Jim Browning

Associate Professor
Department of Electrical and Computer Engineering
Boise State University
1910 University Dr.
Boise, ID 83725-2075

Highlights at Boise State University included on last page of Vita

Education:

Doctor of Philosophy, Nuclear Engineering and Engineering Physics, University of Wisconsin-Madison, 1988
Master of Science, Nuclear Engineering, University of Missouri-Rolla, 1985
Bachelor of Science, Nuclear Engineering, University of Missouri-Rolla, 1983

Academic Research Experience:

Boise State University (2006 to present): Associate Professor in Department of Electrical and Computer Engineering. Developing research efforts in Microwave Vacuum Electron Devices (MVEDs), plasma engineering, and space dust mechanics. Received grants from DARPA, NASA, AFOSR, and NSF.

Northeastern University(1988 to 1992): Senior Scientist and Visiting Professor in Department of Electrical and Computer Engineering. Performed research in Cross-Field Amplifiers and radio frequency wave interactions with electron plasmas, in gated field emission devices and failure mechanisms, in space plasmas, and in microwave plasma sources. Wrote proposals and received grants from NSF and AFOSR; directed graduate students and assisted in lab operations in research at the Center for Electromagnetics Research.

University of Wisconsin(1985 to 1988): Graduate research assistant on Phaedrus Tandem Mirror fusion plasma experiment; studied radio-frequency waves in mirror confined plasmas. Demonstrated rf stabilization of mirror confined plasmas using phased antenna arrays.

Industrial Experience:

WatBro Consulting (2001 to 2006): provided technical services, intellectual property analysis, and manufacturing cost modeling in the areas of Field Emission Displays and other related display technologies. Areas of technical expertise include display and device test, failure analysis, device physics, packaging analysis, and competitor analysis.

PixTech, Inc. (1999 to 2001) : Director of Operations and Head of R&D for Field Emission Display Packaging and Reliability. Directed research and engineering development of 7” and 12” displays; in charge of more than 20 engineers; program manager for DARPA funded display

development (>$5M). Provided engineering manufacturing support for 5" display fabrication facility in Hsinchu, Taiwan.

Micron Technology (1992 to 1999): Test Manager for Display Division; Program Manager for Large Display Development; wrote proposals and managed DARPA funded programs on FED development. Worked on field emission display testing and reliability, display design, display packaging, cost modeling, and field emission physics. Managed over 15 engineers. Developed and demonstrated 0.55" silicon based, active matrix, field emission display; developed 12.1" display technology.

Oak Ridge National Laboratories (Summer 1983): Summer intern performing research on ISX-B tokomak fusion test reactor.

Nagoya Institute of Plasma Physics (Summer 1983): Exchange student performing research on secondary ion mass spectroscopy, Nagoya, Japan

Oak Ridge National Laboratories (Summer 1982): Summer intern performing research on neutral bean energy analyzer on the EBT fusion experiment

Peer Reviewed Publications:

1. Harlan Sangrey, Mahsa Azad, Arvin Farad, Jim Browning, and Elisa Barney, "Stimulation-1: an Experimental Setup for Electromagnetic Stimulation for Geoenvironmental Applications," submitted to the ASTM International Journal (submitted September, 2011).
2. Jesse Taff, Mallory Yates, Carl Lee, Sonya Shawver, Jim Browning, and Don Plumlee, "Fabrication of an Inductively Coupled Plasma Antenna in LTCC," submitted to Applied Ceramic Technology (submitted June, 2011)
3. Jim Browning, Carl Lee, Don Plumlee, Sonya Shawver, Sin Ming Loo, Mallory Yates, Matt McCrink, and Jesse Taff, "A miniature inductively coupled plasma source for ion thrusters," submitted to IEEE Trans. on Plasma Science (accepted for publication).
4. J. Browning, "Analysis of electron hop funnel simulation," submitted to IEEE Trans. on Plasma Science (submitted April, 2011).
5. J. Browning and J. Watrous, "A faceted magnetron concept using field emission cathodes," J. Vacuum Science and Technology B, Vol. 29, March/April (2011).
6. C. Lester, J. Browning, and L. Matthews, "Electron hop funnel measurements and comparison with the Lorentz-2E simulation", IEEE Trans. on Plasma Sci., Vol. 39, No. 1, pp. 555-561, Jan. (2011).
7. S. Meassick, Z. Xia, C. Chan, and J. Browning, "Investigation of the Operating Modes of Gated Vacuum Field Emitter Arrays to Reduce Failure Rates," J. Vac. Sci. Tech. B, **12**, pp. 710 (1994).
8. M. Gilmore, N. E. McGruer, J. Browning, and W. J. Bintz, "Measurement of Gated Field Emitter Failures," Review of Scientific Instruments, **64,** pp. 581-582 (1993).
9. S. Qin, C. Chan, J. Browning, and S. Meassick, "Charge Transfer cross section of He+ in collisional helium plasma using PIII techniques," J. of App. Phys., **74**, pp. 1548 (1993)

10. N.E. McGruer, J. Browning, S. Meassick, M. Gilmore, W.J. Bintz, and C. Chan, "Ion-Spacer-Charge Initiation of Gated Field Emitter Failure," J. Vac. Sci. Tech. B. pp. 11 (1993).
11. J. Browning, N. McGruer, S. Meassick, C. Chan, W. Bintz, and M. Gilmore, "Gated Field Emitter Failures: Experiment and Theory," IEEE Trans. On Plasma Science, **20,** pp. 499-506 (1992).
12. J. Browning, C. Chan, J. Ye, G.E. Dombrowski, and T.E. Ruden, "Electron Plasma and Wave Measurements in a Crossed-field Amplifier and Comparison with a Numerical Simulation," IEEE Trans. On Electron Devices, **39**, pp. 2401-2407 (1992).
13. J. Browning, N.E. McGruer, W. Bintz, and M. Gilmore, "Experimental Observations of Gated Field Emitter Failures," Electron Dev. Letters, **3,** pp. 167 (1992).
14. J. Browning, C. Chan, J.Ye, G.E. Dombrowski, and T.E. Ruden, " In Situ Measurements and Numerical Simulation of Wave-electron Interactions in a Crossed-field Amplifier," Appl. Phys. Lett., **59**, pp. 3384 (1991)
15. S. Qin, C. Chan, N. McGruer, J. Browning, and K. Warner, "The Behavior of a High Voltage Pulse in a Microwave Multipolar Bucket Plasma," IEEE Trans. on Plasma Science, **19**, pp. 1272 (1991)
16. J. Browning, C. Chan, J. Ye, and T. Ruden, "A Low Frequency Crossed-field Amplifier for Experimental Investigations of Electron-Radio Frequency Wave Interactions," IEEE Trans. On Plasma Science, **19**, pp.598 (1991).
17. J.J. Browning, N. Hershkowitz, T. Intrator, R. Majeski, and S. Meassick, "Radio-Frequency Wave Interchange Stability Experiments Below the Ion Cyclotron Frequency," Phys. Fluids B, **1**, pp. 1692 (1989).
18. S. Meassick, T. Intrator, N. Hershkowitz, J. Browning, and R. Majeski, "Measurements of the Ponderomotive Force Including Sideband Mode Coupling Effects and Damping Rates," Phys. of Fluids B, **1**, pp. 1049 (1989)
19. T. Intrator, S. Meassick, J. Browning, R. Majeski, J. Ferron, and N. Hershkowitz, "Measurements of Electromagnetic Waves in Phaedrus: Benchmark of ANTENA Wave field Calculations," Nuc. Fusion, **29**, pp. 377 (1989).
20. T. Intrator, S. Meassick, J. Browning, R. Majeski, and N. Hershkowitz, "The Bispectrum and Three-Wave Coupling Between Fast Magnetosonic Waves and Interchange Modes," Phys. Fluids B, **1**, pp. 271 (1989).
21. Y. Yaska, R. Majeski, J. Browning, N. Hershkowitz, and D. Roberts, "ICRF Heating with Mode Control Provided by a Rotating Field Antenna," Nuc. Fusion, **28**, pp. 1765 (1988).
22. J. Browning, R. Majeski, T. Intrator, N. Hershkowitz, and S. Meassick, "Interchange Stabilization of a Mirror Plasma Using radio-Frequency Waves Below the Ion Cyclotron Frequency," Phys. Fluids, **31,** pp. 714 (1988).
23. R. Majeski, J. Browning, S. Meassick, N. Hershkowitz, T. Intrator, and J.R. Ferron, "Effect of Variable Eigenmode Excitation on rf Stabilization of a Mirror Plasma," Phys. Rev. Lett., **59**, pp. 206 (1987).

Invited Talks:

1. J. Browning, "Packaging of Field Emission Displays," Materials Research Society Spring Meeting, San Francisco, CA, April (1999).

2. J. Browning, C. Watkins, D. Dynka, D. Zimlich, and J Alwan, "Field Emission Displays for Desktop Monitors," The 18th International Display Research Conference, Seoul, Korea, Sept. (1998).
3. J. Browning, C. Watkins, J. Alwan, and J. Hofmann, "Scaling of Field Emission Display Technology," 17th International Display Research Conference, Toronto, Canada, Sept. (1997).

Conference Proceedings/Presentations:

BSU

1. J. Rocha, A. Farid, H. Sangrey, and J. Browning, "Effects of Electromagnetic Stimulation on Soil's Hydraulic Conductivity," accepted for the 2011 Pan-Am Geotechnical Conference, Oct. 2011.
2. S. Shawver, J. Browning, D. Plumlee, S.M. Loo, C. Lee, J. Taff, M. Yates, J. Woldtvedt, L. Knowles, and D. Reis, "Miniaturized Electric Propulsion in Low Temperature Co-Fired Ceramic", 2011 IEEE Conference on Plasma Science, Chicago, IL June, 2011.
3. M. Pearlman, T. Rowe, and J. Browning, "Hop Structure Optimization," 2011 IEEE Conference on Plasma Science, Chicago, IL June, 2011.
4. J. Taff, M. Yates, C. Lee, S. Shawver, J. Browning, and D. Plumlee, "Fabrication of an Inductively Coupled Plasma Antenna in LTCC," IMPAS/ACerS 7th International Conference on Ceramic Interconnect and Ceramic Microsystems Technologies, San Diego, CA, April, 2011.
5. Arvin Farid, Harlan Sangrey, and Jim Browning, "An Experimental Setup for Electromagnetic Stimulation of Geoenvironmental Applications," Proceedings of the Geo-Frontiers Conference, Dallas, TX, March, 2011.
6. A. Farid, H. Sangrey, and J. Browning, "An Experimental Setup for Electromagnetic Stimulation of Air Sparging," American Society of Civil Engineers, Proceedings of the GeoFlorida 2010 Conference, West Palm Beach, FL, Feb., 2010.
7. J. Browning, L. Matthews, J. Watrous, M. Eaton, and N. Kumar, "A Magnetron Using Field Emission Cathodes," 23rd International Vacuum Nanoelectronics Conference, Palo Alto, CA, Technical Digest, 11-12, July, 2010.
8. J. Browning, C. Lester, and L. Matthews, "A Crossed-Field Amplifier Using A Distributed Field Emission Cathode," 2010 IEEE Conference on Plasma Science, Norfolk, VA., June 2010.
9. C. Lester, J. Browning, and L. Matthews, "Simulation and Measurement of Vacuum Electron Hop Funnel IV Characteristics and Energy Distribution," 2010 IEEE Conference on Plasma Science, Norfolk, VA., June 2010.
10. J. Browning, J. Watrous, J. Luginsland, M. Eaton, and N. Kumar, "A Magnetron Using A Field Emission Cathode and a Faceted Geometry," 2010 IEEE Conference on Plasma Science, Norfolk, VA., June 2010.
11. J. Browning, C. Lester, and J. Luginsland, "A Crossed-Field Amplifier using a distributed field emission cathode," 22nd International Vacuum Nanoelectronics Conference, Hamamatsu, Japan, Technical Digest, 205-206, July, 2009.
12. J. Browning, C. Lester, and J. Luginsland, "Development of a 'Smart' Crossed-Field Amplifier," IEEE Conference on Plasma Science, San Diego, CA, May, 2009.

13. C. Lester, J. Browning, and J. Luginsland, “Electron Hop Funnel Measurement and Simulation for Various Geometries and Materials,” IEEE Conference on Plasma Science, San Diego, CA, May, 2009.
14. J. Luginsland, J. Browning, M. Eaton, and B. Fowler, “Electromagnetic Particle-in-Cell Modeling of a THz BWO,” IEEE Conference on Plasma Science, San Diego, CA, May, 2009.

Prior to BSU

15. R.A. Tuck, W. Taylor, M.S. Waite, H.E. Bishop, R.J. Riggs, J.J. Browning, “Coulour Printable Field Emission Display (pFED) with Hop Plate,” International Display Manufacturing Conference, Taipei, Taiwan, Feb. 2005.
16. R.A. Tuck, W. Taylor, M.S. Waite, H.E. Bishop, R.J. Riggs, J.J. Browning, “The pFED- A Viable Route to Large Field Emission Displays,” International Vacuum Nanoelectronics Conference, Oxford, UK, July 2005.
17. J. Browning, N. McGruer, S. Meassick, C. Chan, W. Bintz, and M. Gilmore, "Experimental and theoretical investigation of gated field emitter failures", 1992 IEEE Conference on Plasma Science, Tampa, FL, June 6-8, 1992.
18. C. Chan, S. Meassick, T. Azar, J. Browning, G. Scarmoutzos, and M. A. Morgan, "Study of the current collection of a negatively biased object in the near wake of a conducting body with enhanced secondary electron emission", 1990 Spring Meeting of the American Geophysical Union, Baltimore, MD, May 29-June 1 1990.
19. C. Chan, D. Cooke, J. Browning, S. Meassick, M. Tautz, M. Morgan, and D. Enloe, "Current collection in a spacecraft wake: Laboratory and computer simulations of space plasmas", Seventeenth IEEE International Conference on Plasma Science, 21-23 May, 1990.
20. J. Browning N. Hershkowitz, T. Intrator, R. Majeski, and S. Meassick, "RF stabilization and wave measurements below the ion cyclotron frequency", Bull. Am. Phys. Soc., 33, 1906, Oct., 1988.
21. S. Meassick, T. Intrator, N. Hershkowitz, J. Browning, and R. Majeski, "Measurements of the ponderomotive force including sideband coupling effects and linear growth rates", Bull. Am. Phys. Soc., 33, 1906, Oct., 1988.
22. R.A. Breun, P. Brooker, J. Browning, D. Brouchous, G. Butz, J. Conrad, E. Dales, J. Ferron, R. Goulding, N. Hershkowitz, T. Intrator, C. Litwin, R. Majeski, S. Meassick, et. al., “Stabilization of MHD modes in an axisymmetric magnetic mirror by applied RF waves and initial results of Phaedrus-B", Proc. from the Eleventh Conference on Plasma Physics and Controlled Nuclear Fusion Research, IAEA, Kyoto, Japan, 1986.
23. R. Goulding, R. Majeski, J. Ferron, N. Hershkowitz, R. Breun, D. Brouchous, J. Browning, T. Intrator, S. Meassick, B. Nelson, and H. Persing, "Plasma buildup and heating using ICRF in the Phaedrus-B central cell", Bull. Am. Phys. Soc., 31, 1490, Oct., 1986.
24. J.J. Browning, R. Majeski, T. Intrator, S. Meassick, J. Ferron, N. Hershkowitz, and R. Goulding, “Phased ICRF antenna experiments on Phaedrus-B", Bull. Am. Phys. Soc., 31, 1490, Oct., 1986.
25. T. Intrator, S. Meassick, J.J. Browning, R. Majeski, and N. Hershkowitz, "Sideband formation resulting from coupled fast magnetosonic waves and low frequency electrostatic fluctuations", Bull. Am. Phys. Soc., 31, 1490, Oct., 1986.

26. S. Meassick, J. Browning, R. Majeski, T. Intrator, R. Goulding, and N. Hershkowitz, "Phase fluctuations in the phased antenna array of Phaedrus-B", Bull. Am. Phys. Soc., 31, 1490, Oct 1986.
27. S. Meassick, T. Intrator, J. J. Browning, J. Ferron, and N. Hershkowitz, "ICRF measurements in the Phaedrus tandem mirror", Bull. Am. Phys. Soc., 30, 1490, Oct 1985.
28. T. Intrator, S. Meassick, C. Litwin, J. J. Browning, and N. Hershkowitz, "Modeling ICRF waves in Phaedrus",Bull. Am. Phys. Soc., 30, 1490, Oct 1985.
29. R. A. Breun, P. Brooker, J. Browning, D. Brouchous, G. Butz, J. Conrad, J. Ferron, R. Goulding, N. Hershkowitz, T. Intrator, S. Meassick, and et. al., "Phaedrus upgrade facility", Bull. Am. Phys. Soc., 30, 1490, Oct 1985.

Patents:

1. **Method for making large-area FED apparatus,** US# 7,033,238, issued April, 2006, David Cathey and Jim Browning.
2. **Flat panel display, method of high vacuum sealing,** US# 6,831,404, issued Dec. 2004, Craig Dunham, Seungwoo Lee, Jim Browning, Michael Garcia
3. **Spacer fabrication for flat panel displays ,** US#6,716,081, issued April, 2004, Won-Joo Kim, Robert J. Hanson, David H. Chun, Gary A. Evans; Lee, Seungwoo; Jim Browning
4. **Spacers, display devices containing the same, and methods for making and using the same ,** US#6,688,934, issued Feb. 2004, Browning; Jim Chadha; Surjit S.
5. **Focusing electrode and method for field emission displays ,** US#6,633,113, issued October, 2003, Xia; Zhongyi, Browning; Jim, Watkins; Charles M., Cathey; David A.
6. **Method of testing addressable emissive cathodes,** US#6,559,818 **,** issued May, 2003, Browning; Jim
7. **Flat panel display, method of high vacuum sealing ,** US#6,554,672, issued April, 2003, Dunham; Craig M., Lee; Seungwoo, Browning; Jim, Garcia; Michel
8. **Spacers, display devices containing the same, and methods for making and using the same ,** US#6,530,814, issued March, 2003, Browning; Jim, Chadha; Surjit S.
9. **Focusing electrode and method for field emission displays ,** US#6,524,154, 6,509,677, 6,504,291, issued Jan. 2003, Jan 2003, and Feb 2003, Xia; Zhongyi, Browning; Jim, Watkins; Charles M., Cathey; David A.
10. **Method for cleaning phosphor screens for use with field emission displays ,** US#6,500,040, issued Dec. 2002, Browning; Jim J., Xia; Zhongyi, Cathey; David A. , Chadha; Surjit S.
11. **Method for Cleaning Phosphor Screens for Use with Field Emission Displays,** US#6409564, issued June, 2002, Jim Browning, Zhong-Yi Xia, David Cathey, Surjit Chadha.
12. **Apparatus for testing emissive cathodes in matrix addressable displays ,** US#6,441,634, issued August 2002, Browning; Jim, Watkins; Charles M., Cathey; David A.
13. **Method and apparatus for testing emissive cathodes ,** US#6,429,835, issued August 2002, Browning; Jim, Watkins; Charles M., Cathey; David A.
14. **Spacer fabrication for flat panel displays ,** US#6,413,135, issued July 2002, Kim; Won-Joo, Hanson; Robert J., Chun; David H., Evans; Gary A., Lee; Seungwoo, Browning; Jim J.
15. **Large-area FED apparatus and method for making same ,** US#6,255,772, issued July, 2001, Cathey; David A., Browning; Jimmy J.

16. **Method and apparatus for burn-in and test of field emission displays ,** US#6,229,325, issued May, 2001, Browning; Jim, Xia; Zhongyi
17. **Large-area FED apparatus and method for making same ,** US#6,495,956, issued Dec. 2000, Cathey; David A., Browning; Jimmy J.
18. **Spacers, display devices containing the same, and methods for making and using the same ,** US#6,116,974, issued Sept., 2000, Browning; Jim, Chadha; Surjit S.
19. **Identifying and Disabling Shorted Electrodes in Field Emission Display,** US#6034880, issued March, 2000, Jim Browning, John Lee, Tyler Lowrey.
20. **Fabrication of Field Emission Array with Vacuum Cathodic Arc Deposition,** US#6027619, issued Feb., 2000, David Cathey, Jim Browning, Zhong-Yi Xia.
21. **Alignment method for field emission and plasma displays,** US#6,030,267, issued Feb. 2000, Browning; Jim
22. **Architecture for isolating display grids in a field emission display ,** US#5,909,203, issued Jan. 1999, Browning; Jim J., Lee; John K., Lowrey; Tyler A.
23. **Method and Apparatus for Improved Gray Scale Control in Field Emission Displays,** US#5952987, issued Sept., 1999, Jim Browning, Dean Wilkinson.
24. **Architecture for isolating display grids in a field emission display ,** US#5,754,149, issued May, 1998, Browning; Jim J., Lee; John K., Lowrey; Tyler A.
25. **Method and Apparatus for Testing Emissive Cathodes,** US#5,751,262, issued May, 1998, Jim Browning, Charles Watkins, and David Cathey
26. **Identifying and disabling shorted electrodes in field emission display,** US#5,721,472, issued Feb., 1998, Browning; Jim J., Lee; John K.
27. **Flat panel display drive circuit with switched drive current ,** US#5,644,195, issued July, 1997, Browning; Jim J.
28. **Display with switched drive current ,** US#5,525,868, issued June, 1996, Browning; Jim
29. **Architecture for isolating display grid sections in a field emission display ,** US#5,459,480, issued October, 1995, Browning; Jim J., Lee; John K.
30. **Flat Panel Display Drive Circuit with Switched Drive Current,** US#5387844, issued Feb., 1995, Jim Browning