

CURRICULUM VITAE - HAO XIN

□ Chronology of Education

- **Massachusetts Institute of Technology:** Ph.D. in Physics **February 2001**

Thesis Advisors: 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, **June 1995**

□ Chronology of Employment

- **Aug. 2005 – Present:** Assistant Professor in Electrical and Computer Engineering Department, the University of Arizona.
- **Jan. 2006 – Present:** Assistant Professor (joint appointment) in Physics Department, the University of Arizona.
- **Nov. 2003 – Aug. 2005:** Sr. Multi-Disciplined Principal Engineer, Raytheon Missile Systems, Tucson, Arizona.
- **Aug. 2004 – Aug. 2005:** Adjunct Assistant Professor in Electrical and Computer Engineering Department, the University of Arizona.
- **Nov. 2000 – Nov. 2003:** Member of Technical Staff at Rockwell Scientific Company.
- **Sept. 1995 – Nov. 2000:** Research Assistant and Teaching Assistant, Department of Physics, Department of Electrical Engineering and Computer Science and Lincoln Laboratory, Massachusetts Institute of Technology.
- **Jan. 1993 – May 1995:** Research Assistant, Department of Physics, University of Massachusetts, Dartmouth.

□ Honors and Awards

- IEEE Senior Member since Nov. 2006
- American Society for Engineering Education (ASEE) Member since Oct. 2007
- American Physical Society (APS) Member
- Travel Award for NATO Advanced Institute of Study on Microwave Superconductivity (1999)
- Winner of Society of Physics Students (SPS) Scholarship (1 out of 14 nationwide, 1995)

- Undergraduate research award, Physics Dept., UMASS Dartmouth (1995)
- Highest Scholastic Achievement Award in Arts and Science College, UMASS Dartmouth (1995)
- Member of Sigma Pi Sigma, the National Physics Honor Society
- Scholastic Achievement Award in Physics, Louis Simeone Certificate of Merit, Achievement of Highest Honor in Physics, Achievement of Highest Honor in Mathematics (1992 – 1994)

Service/Outreach (for last 5 years, or period in current rank)

Local/state outreach

- Volunteer faculty demonstrator for the Physics Phun Nite events (received the Wild Cat Family Appreciation Certificate), 2006 and 2007
- Participated and presentation in local IEEE chapter meetings and events, 2006 – present
- Provided scientific and technical guidance to the general public: i.e., email exchanges and meeting with people interested in nanotechnology related topics
- Hosted lab tour for visiting alumni
- Hosted visits and collaborated with local high tech companies (including Sigma Technologies Intl' Inc. etc.)
- Participated in local meetings organized by Arizona Nanotechnology Cluster

National/international outreach

- Technical Paper Reviewer for
 - IEEE Transactions on Microwave Theory and Techniques
 - IEEE Transactions on Antennas and Propagation
 - IEEE Microwave and Wireless Components Letters
 - IEEE Antennas and Wireless Propagation Letters
 - ASME (American Society of Mechanical Engineers) Journal of Heat Transfer
 - OSA (Optical Society of America) Applied Optics
 - IEEE Antennas and Propagation Society (AP-S) International Symposium 2007
 - IEEE Antennas and Propagation Society (AP-S) International Symposium 2008
 - IEEE Radio and Wireless Symposium 2008
- Proposal Reviewer for
 - Army Research Office, 2006
 - Department of States, 2006
- Committees for Technical Organizations
 - Rockwell Scientific Company Nanotechnology Panel Member, 2003
 - Rockwell Scientific Company Communication Technology Panel Member, 2003
- Committees for Conferences / Symposia
 - Technical Program Committee Member, IEEE Radio and Wireless Symposium 2009

- Organizing Committee Member, Sponsorship / Exhibition Chair, IEEE International Workshop on Antenna Technology (iWAT) 2009
 - Technical Program Committee Member, IEEE Radio and Wireless Symposium 2008
 - Special and focus Sessions Organizer, “Millimeter-Wave Antenna Technologies and Applications”, IEEE AP-S International Symposium 2007
 - Session Chair, IEEE AP-S International Symposium 2007
 - Session Chair, Raytheon RF Symposium, 2005
- Taught an advanced training class for practicing engineers at the Radar and RF Center of Raytheon Missile Systems, “Microwave Power Amplifier Design”, Oct. 2006 – Dec. 2006
- Faculty Mentor of NSF REU (Research Experiences for Undergraduates) Program at the University of Arizona, 2005, 2006, 2007
- Industrial Mentor for NSF Connection One Center, 2004, 2005
- Engineering Consultant for Raytheon Missile Systems (2006 to present)
- Engineering Consultant for NextGen Aeronautics (2006 to present)
- Extensive graduate student applicant recruitment effort for the ECE department including numerous email correspondences, telephone calls, presentations and hosts of visiting perspective candidates for more than 50 domestic and international students
- Initiation and exhibition of the UofA ECE Dept. education and research programs at one the largest IEEE conferences (IEEE Intl’ Microwave Symposium 2008, more than 10,000 attendees)
- Invited a number of external speakers and arranged campus wide seminars including IEEE distinguished lecturer
- Departmental committee(s)
 - Comprehensive PhD Exam Committee (2006 - 2007)
 - Graduate Recruiting and Awards Committee (Fall 2006 to Present)
 - Equipment and Computing Committee (Fall 2006 to Present)
 - Ad Hoc Graduate Student Recruiting Committee (volunteer based: Spring 2008 to Present)
 - Student Examination Committees (non-advisor)
 - Master Thesis Defense: 7
 - PhD Dissertation: 4
 - External PhD Dissertation: 1 (Korea University)
 - PhD Preliminary: 4
 - PhD Qualifying: 5

College committee(s)

- Graduate Studies Committee, College of Engineering (Fall 2006 to Present)

University committee(s)

- University Academic Personnel Policy Committee (Fall 2007 to Present)

Other committees (internal or external)

- Volunteered for Teaching Assistant Award Evaluation, College of Engineering, 2007

Publications/Creative Activity (Published or Accepted)

Refereed journal articles, published or accepted in final form

[25] H. Xin, Z. Wu, A. Young, and R. Ziolkowski, "THz Thermal Radiation Enhancement Using an Electromagnetic Crystal", accepted, IEEE Trans. on Antennas and Propagation, June, 2008.

[24] R. Zhou, H. Zhang, and H. Xin, "Experimental Demonstration of Narrow Beam Monopole Antenna Embedded in Low Effective Index of Refraction ($n < 1$) Metallic Wire Media," accepted, Microwave and Optical Technology Letters, April, 2008.

[23] Z. Wu, L. Wang, A. Young, S. Seraphin, and H. Xin, "Terahertz Characterization of Multi-Walled Carbon Nanotube (MWNT) Films", J. App. Phys., Vol. 103, No. 9, May, 2008. *(This article was also published in the June 2, 2008 issue of the Virtual Journal of Nanoscale Science & Technology (www.vjnano.org))*

[22] H. Xin, T-C Chen, and H. Kazemi, "W-Band Low-Loss Quasi-TEM Waveguide Using Electromagnetic Crystal Surfaces", IEEE Trans. on Antennas and Propagation, Vol. 56, No. 6, pp. 1661-1668, June, 2008.

[21] H. Zhang, Y. Peng, and H. Xin, "A Tapped Stepped-Impedance Balun with Dual-Band Operations", IEEE Antennas and Wireless Propagation Letters, Vol. 7, pp. 119-122, January, 2008.

[20] L. Wang, R. Zhou, and H. Xin, "Microwave frequency Characterization of Multi-Walled Carbon Nanotube (MWNT) Paper", IEEE Trans. Microwave Theory and Tech., Vo. 56, No. 2, pp. 499-506, February, 2007.

[19] X. Wang, H. Xin, J. Leonard, G. Chen, and Q. Jiang, "The Oscillatory Characteristics of Carbon Nanotube with Magnetic Particle Fillings", Nano Technology, Vol. 18, pp. 1-7, October, 2007.

[18] X. Wang, H. Xin, J. Leonard, G. Chen, A. Chwang, and Q. Jiang, "The Oscillatory Characteristics of a 2C60/CNT Oscillator System", Journal of Nanoscience and

NanoTechnology, Vol. 7, No. 3, pp. 1512-1517, March, 2007.

[17] D. Kim, M. Kim, H. Xin, and J. Hacker, "A Microstrip Phase Shifter Design Using an Electromagnetic Bandgap Ground Plane", *IEICE Trans. on Communications*, pp. 2632-2635, June, 2005.

[16] 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*, Vol. 53, No. 1, pp. 151-159, January, 2005.

[15] 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*, Vol. 14, No. 9, pp. 437-439, September, 2004.

[14] 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*, Vol. 14, No. 9, pp. 404-406, September, 2004.

[13] T. Nishino, H. Xin, Y. Wang, and T. Itoh, "A Frequency-Controlled Active Phased Array", *IEEE Microwave and Guided Wave Letters*, Vol. 14, No. 3, pp. 115-117, March, 2004.

[12] D. Kim, M. Kim, H. Xin, and J. B. Hacker, "A 2-GHz Electromagnetic Reflector Antenna", *Electronics Letters*, Vol. 39, No. 15, pp. 1096-1098, July 2003.

[11] 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*, Vol. 13, No. 3, pp. 108-110, March, 2003.

[10] 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*, Vol. 51, No. 4, pp. 1281-1288, April, 2003.

[9] M. Kim, J. B. Hacker, H. Xin, and J. A. Higgins, "A Waveguide Shutter Using Electromagnetic Crystals", *Microwave and Optical Technology Letters*, Vol. 34, No. 3, pp. 186-187, August, 2002.

[8] 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*, Vol. 38, No. 16, August, 2002.

*[7] 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, 214533-7, 2002.

*[6] H. Xin, D. E. Oates, G. F. Dresselhaus and M. S. Dresselhaus, "Microwave-frequency

Vortex Dynamics in YBCO Grain Boundaries”, Journal of Superconductivity, Vo. 14, No. 5, pp. 637-649, October, 2001.

*[5] 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, Vol. 11, No. 1, pp. 2804-2807, March, 2001.

*[4] 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, No. 22, R14952-R14955, 2000.

*[3] 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, Vol. 48, No. 7, pp. 1221-1226, July, 2000.

*[2] J. S. Herd, D. E. Oates, H. Xin and S. J. Berkowitz, “Coupled-Grain/RSJ Series Array for Modeling of Nonlinear Microwave Surface Impedance of YBCO Thin Films”, IEEE Trans. on Applied Superconductivity, Vo. 9, No. 2, pp. 2117-2120, June, 1999

**[1] Z. Bar-Yam et al, "A Scintillation Detector of Unique Geometry", Nucl. Instrum. Meth. Vol. A357, pp. 95-102, 1995.

Electronic publication; peer-reviewed: yes no

Work in Progress

Refereed journal articles, under review

[26] H. Zhang, and H. Xin, “A Dual-Band Dipole Antenna with Integrated-Balun”, submitted to IEEE Trans. on Antennas and Propagation, May, 2008.

[27] R. Zhou, D. Liu, and H. Xin, “A Wideband Packaged Circularly Polarized Patch Antenna for 60 GHz Wireless Communications”, submitted to IEEE Trans. on Antennas and Propagation, Jan. 2008.

[28] R. Zhou, H. Zhang, and H. Xin, “Metallic Wire Array as Low-Effective Index of Refraction Medium for Directive Antenna Application”, submitted to IEEE Trans. on Antennas and Propagation, April, 2008.

[29] Z. Wu, J. Kinast, M. Gehm, and H. Xin, “Rapid and Inexpensive Fabrication of Terahertz Electromagnetic Band Gap Structures,” submitted to Optics Express, June, 2008.

Refereed journal articles, under preparation

[30] H. Xin, T. Chen, H. Zhang, and Wayne Tiffin, “A W-Band Waveguide Band Stop Filter”, to be submitted to IEEE Microwave and Wireless Comp. Letts., June, 2008.

[31] A. Young, Z. Wu, and H. Xin, "Characterization Methods of THz Metamaterial Structures," in preparation, June, 2008.

[32] H. Zhang, H. Xin, and R. W. Ziolkowski, "Metamaterial-inspired Compact CPW-Fed Antenna for 44 GHz Applications," in preparation, June, 2008.

□ **Scholarly Presentations**

□ Invited Colloquia

- University of California, Riverside, Dept. of Mechanical Engineering, April 13th 2007

□ Invited Seminars / Talks

- Asylum Research, Santa Barbara CA, June 2nd 2008
- Ohio University, Electrical Engineering and Computer Science Department Seminar, May 13th 2008
- University of Arizona, Physics Department, Low Energy Physics Seminar, Sept. 27th 2007
- Raytheon Company Heterogeneous 3-D Integration Workshop, June 18th 2007
- Raytheon Company RF Symposium Guest Speaker, June 20th 2007
- Nextgen Aeronautics Inc., Torrance CA, Jan. 10th 2007
- Tsinghua University, Dept. of Electrical Engineering, Dec. 21st 2005
- Motorola Lab, Millimeter Wave Group, Tempe AZ, Sept. 12th 2005
- University of Arizona, ECE Dept., Feb. 1st 2005

□ Invited Conference Presentations

- "Measurements of Metamaterial Inspired, Electrically Small Antenna Systems" R. W. Ziolkowski, H. Xin, and C. Holloway, IEEE Antennas and Propagation Society / Union Radio-Scientifique Internationale (URSI) Symp., July 2008.
- "Radiation Characteristics of Monopole Antenna Embedded in Low Effective Index of Refraction ($n < 1$) Wire Media," R. Zhou, H. Zhang, and H. Xin, URSI Symp., Jan. 2008.
- "Metamaterial-based Compact CPW-Fed Antenna for 44 GHz Applications," H. Zhang, H. Xin, and R. W. Ziolkowski, URSI Symp., Jan. 2008.

- “Electromagnetic Bandgap Waveguide (EBG) Phase Shifter for Low Cost Electronically Scanned Antennas (ESA)”, H. Kazemi, J. A. Higgins, B. Herting, H. Xin, J. West, and J. Hacker, IEEE AP-S Symp., June 2007.
- “Incident Angle Dependence of Electromagnetic Crystal Surface Impedance”, H. Xin, IEEE AP-S / URSI Symp., June 2004.
- “Low-Loss Monolithic Electromagnetic Crystal Surfaces with Planar GaAs Schottky Diodes”, H. Xin, H. Kazemi, A. Lee, J. Higgins, and M. Rosker, IEEE AP-S Symposium, June, 2003.
- “Tunable Millimeter-Wave Electromagnetic Crystal (EMXT) Waveguide Band-Stop Filter”, H. Xin, J.A. Higgins, and M. Kim, IEEE AP-S Symposium, June, 2003.
- “Some Applications of Rectangular Waveguide with Electromagnetic Crystal (EMXT) Sidewalls”, H. Xin, J.A. Higgins, J.B. Hacker and M. Kim, IEEE AP-S / URSI Symp., June 2002.

□ Symposia and Conferences (Referred Publications)

[37] Z. Wu, L. Wang, and H. Xin, “High Frequency Characterization of Carbon Nanotube Films,” Accepted, 33rd International Conference on Infrared, Millimeter, and THz Waves, Sept. 2008.

[36] H. Xin, Z. Wu, and R. W. Ziolkowski, “Investigation of THz Thermal Emission from Electromagnetic Crystals,” Accepted, 33rd International Conference on Infrared, Millimeter, and THz Waves, Sept. 2008.

[35] A. Chaves, B. Mayoral, H.-J. Park, M. Tsang, S. Tunell, M. W. Marcellin, and H. Xin, “Wireless Sensor Networks: A Grocery Store Application,” Accepted, International Telemetry Conference (ITC), March, 2008.

[34] B. Duong, Y. Peng, M. Ellis, S. Seraphin, and H. Xin, “Simultaneous Raman Spectroscopy and SEM Analysis of Carbon Nanotubes,” Arizona Imaging and Microanalysis Society Meeting, April 2008.

[33] H. Zhang, and H. Xin, “Designs of Dual-Band Wilkinson Power Dividers with Flexible Frequency Ratios,” Accepted, IEEE Intl Microwave Symp., June 2008.

[32] H. Xin, and Jun Ding, “An Improved Two-Antenna Direction of Arrival (DOA) Technique Inspired by Human Ears,” accepted, IEEE AP-S Intl Symp., July 2008.

[31] L. Wang, Z. Wu, and H. Xin, “THz Characterization of Multi-Walled Carbon Nanotube Paper,” accepted, IEEE AP-S Intl Symp., July 2008.

[30] H. Zhang, H. Xin, and R. Ziolkowski, “Design of Novel Printed Elliptical Monopole Antenna for UWB Applications,” accepted, IEEE AP-S Intl Symp., July 2008.

- [29] (Invited) R. W. Ziolkowski, H. Xin, and C. Holloway, "Measurements of Metamaterial Inspired, Electrically Small Antenna Systems", IEEE AP-S / URSI Symp., July 2008.
- [28] (Invited) R. Zhou, H. Zhang, and H. Xin, "Radiation Characteristics of Monopole Antenna Embedded in Low Effective Index of Refraction ($n < 1$) Wire Media," URSI Symp., Jan. 2008.
- [27] (Invited) H. Zhang, H. Xin, and R. W. Ziolkowski, "Metamaterial-based Compact CPW-Fed Antenna for 44 GHz Applications," URSI Symp., Jan. 2008.
- [26] H. Zhang, Y. Peng, and H. Xin, "Design of Dual-Band Balun with Tapped Stubs", IEEE Radio and Wireless Symp., pp. 859-862, Jan. 2008.
- [25] H. Xin, L. Wang, and D. Carnahan, "Characterization of Multi-Walled Carbon Nanotube (MWNT) Papers Using X-Band Waveguides", in IEEE Intl Microwave Symp. Dig., pp. 1181-1184, June 2007.
- [24] H. Xin, and R. Zhou, "Low-Effective Index of Refraction Medium Using Metallic Wire Array", in IEEE AP-S Intl Symp. Dig., pp. 2530-2533, June 2007
- [23] H. Xin, E. Wu, A. Young, and R. Ziolkowski, "THz Thermal Radiation Enhancement Using Electromagnetic Crystals", in IEEE AP-S Intl Symp. Dig., pp. 2249-2252, June 2007
- [22] (Invited) H. Kazemi, J. Higgins, B. Herting, H. Xin, J. West, and J. Hacker, "Electromagnetic Bandgap Waveguide (EBG) Phase Shifters to Low-Cost Electronically Scanned Antennas (ESA)", in IEEE AP-S Intl Symp. Dig., pp. 4357-4360, June 2007
- [21] H. Xin, E. Wu, and A. Young, "THz Thermal Radiation Enhancement Using Electromagnetic Crystals", accepted, Government Microcircuit Applications and Critical Technology Conference (GOMAC), March, 2007
- [20] H. Xin, and T. C. Chen, "A W-Band Quasi-TEM Waveguide Using Electromagnetic Crystal Surfaces," IEEE Intl Microwave Symp., pp. 606-609, June, 2006
- [19] H. Xin, "Millimeter Wave Components Utilizing Electromagnetic Crystal Surfaces," IEEE Intl Workshop on Antenna Technology (IWAT) – Small Antennas and Novel Metamaterials, pp. 424-427, March, 2006
- [18] 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
- [17] H. Xin, "Two-Dimensional Millimeter Wave Phase Scanned Lens Using Analog Electromagnetic Crystal (EMXT) Waveguide Phase Shifters", Raytheon RF Symp., May 2004
- [16] J. A. Higgins, and H. Xin, "Tunable Millimeter Wave Band-Pass Filter Using Electromagnetic Crystal Sidewalls", IEEE Intl Microwave Symp., vol. 3, pp. 1295-1298, June

2004

[15] (Invited) H. Xin, "Incident Angle Dependence of Electromagnetic Crystal Surface Impedance", IEEE URSI Symp., June 2004

[14] 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

[13] 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, pp. 6-8, April 2004

[12] 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.

[11] M. Rosker, J. Hacker, H. Xin, H. Kazemi, D. Pilz, J. A. Higgins, "Millimeter Wave Beam Circuits", Government Microcircuit Applications and Critical Technology Conference (GOMAC), March, 2003

[10] (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, vol. 2, pp. 435-438, June, 2003.

[9] (Invited) H. Xin, J.A. Higgins, and M. Kim, "Tunable Millimeter-Wave Electromagnetic Crystal (EMXT) Waveguide Band-Stop Filter", IEEE AP-S Symposium, vol. 2, pp. 1107-1110, June, 2003.

[8] 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", Allerton Antenna Applications Symposium, Sept. 2002.

[7] (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.

[6] J. A. Higgins, H. Xin and A. Sailer, "Characteristic of Ka Band Waveguide Using Tunable Electromagnetic Crystal Sidewalls", IEEE Intl Microwave Symp., vol. 2, pp. 1071-1074, June, 2002.

*[5] 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.

*[4] 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.

*[3] 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.

*[2] C. Hagman et al, "A Large-Scale Search for Dark-Matter Axions", (In *Chicago 1996, Relativistic astrophysics and cosmology* 315-317)

*[1] C. Hagman et al, "First Results from a Second Generation Galactic Axion Experiment", Nucl. Phys. Proc. Suppl. 51B:209-212, 1996

- **United States Patents (12 issued and 1 pending:** Several patents have led to the creation of a startup company in El Segundo, CA; while several others are being developed into communication and sensing products at Rockwell Collins and Teledyne Scientific Company)

[13] J. Cheung, and H. Xin, "Magnetic transducer with ferrofluid end bearings", US Patent No. 7,288,860, October 30th, 2007

[12] R. Rosenwald, N. Shah, D. Barker, W. Owens, and H. Xin, "Dynamic Control of Planck Radiation in Photonic Crystals", US Patent No. 7,257,333, August 14th, 2007

[11] J. Higgins, and H. Xin, "Waveguide Band-Stop Filter", US Patent No. 7,250,835, July 31st, 2007

[10] M. Tanaka, K. Matsugatani, and H. Xin, "Multiple-Frequency Common Antenna", US Patent No. 7,145,518, Dec. 5th, 2006 (also issued in Japan)

[9] D. Barker, W. Owens, R. Rosenwald, N. Shah, and H. Xin, "Thermally Powered Tera-Hertz Radiation Source Using Photonic Crystals", US Patent No. 7,078,697, July 18th, 2006

[8] J. Higgins, and H. Xin, "Tunable Waveguide Filter", US Patent No. 7,068,129, June 27th, 2006

[7] (Pending) H. Xin, J. Leonard, Q. Jiang, J. Garay, and C. Ozkan, "Particle Encapsulated Nanoswitch", filed February 14th, 2006, No. PD-05W041

[6] J. Cheung, and H. Xin, "Multiple Magnet System with Different Magnet Properties", US Patent No. 6,861,772, March 1st, 2005 (also in several other countries including China and Mexico)

[5] J. Cheung, and H. Xin, "Multiple Magnet Transducer with Differential Magnetic Strengths", US Patent No. 6,812,598, November 2nd, 2004 (also in several other countries including China and Mexico)

[4] J. Cheung, and H. Xin, "Electrical Generator with Ferrofluid Bearings", US Patent No. 6,812,583, November 2nd, 2004 (also in several other countries including China and Mexico)

[3] J. Cheung, and H. Xin, “Electrical Generator with Ferrofluid Bearings”, US Patent No. 6,809,427, October 26th, 2004 (also in several other countries including China and Mexico)

[2] J. Cheung, and H. Xin, “Electrical Power Generation by Coupled Magnets”, US Patent No. 6,798,090, September 28th, 2004 (also in several other countries including China and Mexico)

[1] J. Cheung, and H. Xin, “Multiple Magnet Transducers”, US Patent No. 6,768,230, July 27th, 2004 (also in several other countries including China and Mexico)