- Pinhao, N. R., Donko, Z., Loffhagen, D., Pinheiro, M. J., and Richley, E.A., “Comparison of kinetic calculation techniques for the analysis of electron swarm transport at low to moderate E/N values”, Plasma Sources Sci. Technol., v13 pp. 719-728.

- Richley, E. A., “Analysis of the low-pressure low-current dc positive column in neon”, *Physical Review E*, Vol. 66, No. 2, August 2002, Art. No. 026402.
- Richley, E. A. and Mikkelsen, J. C., “Electrical processes in nonpolar liquids based on initial transient response and recovery”, *Journal of Applied Physics*, Vol. 86, No. 12, December 1999, pp. 7029-7038.
- Richley, E., “Elliptic representation of the Boltzmann equation with validity for all degrees of anisotropy”, *Physical Review E*, Vol. 59, Issue 4, April 1999, pp. 4533-4541.
- Demers, A., Elrod, S., Kantarjiev, C., Richley E., “A Nano-Cellular Local Area Network Using Near-Field RF Coupling” in *Wireless Personal Communications Research Developments*, pp. 141-156
- Richley, E., “Extending the Calculation of Electron Velocity Distribution Functions for Electrical Discharges to Large Values of E/N”, *Journal of Applied Physics*, Vol. 71, No. 9, May 1 1992, pp. 4190-4195.
- Barth, R. and Richley, E., “Phase-Slip Technique for Direct Sequence Spread Spectrum Communication”, *Xerox Technical Report, PARC Blue-and-White*, 1990.
- Richley, E. and Tuma, D. T., “On the Determination of Particle Concentrations in Multi-temperature Plasmas”, *Journal of Applied Physics*, Vol. 53, No. 12, December 1982, pp. 8537-8542.
- Richley, E. and Tuma, D. T., “Mechanisms for Temperature Decay in the Freely Recovering Gas Blast Arc”, *IEEE Transactions on Plasma Science*, Vol. PS-10, No. 1, March 1982, pp. 2-7.
- Richley, E. and Tuma, D. T., “Free Recovery of the Gas Blast Arc Column”, *IEEE Transactions on Plasma Science*, Vol. PS-8, No. 1, December 1980, pp. 405-410.

#### OTHER ARTICLES

- Richley, E., “Design of Quadrature Detectors”, *RF Design*, May, 1991, pp. 68-72.
- Richley, E., “Marx Generator for High Voltage Experiments”, *Electronics and Wireless World*, Vol. 93, No. 1615, May, 1987, pp. 519-523.
- Richley, E. and Caimi, F. “Converting Mobile Microphones for Handheld VHF Transceivers”, *Ham Radio*, Vol. 19, No. 3, March 1986, pp. 79-86.
- Richley, E., “Improving the Audio on the ICOM IC-27”, *Ham Radio*, Vol. 19, No. 2, February 1986, pp. 61-62.
- Richley, E. and Caimi, F. “A Carrier Operated Relay for VHF Amplifiers”, *Ham Radio*, Vol. 18, No. 4, April 1985, pp. 45-47.

#### U.S. PATENTS

- 9,699,278, E. Richley Edward A. , B. Turner, A. Ameti, J. Stelfox, J. O’Hagan, A. Mueggenborg, “Modular location tag for a real time location system network”
- 9,668,164, E. Richley, B. Turner, C. Wang, A. Ameti, “Receiver processor for bandwidth management of a multiple receiver real-time location system (RTLs)”
- 9,667,287, E. Richley, “Multiple antenna interference rejection in ultra-wideband real time locating systems”
- 9,661,455, E. Richley, B. Turner, C. Wang, “Method, apparatus, and computer program product for real time location system referencing in physically and radio frequency challenged environments”
- 9,626,616, E. Richley, “Low-profile real-time location system tag”
- 9,520,630, E. Richley, D. Donato, “Isolation devices that pass coupler output signals”
- 9,360,547, A. Ameti, K. Chen, R. Fontana, E. Richley, B. Turner, “Extensible object location system and method using multiple references”
- 9,340,731, E. Richley, “Production of Fuel Gas by Pyrolysis utilizing a High Pressure Electric Arc”

- 9,180,357, E. Richley, “Multiple antenna interference rejection in ultra-wideband real time locating systems”
- 9,000,862, E. Richley, D. Donato, “Isolation devices that pass coupler output signals”
- 8,933,768, E. Richley and S. Luo, “Structures for Registration Error Compensation”
- 8,742,986, A. Ameti, K. Chen, R. Fontana, E. Richley, B. Turner, “Wireless time reference system and method”
- 8,705,671, A. Ameti, E. Richley, “Method and apparatus for performing temperature compensation”
- 8,149,169, A. Aitan, K. Chen, R. Fontana, E. Richley, B. Turner, “Extensible object location system and method using multiple references”
- 8,063,826, A. Ameti, K. Chen, R. Fontana, E. Richley, B. Turner, “Wireless time reference system and method”
- 7,907,065, E. Richley, “Device for Activating Inductive Loop Sensor of a Traffic Light Control System”
- 7,710,322, A. Ameti, K. Chen, R. Fontana, E. Richley, B. Turner, “Extensible object location system and method using multiple references”
- 7,492,316, A. Aitan, K. Chen, R. Fontana, E. Richley, B. Turner, “Wireless time reference system and method”
- 7,432,827, E. Richley, “Device for Activating Inductive Loop Sensor of a Traffic Light Control System”
- 7,412,007, E. Richley, R. Fontana, “High efficiency ultra wideband generator”
- 7,229,017, E. Richley, R. Want, K. Fishkin, B. Harrison, A. Gujar, “Laser locating and tracking system for externally activated tags”
- 6,903,719, E. Richley, “Rotation and threshold mechanism for twisting ball display”
- 6,882,315, E. Richley, R. Fontana, D. Perino, A. Ameti, “Object location system and method”
- 6,812,884, E. Richley, R. Fontana, “Transceiver system and method utilizing nanosecond pulses”
- 6,766,988, E. Richley, “Block Occupancy Detector for Model Railroads”
- 6,700,556, E. Richley, D. Biegelsen, “Display sheet with stacked electrode structure”
- 6,586,999, E. Richley, “Ultra wideband transmitter with gated push-pull RF amplifier”
- 6,559,820, J. Mikkelsen, N. Sheridan, E. Richley, “Tribo-addressed and tribo-suppressed electric paper”
- 6,542,083, E. Richley, R. Want, K. Fishkin, B. Harrison, A. Gujar, “Electronic tag position detection using radio broadcast”
- 6,507,333, J. Mikkelsen, N. Sheridan, E. Richley, “Tribo-addressed and tribo-suppressed electric paper”
- 6,798,349, E. Richley, B. Harrison, “Passive microwave tag identification system”
- 6,485,280, E. Richley, “Methods and apparatus for fabricating bichromal elements”
- 6,456,272, M. Howard, E. Richley, “Field addressed displays using charge discharging in conjunction with charge retaining island structures”
- 6,362,915, N. Sheridan, E. Richley, J. Mikkelsen, “Bichromal beads having crystalline materials therein”
- 6,348,908, E. Richley, A. Silverman, M. Howard, B. Preas, “Ambient energy powered display”
- 6,312,104, R. Stearns, E. Richley, “Reduction of spot misplacement through electrostatic focusing of uncharged drops”
- 6,243,058, J. Mikkelsen, N. Sheridan, E. Richley, “Tribo-addressed and tribo-suppressed electric paper”
- 6,222,513, M. Howard, R. Sprague, E. Richley, “Charge retention islands for electric paper and applications thereof”
- 6,184,789, E. Richley, M. Weiser, A. Silverman, M. Howard, B. Preas, “Method and apparatus for visually determining object location”
- 6,137,467, N. Sheridan, E. Richley, “Optically sensitive electric paper”
- 5,976,428, E. Richley, “Method and apparatus for controlling formation of two-color balls for a twisting ball display”
- 5,900,858, E. Richley, “Rotation mechanism for bichromal balls of a twisting ball display sheet based on

contact potential charging”

- 5,900,192, E. Richley, “Method and apparatus for fabricating very small two-color balls for a twisting ball display”
- 5,815,306, N. Sheridan, L. Romano, J. Mikkelsen, E. Richley, J. Crowley, “”Eggcrate” substrate for a twisting ball display”
- 5,752,677, E. Richley, “Block Occupancy Detector for Model Railroads”
- 5,437,057, E. Richley and L. Butcher, “Wireless Communications using Near Field Coupling”
- 5,262,098, J. Crowley, E. Richley, and N. Sheridan, “Method and Apparatus for Fabricating Bichromal Balls for a Twisting Ball Display”
- 5,223,755, E. Richley, “Extended Frequency Range Variable Delay Locked Loop for Clock Synchronization”
- 5,222,075, E. Richley, “Transmitted Code Clock Code-Matching Synchronization for Spread-Spectrum Communication Systems”
- 5,122,818, S. Elrod, E. Richley, and E. Rawson, “Acoustic Ink Printers having Reduced Focusing Sensitivity”
- 5,101,417, E. Richley and R. Barth, “Phase Controlled Synchronization for Direct Sequence Spread Spectrum Communication Systems”
- 5,025,793 E. Richley and C. Russell, “Finger Blood Pressure Measurement System”

#### **AWARDS**

- Fannie and John Hertz Foundation Graduate Fellowship 1979-1984.
- IEEE Nuclear and Plasma Science Graduate Student Award 1983.
- Carnegie-Mellon University, Electrical Engineering Department, E. M. Williams award 1979.

#### **AFFILIATIONS**

American Physical Society, member