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CITIZENSHIP: United State of America

SPECIALTY Microwave and Millimeter wave Engineering and Solid State Physics.

EDUCATION

Massachusetts Institute of Technology: Ph.D. in Physics **November 2000**

Thesis Supervisors: Prof. Mildred Dresselhaus, Dr. Daniel Oates

Thesis Title: Study of Microwave Properties of High- T_c Superconducting Films

University of Massachusetts, Dartmouth: BS in Physics and Mathematics, Summa cum Laude, 1995

EXPERIENCES

Aug. 2005 – Present: Assistant Professor, Electrical and Computer Engineering Dept. and Physics Dept., the University of Arizona. Current research focus is in the area of microwave technologies and solid state physics, including solid state devices and circuits, antennas, passive circuits, properties and applications of new materials such as electromagnetic band gap crystals and carbon nanotubes.

Nov. 2003 – Aug. 2005: Sr. Multi-Disciplined Principal Engineer at Radar and RF Center and Advanced Programs / DARPA New Business of Raytheon Missile Systems, Tucson, Arizona.

2000-2003: Member of technical staff at Rockwell Scientific Company.

- Lead and managed (as program manager and/or principle investigator) research effort in electromagnetic band gap structures, monolithic microwave and millimeter wave circuits, microwave and millimeter wave antennas, and their applications in communication and sensor systems. Lead and managed various government R & D programs including Future Combat System – Communications, Intelligent RF Front-End Systems, etc. Lead and managed sub-contracting programs for various external industrial companies including Rockwell Collins, Raytheon, TRW, and Boeing.
- Lead and/or participated in marketing efforts for numerous government and commercial contracts. Member of various internal technology panels including communication technology panel and nano-technology panel.
- Demonstrated first millimeter wave phase shifter and phased array antenna prototype based on innovative electromagnetic band gap structures.
- Demonstrated first tunable millimeter wave band-stop and band-pass filter based on innovative electromagnetic band gap structures
- Designed and characterized various III-V semiconductor devices and microwave circuits based on GaAs PHEMT, GaAs Schottky diode, InP HEMT, InP HBV, Ferro-electric materials, etc.
- Built, tested, and modeled innovative power harvesting devices based on nano-scale ferro-magnetic materials

1997-2000: Research assistant at MIT physics department and Lincoln Laboratory

- Measured and modeled nonlinearity of microwave properties of YBCO thin films, including surface impedance, harmonic generation and inter-modulation at 1 – 20 GHz using fundamental and overtone modes of microwave stripline-resonators.

- Modeled and measured a microwave phase-shifting device made of a transmission line containing 300 high- T_C Josephson junctions in series at 1 – 20 GHz.
- Investigated microwave resistance and reactance of bi-crystal grain boundary Josephson junctions as a function of dc and rf (4.4 GHz) magnetic fields in a microstrip-resonator setup. Built an oscillator with a microstrip resonator containing a grain boundary Josephson junction.
- Designed and fabricated a stripline-resonator with fundamental center frequency of 1.8 GHz and a high power handling (up to 40 dBm) sapphire dielectric-resonator operating at mode TE_{011} (10.7 GHz) to study the etching/patterning effect on the microwave surface impedance of YBCO thin films. Measured the microwave surface impedance from 1.8 to 12 GHz by frequency and time domain methods using both types of resonator. Simulated and compared effects of current distributions on the quality factors for both types of resonator.

1996-1997: Part-time technical support of GIS/TRANS, Inc.

Improved productivity and payroll database using EXCEL.

1995-1997: Research assistant at MIT physics department and Lawrence Livermore National Laboratory, worked on a cryogenic microwave cavity experiment searching for dark matter axion.

- Worked with large tunable microwave cavity at 0.3-1 GHz at 1.5 K.
- Experiences also including Monte-Carlo simulation, signal processing, data analysis and electronic hardware.

1997-1998: Teaching Assistant of Physics of Solids at MIT EECS department.

1995-1996: Teaching Assistant of Electricity and Magnetism at MIT physics department.

1992-1995: Research Assistant of Experiment-852 at Brookhaven National Laboratory (Searching for Exotic Mesons).

- Experiences including: Electronics, detector building and data analyzing.

1993-1994: Software designer and programmer for a NSF education project "SIMCALC" at UMASS Dartmouth.

ACTIVITIES

Steering Committee member, IEEE International Microwave Symposium at Long Beach, 2005
 Editorial board member, IEEE Transactions on Microwave Theory and Techniques, IEEE Transactions on Antennas and Propagation.

2001-present: Member of IEEE Microwave Theory and Techniques Society.

1997-2000: Member of Material Research Society.

1993-1995: Secretary of Physics Club, President of Physics Club, the official SPS Chapter at UMASS Dartmouth. Member of Mathematics Club at UMASS Dartmouth.

ACADEMIC HONORS

1999: Awarded a grant for NATO Advanced Institute of Study on Microwave Superconductivity.

1995: Society of Physics Students Scholarships (1 out of 14 nationwide).

1995: Highest Scholastic Achievement Award in Arts and Science College at UMASS Dartmouth.

1992-1994: Scholastic Achievement Award in Physics, Louis Simeone Certificate of Merit, Achievement of Highest Honor in Physics, Achievement of Highest Honor in Mathematics, Member of Sigma Pi Sigma National Physics Honor Society.

REFERENCES

Mildred S. Dresselhaus, Institute Professor in EECS and Physics, M.I.T., millie@mgm.mit.edu

Daniel E. Oates, Staff, Lincoln Laboratory, M.I.T., oates@ll.mit.edu

Derek T. Cheung, CEO and President, Rockwell Scientific Company, dcheung@rws.com

Mark J. Rosker, Program Manager, MTO, DARPA, mrosker@darpa.mil

PUBLICATION LIST

Refereed Journal Papers:

- X. Wang, **H. Xin**, J. Leonard, G. Chen, A. Chwang, and Q. Jiang, "The Oscillatory Characteristics of a $2C_{60}$ /CNT Oscillator System", submitted, *Journal of Nanoscience and NanoTechnology*, January, 2006.
- D. Kim, M. Kim, **H. Xin**, and J. Hacker, "A Microstrip Phase Shifter Design Using an Electromagnetic Bandgap Ground Plane", *IEICE Trans. On Communications*, June, 2005
- **H. Xin**, J. B. West, J. C. Mather, J. P. Doane, and J. A. Higgins, "A Two-Dimensional Electronic-Scanned Antenna Utilizing Analog Electromagnetic Crystal (EMXT) Waveguide Phase Shifters", *IEEE Trans. on Antennas and Propagation*, January, 2005.
- **H. Xin**, M. Kim, J. B. Hacker, and J. A. Higgins, "Incident Angle-Dependence of Electromagnetic Crystal (EMXT) Surfaces", *IEEE Microwave and Guided Wave Letters*, September, 2004.
- **H. Xin**, J. B. Hacker, A. Sailer, G. Nagy, J. A. Higgins, D. Pilz, and M. J. Rosker, "25 – 45 GHz Wave-front Adaptive Control System for Quasi-Optical Power Amplifiers in Intelligent RF Front Ends", *IEEE Microwave and Guided Wave Letters*, September, 2004
- T. Nishino, **H. Xin**, Y. Wang, and T. Itoh, "A Frequency-Controlled Active Phased Array", *IEEE Microwave and Guided Wave Letters*, March, 2004
- D. Kim, M. Kim, **H. Xin**, and J. B. Hacker, "A 2-GHz Electromagnetic Reflector Antenna", *Electronics Letters*, 39(15), July 2003
- **H. Xin**, J.A. Higgins, J.B. Hacker, M. Kim and M. Rosker, "Electromagnetic Crystal (EMXT) Waveguide Band-Stop Filter", *IEEE Microwave and Guided Wave Letters*, March, 2003
- J. A. Higgins, **H. Xin**, A. Sailer and M. Rosker, "Ka-Band Waveguide Phase Shifter Using Tunable Electromagnetic Crystal Sidewalls", *IEEE Trans. on Microwave Theory and Techniques*, April, 2003
- M. Kim, J. B. Hacker, **H. Xin**, and J. A. Higgins, "A Waveguide Shutter Using Electromagnetic Crystals", *Microwave and Optical Technology Letters*, 34 (3), August, 2002
- **H. Xin**, M. Kim, J. B. Hacker, J. A. Higgins, and M. J. Rosker, "Mutual Coupling of Monopole Antennas on High Impedance Ground Plane", *Electronics Letters*, 38 (16), August, 2002
- **H. Xin**, D. E. Oates, G. F. Dresselhaus and M. S. Dresselhaus, "Microwave Intermodulation Distortion in Bicrystal YBCO Grain Boundary Junctions", *Phys. Rev. B*, 65, 214533, 2002
- **H. Xin**, D. E. Oates, G. F. Dresselhaus and M. S. Dresselhaus, "Microwave-frequency Vortex Dynamics in YBCO Grain Boundaries", *Journal of Superconductivity*, 14 (5), October, 2001
- D. E. Oates, **H. Xin**, G. F. Dresselhaus and M. S. Dresselhaus, "Intermodulation Distortion and Josephson Vortices in YBCO Bicrystal Grain Boundaries", *IEEE Trans. On Applied Superconductivity*, March, 2001
- **H. Xin**, D. E. Oates, S. Sridhar, G. F. Dresselhaus, M. S. Dresselhaus, "Observation of Individual Josephson Vortices in YBCO bi-Crystal Grain Boundary Junctions", *Phys. Rev. B*, 61, R14952, 2000
- **H. Xin**, D. E. Oates, A. C. Anderson, R. L. Slattery, G. F. Dresselhaus and M. S. Dresselhaus, "Comparison of Power Dependence of Microwave Surface Resistance of Unpatterned and Patterned YBCO Thin Film", *IEEE Trans. on Microwave Theory and Techniques*, July, 2000
- J. S. Herd, D. E. Oates, **H. Xin** and S. J. Berkowitz, "Coupled-Grain/RJSJ Series Array for Modeling of Nonlinear Microwave Surface Impedance of YBCO Thin Films", *IEEE Trans. on Applied Superconductivity*, June, 1999
- Z. Bar-Yam et al, "A Scintillation Detector of Unique Geometry", *Nucl. Instrum. Meth.* A357:95-102, 1995.

Conference Papers / Presentations:

- **H. Xin**, and T. C. Chen, "A W-Band Quasi-TEM Waveguide Using Electromagnetic Crystal Surfaces," *IEEE Intl Microwave Symp.*, June, 2006

- **H. Xin**, “Millimeter Wave Components Utilizing Electromagnetic Crystal Surfaces,” **accepted**, *IEEE Intl Workshop on Antenna Technology (IWAT)*, March, 2006
- **H. Xin**, J. Leonard, C. Bailey, and Qing Jiang, “Carbon Nanotube with Magnetic Particle Fillings as Nano-Electromechanical Systems (NEMS),” *Government Microcircuit Applications and Critical Technology Conference (GOMAC)*, 28-3, March, 2006
- **H. Xin**, and J. A. Higgins, “Tunable Millimeter Wave Band-Pass Filter Using Electromagnetic Crystal Sidewalls”, *IEEE MTT Symp.*, June 2004
- (Invited) **H. Xin**, “Incident Angle Dependence of Electromagnetic Crystal Surface Impedance”, *IEEE URSI Symp.*, June 2004
- H. Kazemi, L. Tran, **H. Xin**, D. Deakin, J. Ausen, and J. Hacker, “Novel Via Planarization Scheme for High Resolution Backside Wafer Processing”, *GaAs MANTECH Conference*, 2004
- H. Kazemi, J. B. Hacker, **H. Xin**, M. Grace, W. Norvell, K. Higgins, and M. Gilbert, “An Ultra-Low Power integrated T/R Module for Space-Based Radar Technology”, *IEEE Radar Conference*, April 2004
- J. B. West, **H. Xin**, J. P. Doane, W. Elsallal and J. C. Mather, “A Dual-Beam, Dual-Band Millimeter Wave ESA Utilizing Dual Analog EBG Waveguide Phase Shifters”, *Allerton Antenna Applications Symposium*, Sept. 2003.
- M. Rosker, J. Hacker, **H. Xin**, H. Kazemi, D. Pilz, J. A. Higgins, “Millimeter Wave Beam Circuits”, *GOMAC*, 2003
- (Invited) **H. Xin**, H. Kazemi, A. Lee, J. Higgins, and M. Rosker, “Low-Loss Monolithic Electromagnetic Crystal Surfaces with Planar GaAs Schottky Diodes”, *IEEE AP-S Symposium*, June, 2003.
- (Invited) **H. Xin**, J.A. Higgins, and M. Kim, “Tunable Millimeter-Wave Electromagnetic Crystal (EMXT) Waveguide Band-Stop Filter”, invited paper, *IEEE AP-S Symposium*, June, 2003.
- J. B. West, **H. Xin**, J. C. Mather, J. P. Doane, H. Kazemi and J. A. Higgins, “A Two-Dimensional Millimeter Wave Phase Scanned Lens Utilizing Analog Photonic Band Gap Phase Shifters”, *Proceeding of Allerton Antenna Applications Symposium*, Sept. 2002.
- (Invited) **H. Xin**, J.A. Higgins, J.B. Hacker and M. Kim, “Some Applications of Rectangular Waveguide with Electromagnetic Crystal (EMXT) Sidewalls”, *IEEE URSI Symp.*, June 2002
- J. A. Higgins, **H. Xin** and A. Sailer, “Characteristic of Ka Band Waveguide Using Tunable Electromagnetic Crystal Sidewalls”, *MTT-Symposium Digest*, June, 2002
- **H. Xin**, D. E. Oates, G. F. Dresselhaus, and M. S. Dresselhaus, “Microwave Intermodulation Distortion in Bi-Crystal YBCO Grain Boundary Junctions”, *Material Research Society Symp.*, December, 2000
- **H. Xin**, D. E. Oates, G. F. Dresselhaus, and M. S. Dresselhaus, “Mesoscopic Josephson Vortices in YBCO bi-Crystal Grain Boundary Junctions”, *Material Research Society Symp.*, December, 1999
- **H. Xin**, D. E. Oates, A. Anderson, R. Slattery, G. F. Dresselhaus, and M. S. Dresselhaus, “Comparison of Power Dependence of Microwave Surface Resistance of Unpatterned and Patterned YBCO Thin Film”, *Material Research Society Symp.*, December, 1998
- C. Hagman et al, "A Large-Scale Search for Dark-Matter Axions", (In *Chicago 1996, Relativistic astrophysics and cosmology* 315-317)
- C. Hagman et al, "First Results from a Second Generation Galactic Axion Experiment", *Nucl. Phys. Proc. Suppl.*51B:209-212,1996

PATENTS

Total of 12 patents filed from 2001 to 2006:

- Six patents issued in the area of random power harvesting based on ferro-fluidic nano-particles. Five patents pending in the area of electromagnetic band-gap materials and their applications in antennas, microwave circuits, and THz sources.
- One patent in the area of nanotube based devices
- Several internal disclosures pending.