

## Michael Allen Jensen

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### Education

**Ph.D. in Electrical Engineering/Electromagnetics** (1994) GPA: 4.0/4.0

University of California, Los Angeles

Minors: Quantum Electronics, Circuits and Signal Processing

Dissertation: *Time-Domain Finite-Difference Methods in Electromagnetics: Application to Personal Communications*

**M.S. in Electrical Engineering/Electrosiences** (1991) GPA: 4.0/4.0

Brigham Young University

Thesis: *Controllable Cladding Removal for In-Fiber Integrated Optics Components*

**B.S. in Electrical Engineering/Electronics** (1990 – Summa Cum Laude) GPA: 4.0/4.0

Brigham Young University

### Experience

**Professor** (2005-present) and **Department Chair** (2006-present)

Department of Electrical and Computer Engineering, Brigham Young University

**Associate Professor** (2000-2005) and **Assistant Professor** (1994-2000)

Department of Electrical and Computer Engineering, Brigham Young University

**Founder** (2004-Present)

RFWare, LLC

**Co-Founder**

AJ Design Group, Inc (1998) and Wavetronix, LLC (2000)

**Visiting Researcher** (June-July 1995)

Department of Electrical Engineering, UCLA

**Consultant** (1993-present)

Antenna design, wireless communications system design, legal issues and expert witness

### Honors

Elevated to Fellow of the Institute of Electrical and Electronics Engineers, 2008.

Karl G. Maeser Research and Creative Arts Award, BYU, August 2005.

Best Overall Conference Paper Award: *40<sup>th</sup> International Telemetering Conference*, 2004.

Ward Endowed Chair Recipient: Dept. of Electrical and Computer Engineering, 2003-2006.

Harold A. Wheeler Applications Prize Paper Award, *IEEE Trans. Antennas and Propag.*, 2002.

Educator of the Year Award, Dept. of Electrical and Computer Engineering, BYU, 2002, 2003, 2007.

Outstanding Faculty Member Award, Dept. of Electrical and Computer Engineering, BYU, 1998.

Best PhD Award, UCLA School of Engineering and Applied Science, 1995

NASA Certificate of Achievement, 1994

Best Student Paper Award, IEEE AP-S Symposium, 1993

Graduate Fellowship, UCLA, 1991-1994

Ranked first in the Ph.D. qualifying examinations, UCLA

National Science Foundation Graduate Fellowship, 1990-1993

Hewlett-Packard – BYU Electrical Engineer of the Year, 1990

## Professional Activities

Associate Editor, *IEEE Antennas and Wireless Propagation Letters*, 2009-present  
Guest Editor, *EURASIP Journal on Wireless Communications and Networking*, Special Issue on Advances in Propagation Modeling for Wireless Systems, 2008-2009  
Chair, Joint AP-S/URSI Meetings Committee, 2008-present  
Guest Editor, *IEEE Trans. Antennas Propag.*, Special Issue on Wireless Communications, 2006  
Elected to IEEE AP-S Administrative Committee: 3 year term 2005-2007  
Symposium Co-Chair, 2007 IEEE AP-S International Symposium, Honolulu, HI  
Symposium Co-Chair, 2005 IEEE Intl. Conf. on Wireless Comm. and Appl. Comp. Electromagnetics, Honolulu, HI  
Chair, IEEE AP-S Ad Hoc committee on symposium format, 2004  
Associate Editor, *IEEE Trans. Antennas Propag.*, 2003-2007  
Member, Joint AP-S/URSI Meetings Committee, 2002-2007  
Technical Program Committee, 2004 IEEE INFOCOMM  
Symposium Co-Chair, 2003 IEEE AP-S Topical Conf. on Wireless Comm. Technology, Honolulu, HI  
Technical Program Committee, IEEE Vehicular Technology Conference: Fall 2003, Spring 2005, Fall 2005, Fall 2008, Fall 2009  
Special Session Organizer, 2002, 2004, 2005, 2008 IEEE AP-S International Symposia  
Technical Program Committee, 2002-2009 IEEE AP-S International Symposia  
Technical Program Co-Chair, 2000 IEEE AP-S International Symposium, Salt Lake City, UT  
Organizer, 1999 NSF Workshop in Radio Frequency MEMS  
Symposium Co-Chair, 1998 and 1999 Applied Computational Electromagnetics Symposia  
Short Course Presentation, 1996, 1997, 1998 IEEE AP-S International Symposia  
Regular Session Chair at International Symposia  
Frequent Reviewer, *IEEE Trans. Antennas Propag.*, *J. Opt. Soc. Am.*, *Radio Science*, etc.  
IEEE Student Chapter Advisor, BYU, 1995  
Member of Eta Kappa Nu, and Tau Beta Pi

## University Committee Work

Department Chair, 2006-Present  
College of Engineering Dean's Search Committee Member, 2004  
Graduate Coordinator and Department Executive Committee Member, 2003-2006  
Department Faculty Recruiting Chair, 1999-2000  
Graduate Committee Member, 1995-2003  
Student Chapter Advisor of the Institute of Electrical and Electronics Engineers, 1995

## International Academic Service

PhD Dissertation Co-Referee: Technical University of Karlsruhe, Germany, May 2004.  
PhD Dissertation Reviewer: University of Newcastle, Australia, June 2003  
Helsinki University of Technology, January 2009  
PhD Committee Member: University of Hawaii, February 2009  
Lund University, Sweden, March 2009  
PhD Defense Opponent: Uppsala University, Sweden, October 2002  
Chalmers University, Sweden, May 2005  
Lund University, Sweden, March 2009

## Courses Taught

ECEn 191	Freshman Seminar
ECEn 360/361	Electromagnetics/Electromagnetics Lab
ECEn 380	Signals and Systems
ECEn 460/461	Applied Electromagnetics/Applied Electromagnetics Lab
ECEn 491	Senior Seminar
ECEn 560	Advanced Electromagnetic Theory
ECEn 561	High-Frequency Circuits
ECEn 563	Computational Electromagnetics
ECEn 565	Antennas and Propagation for Wireless Communications
ECEn 686	Advanced Digital Communications

## Teaching Evaluations:

1994-2002: Average score of 6.4 out of a possible 7.0 (Department average: 5.4)

2002-Present: Average score of 7.2 out of a possible 8.0 (Department average: 6.4)

## PUBLICATIONS

### Journals

1. B. T. Quist and M. A. Jensen, "Optimal antenna radiation characteristics for diversity and MIMO systems," *IEEE Trans. Antennas Propag.*, vol. 57, no. 11, pp. 3474-3481, Nov. 2009.
2. J. W. Wallace and M. A. Jensen, "Sparse power angle spectrum estimation," *IEEE Trans. Antennas Propag.*, vol. 57, no. 8, pp. 2452-2460, Aug. 2009.
3. C. Chen and M. A. Jensen, "A stochastic model of the time-variant MIMO channel based on experimental observations," *IEEE Trans. Vehicular Technology*, vol. 58, no. 6, pp. 2618-2625, Jul. 2009.
4. N. W. Bikhazi, M. A. Jensen, and A. L. Anderson, "MIMO signaling over the MMF optical broadcast channel with square-law detection," *IEEE Trans. Communications*, vol. 57, no. 3, pp. 614-617, Mar. 2009.
5. N. W. Bikhazi and M. A. Jensen, "Impact of coupling on MIMO capacity in correlated fast fading environments," *IEEE Trans. Vehicular Technology*, vol. 58, no. 3, pp. 1595-1597, Mar. 2009.
6. A. L. Anderson, J. R. Zeidler, and M. A. Jensen, "Reduced-feedback linear precoding with stable performance for the time-varying MIMO broadcast channel," *IEEE Journal on Selected Areas in Communications*, vol. 26, pp. 1483-1493, Oct. 2008.
7. B. T. Maharaj, J. W. Wallace, and M. A. Jensen, "A low-cost open-hardware wideband multiple-input multiple-output (MIMO) wireless channel sounder," *IEEE Trans. Instrum. Meas.*, vol. 57, pp. 2283-2289, Oct. 2008.
8. M. A. Jensen, B. T. Quist, and N. W. Bikhazi, "Antenna design for mobile MIMO systems," *IEICE Trans. on Communications, Special Issue on 2007 International Symposium on Antennas and Propagation*, vol. E91-B, No. 6, p. 1705-1712, Jun. 2008. **Invited**
9. A. L. Anderson, J. R. Zeidler, and M. A. Jensen, "Stable transmission in the time-varying MIMO broadcast channel," *EURASIP Journal on Advances in Signal Processing, Special Issue on MIMO Transmission with Limited Feedback*, vol. 2008, Article ID 617020, 14 pages, 2008. doi:10.1155/2008/617020
10. D. Pinchera, J. W. Wallace, M. D. Migliore, and M. A. Jensen "Experimental analysis of a wideband adaptive-MIMO antenna," *IEEE Trans. Antennas Propag.*, vol. 56, pp. 908-913, Mar. 2008.
11. J. W. Wallace and M. A. Jensen, "Electromagnetic considerations for communicating on correlated MIMO channels with covariance information," *IEEE Trans. Wireless Communications*, vol. 7, pp. 543-551, Feb. 2008.
12. M. A. Jensen and J. W. Wallace, "Capacity of the continuous-space electromagnetic channel," *IEEE Trans. Antennas Propag.*, vol. 56, pp. 524-531, Feb. 2008.
13. S. Wang, A. Abdi, J. Salo, H. El-Sallabi, J. Wallace, P. Vainikainen, M. A. Jensen, "Time-varying MIMO channels: parametric statistical modeling and experimental results," *IEEE Trans. Vehicular Technology*, vol. 56, part 2, pp. 1949-1963, July 2007.
14. K. F. Warnick and M. A. Jensen, "Optimal noise matching for mutually-coupled arrays," *IEEE Trans. Antennas Propag.*, vol. 55, pp. 1726-1731, June 2007.
15. J. W. Wallace, M. A. Jensen, A. Gummalla, and H. Lee, "Experimental characterization of the outdoor MIMO wireless channel temporal variation," *IEEE Trans. Vehicular Technology*, vol. 56, pp. 1041-1049, May 2007.
16. N. W. Bikhazi and M. A. Jensen, "The relationship between antenna loss and superdirectivity in MIMO systems," *IEEE Trans. Wireless Communications*, vol. 6, pp. 1796-1802, May 2007.
17. M. A. Jensen, M. D. Rice, and A. L. Anderson, "Aeronautical telemetry using multiple-antenna transmitters," *IEEE Trans. Aerospace Electronic Systems*, vol. 43, pp. 262-272, Jan. 2007.
18. J. W. Wallace and M. A. Jensen, "Time varying MIMO channels: measurement, analysis, and modeling," *IEEE Trans. Antennas Propag., Special Issue on Wireless Communications*, vol. 54, pp. 3265-3273, Nov. 2006.

19. M. Zorzi, J. Zeidler, A. Anderson, B. Rao, and J. Proakis, A. L. Swindlehurst, M. Jensen, S. Krishnamurthy, "Cross-layer issues in MAC protocol design for MIMO ad hoc networks," *IEEE Wireless Communications*, vol. 13, pp. 62-76, Aug. 2006. **Invited Overview Article**
20. B. T. Maharaj, J. W. Wallace, L. P. Linde, and M. A. Jensen, "Linear dependence of double-directional spatial power spectra at 2.4 and 5.2 GHz from indoor MIMO channel measurements," *Electronics Lett.*, vol. 41, issue. 24, pp. 1338-1340, 24 Nov, 2005.
21. M. L. Morris and M. A. Jensen, "Impact of receive amplifier signal coupling on MIMO system performance," *IEEE Trans. Vehicular Technology*, vol. 54, pp. 1678-1683, Sept. 2005.
22. M. L. Morris, M. A. Jensen, and J. W. Wallace, "Superdirectivity in MIMO systems," *IEEE Trans. Antennas Propag.*, vol. 53, pp. 2850-2857, Sept. 2005.
23. K. F. Warnick and M. A. Jensen, "Effects of mutual coupling on interference mitigation with a focal plane array," *IEEE Trans. Antennas Propag.*, *Special Issue on Applications of Antennas and Propagation*, vol. 53, pp. 2490-2498, Aug. 2005.
24. M. L. Morris and M. A. Jensen, "Improved network analysis of coupled antenna diversity performance," *IEEE Trans. Wireless Communications*, vol. 4, pp. 1928-1934, July 2005.
25. B. T. Maharaj, J. W. Wallace, L. P. Linde, and M. A. Jensen, "Frequency scaling of spatial correlation from co-located 2.4 GHz and 5.2 GHz wideband indoor MIMO channel measurements," *Electronics Lett.*, vol. 41, issue 6, pp. 336-337, 17 March, 2005.
26. M. A. Jensen and M. L. Morris, "Efficient capacity-based antenna selection for MIMO systems," *IEEE Trans. Vehicular Technology*, vol. 54, pp. 110-116, Jan. 2005.
27. M. L. Morris and M. A. Jensen, "Network model for MIMO systems with coupled antennas and noisy amplifiers," *IEEE Trans. Antennas Propag.*, vol. 53, pp. 545-552, Jan. 2005.
28. M. A. Jensen and J. W. Wallace, "A review of antennas and propagation for MIMO wireless communications," *IEEE Trans. Antennas Propag.*, vol. 52, pp. 2810-2824, Nov. 2004. **Invited Review Article, Top 100 Documents Accessed in IEEE Xplore, Feb 2005 (#97), Top IEEE Xplore download for AP Transactions in 2004 and 2<sup>nd</sup> for 2005 and 2006.**
29. M. Jensen and J. Wallace, "Analysis of coupling in multi-antenna communication systems," *IEICE Trans.*, *Special Issue on Wave Technologies for Wireless and Optical Communications*, vol. E87-C, pp. 1418-1424, Sep. 2004.
30. J. W. Wallace and M. A. Jensen, "Mutual coupling in MIMO wireless systems: a rigorous network theory analysis," *IEEE Trans. Wireless Commun.*, vol. 3, pp. 1317-1325, Jul. 2004.
31. M. A. Jensen and K. W. Warnick, "Comment on 'Coulomb Torque - A General Theory for Electrostatic Forces in Many-body Systems'", *J. Phys. A: Mathematical and General*, vol. 37, pp. 6409-6411, 18 Jun. 2004.
32. T. Svantesson, M. A. Jensen, and J. W. Wallace, "Analysis of electromagnetic field polarizations in multi-antenna systems," *IEEE Trans. Wireless Commun.*, vol. 3, pp. 641-646, Mar. 2004.
33. C. Furse, R. Woodward, and M. A. Jensen, "Laboratory project in wireless FSK receiver design," *IEEE Trans. Educ.*, vol. 47, pp. 18-25, Feb. 2004.
34. J. W. Wallace and M. A. Jensen, "Termination-dependent diversity performance of coupled antennas: network theory analysis," *IEEE Trans. Antennas and Propag.*, vol. 52, pp. 98-105, Jan. 2004.
35. J. W. Wallace, M. A. Jensen, A. L. Swindlehurst, and B. D. Jeffs, "Experimental characterization of the MIMO wireless channel: data acquisition, analysis, and modeling," *IEEE Trans. Wireless Commun.*, vol. 2, pp. 335-343, Mar. 2003.
36. J. W. Wallace and M. A. Jensen, "Modeling the indoor MIMO wireless channel," *IEEE Trans. Antennas Propag.*, *Special Issue on Wireless Communications*, vol. 50, pp. 591-599, May 2002. **Winner of Harold A. Wheeler Applications Prize Paper Award**
37. J. W. Wallace and M. A. Jensen, "Analysis of optical waveguide structures by use of a combined finite-difference/finite-difference time-domain method," *J. Optical Soc. Am. A*, vol. 19, pp. 1-10, Mar. 2002.

38. M. A. Jensen, R. H. Selfridge, and K. F. Warnick, "System level microwave design projects," *IEEE Antennas Propag. Magazine*, vol. 43, pp. 138-142, Oct. 2001.
39. M. A. Jensen and G. P. Nordin, "Characterization of two-dimensional finite-aperture wire grid polarizers by a spectral-domain technique," *Applied Optics*, vol. 40, pp. 4738-4745, Sep. 2001.
40. M. A. Jensen and G. P. Nordin, "Finite-aperture wire grid polarizers," *J. Optical Soc. Am. A*, vol. 17, pp. 2191-2198, Dec. 2000.
41. M. A. Jensen, D. V. Arnold, and D. E. Crockett, "System level microwave design: radar-based laboratory projects," *IEEE Trans. Educ.*, vol 43, pp. 414-419, Nov. 2000.
42. B. M. Green and M. A. Jensen, "Diversity performance of dual-antenna handsets near operator tissue," *IEEE Trans. Antennas Propag.*, vol 48, pp. 1017-1024, July 2000.
43. Q. H. Spencer, B. D. Jeffs, M. A. Jensen, and A. L. Swindlehurst, "Modeling the statistical time and angle of arrival characteristics of an indoor multipath channel," *IEEE J. Selected Areas Commun.*, vol 18, pp. 347-360, Mar. 2000.
44. M. A. Jensen and J. D. Freeze, "A recursive Green's function method for boundary integral analysis of inhomogeneous domains," *IEEE Trans. Antennas Propag.*, vol. 46, pp. 1810-1816, Dec. 1998.
45. J. S. Colburn, Y. Rahmat-Samii, M. A. Jensen, and G. J. Pottie, "Evaluation of personal communications dual antenna handset diversity performance," *IEEE Trans. Veh. Tech.*, vol. 47, pp. 737-746, Aug. 1998.
46. M. A. Jensen, "A recursive Green's function technique for acoustic scattering from heterogeneous objects," *J. Acoust. Soc. Am.*, vol. 103, pp. 713-720, Feb. 1998.
47. J. D. Freeze, M. A. Jensen, and R. H. Selfridge, "A unified Green's function analysis of complicated DFB lasers," *IEEE J. Quantum Electron.*, vol. 33, pp. 1253-1259, Aug. 1997.
48. M. A. Jensen and Y. Rahmat-Samii, "Finite difference and finite volume time domain techniques in electromagnetics: A comparative study," *Radio Science*, vol. 31, pp. 1823-1836, Nov.-Dec. 1996. *Invited*
49. A. Fijany, M. A. Jensen, Y. Rahmat-Samii, and J. Barhen, "A massively parallel computation strategy for FDTD: The concept of time and space parallelism," *IEEE Trans. Antennas Propag.*, vol. 43, pp. 1441-1449, Dec. 1995.
50. M. A. Jensen and Y. Rahmat-Samii, "EM interaction of handset antennas and a human in personal communications," *IEEE Proc.*, vol. 83, pp. 7-17, Jan. 1995.
51. Y. Rahmat-Samii and M. A. Jensen, "Characterization of antennas for personal wireless communications applications," *International Journal of Wireless Information Networks*, vol. 1, pp. 165-176, 1994. *Invited*
52. M. A. Jensen and Y. Rahmat-Samii, "Performance analysis of antennas for hand-held transceivers using FDTD," *IEEE Trans. Antennas Propag.*, vol. 42, pp. 1106-1113, Aug. 1994.
53. M. A. Jensen and Y. Rahmat-Samii, "Characterization of electromagnetically coupled superquadric loop antennas for mobile communications applications," *IEE Proc. H – Microw. Antennas Propag.*, vol. 141, pp. 85-93, Apr. 1994.
54. M. A. Jensen and Y. Rahmat-Samii, "Electromagnetic characteristics of superquadric wire loop antennas," *IEEE Trans. Antennas Propag.*, vol. 42, pp. 264-269, Feb. 1994.
55. M. A. Jensen and R. H. Selfridge, "Analysis of diffraction gratings based on D-shaped fiber," *J. Opt. Soc. Am. A*, vol. 9, pp. 1086-1090, Jul. 1992.
56. M. A. Jensen and R. H. Selfridge, "Analysis of etching-induced birefringence changes in elliptic core fibers," *Appl. Optics*, vol. 31, pp. 2011-2016, 20 Apr. 1992.

### **Journals - In Review**

57. C. Chen and M. A. Jensen, "Improved quantization techniques for secret key establishment in wireless systems," *IEEE Trans. Wireless Communications*, submitted Nov. 2009.
58. Y. Shi and M. A. Jensen, "Feedback reduction for beamforming in the MIMO broadcast channel," *IEEE Trans. Vehicular Technology*, submitted Oct. 2009.

59. M. A. Jensen and B. K. Lau, "Uncoupled matching for active and passive impedances of coupled arrays in MIMO systems," *IEEE Trans. Antennas Propag.*, submitted Oct. 2009.
60. C. Chan and M. A. Jensen, "Secret key establishment using temporally and spatially correlated wireless channel coefficients," *IEEE Trans. Mobile Computing*, submitted Oct. 2009.
61. A. L. Anderson, J. R. Zeidler, and M. A. Jensen, "Instantaneous and average sum-rate optimizations for multi-user MIMO topologies," *IEEE Trans. Wireless Communications*, submitted Jun. 2009.
62. D. N. Evans and M. A. Jensen, "Near-optimal radiation patterns for antenna diversity," *IEEE Trans. Antennas Propag.*, submitted May 2009.

### Book Chapters

63. M. A. Jensen and J. W. Wallace, "Antenna Design Considerations for MIMO and Diversity Systems," chapter 23 in *Modern Antenna Handbook*, C. A. Balanis, Ed., pp. 1327-1375, John Wiley & Sons: New Jersey, September, 2008.
64. M. A. Jensen and J. W. Wallace, "MIMO Wireless Channel Modeling and Experimental Characterization," chapter 1 in *Space-Time Processing for MIMO Communications*, A. B. Gershman and N. D. Sidiropoulos, Eds., John Wiley & Sons, Ltd.:UK, 2005.
65. Y. Rahmat-Samii, K. Kim, and M. A. Jensen, "Antennas and Humans in Personal Communications," chapter 7 in *Mobile Antenna Systems Handbook*, 2<sup>nd</sup> Edition, K. Fujimoto and J. R. James, Eds., Artech House: Boston, 2000.

### Conferences

66. C. Chen and M. A. Jensen, "Secrecy extraction from increased randomness in a time-varying MIMO channel," *Proc. of the 2009 IEEE Global Communications Conference (GlobeCom)*, Honolulu, HI, Nov. 30-Dec 4, 2009, to appear.
67. D. Maas, N. Patwari, J. Zhang, S. K. Kasera, and M. A. Jensen, "Location distinction in a MIMO channel," *2009 Virginia Tech Symposium on Wireless Personal Communications*, pp. 1-9, Blacksburg, VA, June, 2009.
68. C. Chen and M. A. Jensen, "Random number generation from multipath propagation: MIMO-based encryption key establishment," *2009 IEEE AP-S International Symposium Digest*, pp. 1-4, Charleston, SC, June 1-5, 2009.
69. D. N. Evans and M. A. Jensen, "Element radiation characteristics for optimal antenna diversity," *2009 IEEE AP-S International Symposium Digest*, pp. 1-4, Charleston, SC, June 1-5, 2009.
70. J. W. Wallace, C. Chen, and M. A. Jensen, "Key generation exploiting MIMO channel evolution: algorithms and theoretical limits", *Proceedings of 2009 European Conference on Antennas and Propagation*, Berlin, Germany, Mar. 23-27, 2009. **Invited**
71. D. Evans and M. A. Jensen, "Near-optimal radiation characteristics for diversity antenna design," *Proceedings of the 2009 IEEE International Workshop on Antenna Technology (iWAT 2009)*, 4 pages, Santa Monica, CA, Mar. 2-4, 2009. **Invited**
72. A. L. Anderson, J. R. Zeidler, and M. A. Jensen, "Instantaneous and average rate maximization in MIMO multiple-access channels (MAC) with linear processing," *Conference Record of the 42<sup>nd</sup> Asilomar Conference on Signals, Systems, and Computers*, pp. 1-5, Pacific Grove, CA, Oct. 26-29, 2008.
73. Y. Shi and M. A. Jensen, "Stable transmission in the frequency-selective MIMO broadcast channel," *2008 IEEE 68th Vehicular Technology Conference Digest (VTC Fall 2008)*, pp. 1-5, Calgary, Alberta, CA, Sep. 21-24, 2008.
74. A. L. Anderson, J. R. Zeidler, and M. A. Jensen, "Regularized channel distribution inversion (RCDI) and parameterization in the MIMO broadcast channel," *2008 IEEE 68th Vehicular Technology Conference Digest (VTC Fall 2008)*, pp. 1-5, Calgary, Alberta, CA, Sep. 21-24, 2008.
75. A. L. Anderson, J. R. Zeidler, and M. A. Jensen, "Covariance-based signaling and feedback data parameterization for the time-varying MIMO broadcast channel," *Proceedings of the 28<sup>th</sup> General Assembly of International Union of Radio Science*, pp. 1-4, Chicago, IL, Aug. 7-16, 2008. **Invited**
76. C. Chen and M. A. Jensen, "Time-variant MIMO channels: stochastic modeling based on experimental observations," *Proceedings of the 28<sup>th</sup> General Assembly of International Union of Radio Science*, pp. 1-4, Chicago, IL, Aug. 7-16, 2008. **Invited**

77. B. T. Quist and M. A. Jensen, "Performance analysis of optimal and practical diversity antenna designs," *2008 IEEE AP-S International Symposium Digest*, pp. 1-4, San Diego, CA, July 5-12, 2008. **Invited**
78. C. Chen and M. A. Jensen, "Modeling time-variant multipath characteristics for MIMO channels," *2008 IEEE AP-S International Symposium Digest*, pp. 1-4, San Diego, CA, July 5-12, 2008.
79. B. T. Quist and M. A. Jensen, "Optimal antenna characteristics for MIMO systems," *Proceedings of the 2008 USNC/URSI National Radio Science Meeting*, paper # BS11-3, 1 page, Boulder, CO, Jan. 3-6, 2008. **Invited**
80. A. L. Anderson, J. R. Zeidler, and M. A. Jensen, "Parameterized channel feedback using correlation-based channel models for multi-user MIMO systems," *Proceedings of the 2008 USNC/URSI National Radio Science Meeting*, paper # BS11-4, 1 page, Boulder, CO, Jan. 3-6, 2008. **Invited**
81. K. F. Warnick, D. Jones, B. D. Jeffs, and M. A. Jensen, "Noise penalty due to mutual coupling for receive arrays," *Proceedings of the 2008 USNC/URSI National Radio Science Meeting*, paper # BS11-5, 1 page, Boulder, CO, Jan. 3-6, 2008. **Invited**
82. M. A. Jensen and J. W. Wallace, "Experimental characterization of the MIMO channel temporal behavior", *Proceedings of 2007 European Conference on Antennas and Propagation*, Edinburgh, UK, Nov. 11-16, 2007. **Invited**
83. M. A. Jensen and J. W. Wallace, "Modeling the time-variant MIMO channel", *Proceedings of 2007 European Conference on Antennas and Propagation*, Edinburgh, UK, Nov. 11-16, 2007. **Invited**
84. K. F. Warnick and M. A. Jensen, "Signal and noise analysis of small antennas terminated with high-impedance amplifiers", *Proceedings of 2007 European Conference on Antennas and Propagation*, Edinburgh, UK, Nov. 11-16, 2007.
85. M. A. Jensen, "Antenna design and channel characterization for mobile MIMO systems," *2007 International Symposium on Antennas and Propagation (ISAP)*, Niigata, Japan, Aug. 20-24, 2007. **Invited Keynote Address**
86. D. Pinchera, M. D. Migliore, M. A. Jensen, and J. W. Wallace, "Characterization of a wideband adaptive-MIMO antenna," *2007 IEEE AP-S International Symposium Digest*, pp. 2401-2404, Honolulu, HI, June 10-15, 2007.
87. B. T. Quist and M. A. Jensen, "Optimal antenna pattern design for MIMO systems," *2007 IEEE AP-S International Symposium Digest*, pp. 1905-1908, Honolulu, HI, June 10-15, 2007.
88. K. F. Warnick and M. A. Jensen, "Optimal noise matching condition for mutually coupled antenna arrays," *2007 IEEE AP-S International Symposium Digest*, pp. 2953-2956, Honolulu, HI, June 10-15, 2007.
89. H. Stephen and M. A. Jensen, "Optimizing diversity gain using uncoupled impedance matching with coupled antennas," *2007 IEEE AP-S International Symposium Digest*, pp. 2961-2964, Honolulu, HI, June 10-15, 2007.
90. J. W. Wallace and M. A. Jensen, "Modeling antenna coupling and correlation in rapidly fading MIMO channels," *Proceedings of 2006 European Conference on Antennas and Propagation*, Nice, France, Nov. 6-10, 2006. **Invited**
91. M. A. Jensen and B. Booth, "Optimal uncoupled impedance matching for coupled MIMO arrays," *Proceedings of 2006 European Conference on Antennas and Propagation*, Nice, France, Nov. 6-10, 2006.
92. A. L. Anderson, J. R. Zeidler, and M. A. Jensen, "Performance of transmit precoding in time-varying point-to-point and multi-user MIMO channels," *Proceedings of the 40th Asilomar Conference on Signals, Systems, and Computers, 2006*, pp. 112-116, Pacific Grove, CA, Oct. 29-Nov. 1, 2006.
93. J. W. Wallace and M. A. Jensen, "Communicating on MIMO channels with covariance information: antenna correlation and coupling," *64th IEEE Vehicular Technology Conference Digest (VTC Fall 2006)*, pp. 1-5, Montreal, CA, Sep. 25-28, 2006.
94. N. W. Bikhazi and M. A. Jensen, "The effect of antenna loss on superdirectivity in MIMO systems," *2006 IEEE AP-S International Symposium Digest*, pp. 305-308, Albuquerque, NM, July 9-14, 2006.
95. J. W. Wallace and M. A. Jensen, "Experimental analysis of the time-varying MIMO channel," *2006 IEEE AP-S International Symposium Digest*, pp. 321-324, Albuquerque, NM, July 9-14, 2006.
96. M. A. Jensen, "Antenna design for mobile MIMO systems," *Proceedings of Antenn 06 Nordic Antenna Symposium*, pp. 17-22, Linköping, Sweden, 30 May-1 June, 2006. **Invited Keynote Address**

97. T. Nelson, M. Rice, and M. Jensen, "Experimental results for space-time coding using ARTM Tier-1 Modulation," *Proceedings of the 41<sup>st</sup> International Telemetering Conference*, 11 pages, Las Vegas, NV, Oct 24-27, 2005.
98. B. T. Maharaj, J. W. Wallace, and M. A. Jensen, "Comparison of double directional channel response at 2.4 and 5.2 GHz from indoor co-located wideband MIMO channel measurements," *Proceedings of the 27<sup>th</sup> General Assembly of International Union of Radio Science*, paper O1722 (4 pages), New Delhi, India, Oct. 23-29, 2005. **Invited**
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### **Internal Reports**

209. M. A. Jensen and G. P. Nordin, "Finite-aperture wire grid polarizers," Technical Report No. 99-08, Brigham Young University Microwave Earth Remote Sensing Laboratory, 1999.
210. J. S. Colburn, M. A. Jensen, Y. Rahmat-Samii, and G. J. Pottie, "Indoor ISM Band Propagation/Diversity Measurements," UCLA Report no. ENG-95-133, UCLA School of Engineering and Applied Science, 1995.
211. M. A. Jensen, "Time-domain finite-difference methods in electromagnetics: application to personal communications," Ph.D Dissertation, UCLA, 1994.
212. M. A. Jensen and Y. Rahmat-Samii, "Geometrical theory of diffraction analysis of a dipole source over a rectangular ground plane," UCLA Report no. ENG-92-20, UCLA School of Engineering and Applied Science, 1992.
213. M. A. Jensen, "Controllable cladding removal for in-fiber integrated optics components," Masters Thesis, Brigham Young University, 1991.

### **Funded Contracts and Grants**

#### *DOD Science and Technology/Test and Evaluation Program*

PI: Michael Rice, 4/09-3/11, \$491,577

Co-I: M. A. Jensen + collaborator from Univ. Texas Dallas

"Multipath Modeling and Mitigation using Multiple Antennas"

#### *Army Research Office - MURI*

PI: Prasant Mohapatra (UCD), 6/07-5/12, \$455,000 (BYU Portion)

Co-I: M. A. Jensen (BYU) + collaborators from UCD, UCSC, UCI, UCR

"ARSENAL: A cross layer architecture for secure resilient tactical mobile ad hoc networks"

#### *SRJ Technologies*

PI: Michael A. Jensen, 12/04-11/05, \$32,958  
“Mobile MIMO Measurement Campaign”

*National Science Foundation*

PI: A. Lee Swindlehurst, 9/04-8/09, \$1,124,191  
Co-I's: M. A. Jensen, B. D. Jeffs, M. D. Rice, R. L. Beard, B. Nelson, T. Moon, J. Gunther  
“Distributed Communications and Control for Multiple Miniature Unmanned Air Vehicles”

*Utah State Center of Excellence*

PI: Michael A. Jensen, 7/04-6/09, \$642,238  
Co-I's: A. L. Swindlehurst, M. D. Rice  
“Center of Excellence in Advanced Communications Technology.”

*Central Test and Evaluation Investment Program*

PI: Michael D. Rice, 11/04-10/07, \$893,452  
Co-I: M. A. Jensen  
“Prototype Design for Space-Time Coding Experiments in Aeronautical Telemetry”

*Army Research Office - MURI*

PI: James Zeidler (UCSD), 5/04-4/09, \$589,896 (BYU Portion)  
Co-I's: M. A. Jensen (BYU) + collaborators from UCSD, UCSC, UCI, UCR  
“Space-Time Processing for Tactical Mobile Ad-Hoc Networks”.

*L-3 Communications*

PI: Michael A. Jensen, 6/04-5/05, \$125,000  
Co-I: M. D. Rice  
“Project-Oriented Education in Wireless Communications.”

*National Science Foundation*

PI: A. Lee Swindlehurst, 9/03-8/06, \$354,042  
Co-I's: B. D. Jeffs, M. A. Jensen, and M. D. Rice  
“ITR: Multi-user, Multi-antenna Networks: Achieving High Capacity in a Mutual Interference Environment.”

*Edwards Air Force Base*

PI: Michael Jensen, 5/03-4/04, \$100,000  
Co-I: M. D. Rice  
“Differential Space-Time Coding for Aeronautical Telemetry”

*Department of the Navy*

PI: Michael Jensen, 6/02-6/03, \$60,000  
“Wrap-Around Antenna Evaluation for GPS Applications”

*Air Force: Edwards Air Force Base*

PI: Michael Rice, 6/02-6/03, \$100,000  
Co-I: M. A. Jensen  
“Space-Time coding for Aeronautical Telemetry”

*Air Force Office of Scientific Research*

PI: Michael Jensen, 12/00-12/02, \$200,000  
“Full L-S Band Telemetry System.”

*National Science Foundation*

PI: A. Lee Swindlehurst, 10/00-9/03, \$488,761  
Co-I's: B. D. Jeffs, M. A. Jensen, and M. D. Rice  
“ITR/SII: Analysis of the Capacity Improvement for Wireless Networks with Multiple Transmit and Receive Antennas.”

*National Science Foundation*

PI: A. Lee Swindlehurst, 8/00-4/03, \$370,567

Co-I's: B. D. Jeffs, M. A. Jensen, and M. D. Rice

"Development of a Comprehensive Real-Time Instrument for MIMO Wireless Channel Measurement and Space-Time Coding Implementation."

*National Science Foundation*

PI: Michael A. Jensen, 6/00-5/01, \$6,990

"Special Sessions to Encourage Collaboration and Interaction Across Disciplinary Boundaries."

*National Science Foundation*

PI: Michael A. Jensen, 9/99-9/01, \$42,000

"Workshop on RF Micromachining and MEMS Technology for Wireless Communications Systems."

*National Science Foundation*

PI: A. Lee Swindlehurst, 9/99-9/02, \$698,000

Co-I's: M. A. Jensen, B. D. Jeffs, and M. D. Rice

"Modeling and Design for the Lower Layers of 4<sup>th</sup> Generation Indoor/Outdoor Wireless Networks."

*NASA Headquarters*

PI: David G. Long, 7/99-7/02, \$266,355

Co-I: M. A. Jensen

"Polar Ice Sheet Monitoring from Long-Term Scatterometer and Radiometer Observations."

*NASA Headquarters*

PI: David V. Arnold, 9/98-9/01, \$557,000

Co-I's: W. K. Melville, M. A. Jensen, D. G. Long, and K. F. Warnick.

"Improved Estimation of the Electromagnetic Bias for the JASON-1 Altimeter."

*Canadian National Railway*

PI: David V. Arnold, 9/98-1/00, \$151,000

Co-I's: M. A. Jensen and D. G. Long.

"Investigation of Interferometric Radar Technology applied to Rockfall, Landslide, and Washout Detection in a Railway Operating Environment."

*Hewlett Packard*

PI: Michael A. Jensen, 7/98.

40 licenses of HP EEsof Advanced Design System (ADS) and High Frequency Structure Simulator (HFSS).

HP Estimated Value: \$20,000,000.

*Nichols Research Corporation*

PI: Michael A. Jensen, 9/98-12/98, \$5,000

"Diffractive Optical Element Analysis."

*NASA Headquarters*

PI: Michael A. Jensen, 1/98-1/99, \$130,000

Co-I's: D.G. Long, D.V. Arnold, P.J. Hardin and E.J. Nelson.

"Computing Resources for Enhanced Environmental Assessment and Research Capabilities at BYU."

*NASA Headquarters*

PI: David G. Long, 3/96-3/99, \$460,000

Co-I's: D.V. Arnold, M.A. Jensen, and G.M. Miner.

"An Inexpensive Interferometric Synthetic Aperture Radar for Geophysical Research."

*Hughes Research*

PI: Michael A. Jensen, 1/96-1/98, \$38,000

"FDTD Algorithm Enhancement for Antenna Analysis."

*Air Force Office of Scientific Research/Utah Asian Consortium*

PI: Michael A. Jensen, 4/96-10/97, \$15,000

“Antenna Design and Evaluation for Personal Wireless Communications.”