

Curriculum Vitae

PERSONAL INFORMATION

Name Dr. M. Jaleel Akhtar
Designation Assistant Professor
Office Address 326 ACES, Department of Electrical Engineering
Indian Institute of Technology, Kanpur - 208016
INDIA

Contact details:

Tel: +91-512-259 6523 (Work)
Fax: +91-512-259 0063
Email: mjakhtar[AT]iitk.ac.in

Area of Interest

- Microwave material processing
- Microwave imaging and nondestructive testing
- Electromagnetic characterization of dielectric and composite materials
- Electromagnetic scattering: direct and inverse problems
- Computational electromagnetics

EDUCATIONAL BACKGROUND

- 2003** **Ph.D. (Dr.-Ing.),** *Magna cum Laude, Electrical Engineering*
Otto-von-Guericke University of Magdeburg, Magdeburg, Germany
Specialization: Electromagnetics and Microwave Engineering,
- 1993** **Master of Engineering,** *Electronics and Communication Engineering*
Birla Institute of Technology, Ranchi
Specialization: Microwave Engineering
- 1990** **B.Sc. Engineering,** *Electronics Engineering*
Aligarh Muslim University, Aligarh

EMPLOYMENT HISTORY

August 2003 **Karlsruhe Research Center (FZK), Karlsruhe, Germany**
- March 2009 **Institute for Pulsed Power and Microwave Technology (IHM)**

Position: **Postdoctoral Scientist / Project Leader**

Field of Work: Microwave material processing; Electromagnetic characterization of dielectrics and advanced composites in the microwave frequency band; Analytical and numerical simulation of multi-layered waveguide structures; Development of microwave industrial systems for curing of advanced composites; Liaising with various industrial partners and research institutions in the framework of a number of research and development projects.

Nov. 1999 - Otto-von-Guericke University of Magdeburg, Magdeburg, Germany
Nov. 2002 Chair of Microwave and Communication Engineering
Research Assistant on a DFG sponsored project

Field of Work: Development of a generalized integral transform technique for the one-dimensional microwave imaging of dielectric objects; Establishment of an experimental setup for facilitating the reconstruction of permittivity profiles of multi-layered dielectric structures.

Aug. 1993– Central Electronics Engineering Research Institute, Pilani, India
Dec. 1997 Microwave Tube Division
Scientist (August 1994- December 1997)
Research Associate (August 1993- July 1994)

Field of Work: Analysis, design and development of the electron gun, the multi-stage depressed collector and the RF cavity structure for high power traveling waves tubes; Development of software and post-processor packages for the simulation and design of various assembly parts of microwave tubes.

MAJOR ACHIEVMENTS & PROJECTS UNDERTAKEN

- **Microwave curing of ceramic kitchen sinks (FZK, Germany, 2008-2009), Project Leader:** The aim of this industrial project has been to replace the conventional heating methods, presently being employed by the industry to cure these sinks, with microwaves. The microwave heating makes the curing process quite fast, and hence the energy requirements are substantially reduced. The reduction of processing time and energy requirements would ultimately make these sinks cheaper, and their market share would increase. This development project of curing modern ceramic sinks using microwaves was taken in collaboration with an industrial partner, which is the leading manufacturer of kitchen appliances.
- **Establishment of a test facility for the electromagnetic characterization of dielectric and composite materials in the microwave frequency band (FZK, Germany, 2003-2007), Postdoctoral Research Scientist:** I was responsible for establishing a rectangular waveguide based test facility for the electromagnetic characterization of dielectric and composite materials in the microwave frequency band (2.45 GHz) at this institute. In this framework, some noble algorithms were developed, which were then successfully employed to measure the electromagnetic properties of a number of dielectrics and advanced composites for the first time.
- **Development of innovative industrial microwave systems for the curing of advanced composite materials (FZK, Germany, 2007-2009), Postdoctoral Research Scientist:** The main goal of this major project involving a number of academic and industrial partners, has been to facilitate the curing of advanced composites using microwaves in order to reduce the energy requirements which are otherwise quite tremendous when conventional autoclaves are employed. My role in this project has been to study the feasibility of different materials which can effectively be cured under microwave systems, and to advise different industrial partners on issues related to the microwave-material interactions. I was also responsible for carrying out dielectric measurements of different test samples supplied by various research institutions and industrial partners, and accordingly liaise with them in order to modify the properties of these materials to make them suitable and more efficient for microwave heating purposes.
- **Reconstruction of one-dimensional permittivity profiles of non-planar objects with controllable resolution (University of Magdeburg, Germany, 2000-2002), Research Assistant:** It was a three-year project sponsored by the German Research

Council (DFG), where the main goal was to develop a generalized technique for the reconstruction of depth-dependent permittivity profile of arbitrary shaped dielectric objects in terms of the spectral domain reflection coefficient data. The developed method helped in obtaining closed form expressions for the permittivity profiles of cylindrical and spherical shaped objects, which was till now only limited to the simple planar objects in the Cartesian coordinate system. I was also primarily responsible for the successful completion of this project in the given time frame.

- **Design and development of high power traveling wave tubes (CEERI, Pilani, 1993-1997), Scientist / Research Associate:** My main duties here involved the design and development of the electron gun and the multi-stage depressed collector for high power traveling wave tubes. I was also quite actively involved in the analysis and design of the RF cavity structure for the coupled-cavity traveling wave tubes (TWTs) using the 3-D electromagnetic field simulator. The corresponding design was successfully employed in two major sponsored projects involving development of helix and coupled-cavity TWTs.

SHORT COURSES CONDUCTED AT VARIOUS FORUMS

- **Minicourse on microwave material processing applications:** This course was organized as part of the 35th IEEE International Conference on Plasma Science (<http://www.icops2008.org>) in Karlsruhe, Germany on June 19-20, 2008. I was invited to lecture at the Minicourse forum, which was widely attended, and where ten chosen experts from all around the world working on various aspects of the microwave material processing served as instructors. I enlightened the attendees with various dielectric measurement techniques relevant for the microwave material processing applications. My part of lecture also dealt with some advanced methods especially developed for characterizing highly conducting composites and various kinds of resins.
- **Short course on dielectric measurements:** I organized this short course on dielectric measurements along with Prof. Tran and Dr. Nelson at the International Microwave Power Institute's (<http://www.impi.org>) 41st Annual International Microwave Symposium held in Vancouver, Canada on August 1-3, 2007.

SUPERVISION OF MASTER'S THESIS

Xiaofeng Pan, "*Determination of the Effective Complex Relative Permittivity of Mixed Dielectrics and Composite Materials*," (in German), Technical University of Karlsruhe, Karlsruhe, Germany, January, 2008.

AWARDS & FELLOWSHIPS

- ❖ Got Scholarship from the Ministry of Human Resource Development, Govt. of India for pursuing Master's program in Engineering during 1991-1993.
- ❖ Granted Fellowship from the University of Magdeburg, Germany during 1998-2000 for pursuing Ph.D. at the University of Magdeburg, Germany.
- ❖ Received Student-Travel Grant from the European Microwave Association in the year 2000 for presenting a paper at the 30th *European Microwave Conference* in Paris.
- ❖ Listed in Marquis Who's Who in Science and Engineering, 2003 Edition.
- ❖ Listed in Marquis Who's Who in the world, 2009 Edition.

PROFESSIONAL MEMBERSHIP

- Senior Member, IEEE (The Institute of Electrical and Electronics Engineers, Inc., USA)
- Fellow, IETE (The Institution of Electronics and Telecommunication Engineers)
- Life Member, Indian Physics Association
- Life Member, Indo-French Technical Association

PROFESSIONAL ACTIVITIES

- Reviewer, IEEE Transactions on Microwave Theory and Techniques
- Reviewer, IEEE Transactions on Geoscience and Remote Sensing
- Reviewer, IEEE Geoscience and Remote Sensing Letters
- Reviewer, IOP Measurement Science and Technology
- Reviewer, Journal of Microwave Power and Electromagnetic Energy.

PROFESSIONAL DEVELOPMENT PROGRAM / MANAGEMENT TRAINING

- Basic Project Management Course, Karlsruhe Research Centre (FZK), Germany, September 2007.
- Project Proposal - FP7 Course, Karlsruhe Research Centre (FZK), Germany, May 2008.
- Team Management - Leadership and Team-Building Course, University of Karlsruhe, Germany, July 2008.

Publications

Book

1. **Jaleel Akhtar**, *Microwave Imaging: Reconstruction of One Dimensional Permittivity Profiles*, Vdm Verlag Dr. Mueller, Germany, May 2008, ISBN 3639014553.

Book Chapter(s)

1. **M. J. Akhtar**, L. Feher and M. Thumm, "A generalized approach for measuring the dielectric properties of lossy composite materials," in *Microwave and Radio Frequency Applications, Proceedings of the Fourth World Congress on Microwave and Radio Frequency Applications (selected papers)*, edited by R. L. Schulz, D.C. Folz, The Microwave Working Group Ltd., USA, January 2006, pp. 383-391, ISBN 0978622200.

Papers in refereed journals

1. **M. J. Akhtar**, L. E. Feher and M. Thumm, "Noninvasive procedure for measuring the complex permittivity of resins, catalysts and other liquids using a partially filled rectangular waveguide structure," *IEEE Transactions on Microwave Theory and Techniques*, vol. 57, No. 2, Feb. 2009, pp. 458-470.
2. **M. J. Akhtar**, L. E. Feher and M. Thumm, "A Unified nondestructive approach to evaluate dielectric properties of industrial resins and common liquids," *FREQUENZ - Journal of RF Engineering and Telecommunications*, Germany, vol. 62, No. 9-10, Dec. 2008, pp. 246-251.
3. **M. J. Akhtar**, L. E. Feher and M. Thumm, "Nondestructive approach for measuring temperature-dependent dielectric properties of epoxy resins," *The Journal of Microwave Power and Electromagnetic Energy (JMPEE)*, vol. 42, No. 3, 2008, pp. 17-26.
4. **M. J. Akhtar**, L. Feher and M. Thumm, "A Closed Form Solution for Reconstruction of Permittivity of Dielectric Slabs Placed at the Center of a Rectangular Waveguide," *IEEE Geoscience and Remote Sensing Letters*, vol. 4, No. 1, Jan 2007, pp. 122-126.
5. **M. J. Akhtar**, L. Feher and M. Thumm, "A waveguide based two-step approach for measuring complex permittivity tensor of uniaxial composite materials," *IEEE Transactions on Microwave Theory and Techniques*, vol. 54, No. 5, May 2006, pp. 2011-2022.
6. A. S. Omar and **M. J. Akhtar**, "A generalized technique for the reconstruction of permittivity profiles with a controllable resolution in an arbitrary coordinate system," *IEEE Transactions on Antennas and Propagation*, vol. 53, No. 1, January 2005, pp. 294-304.
7. **M. J. Akhtar** and A. S. Omar, "An analytical approach for the inverse scattering solution of radially inhomogeneous spherical bodies using higher order TE and TM illuminations," *IEEE Transactions on Geoscience and Remote Sensing*, vol. 42, No. 7, July 2004, pp.1450-1455.
8. **M. J. Akhtar** and A. S. Omar, "Reconstruction of permittivity profiles in cylindrical objects illuminated by higher order TE_{mn} and TM_{mn} modes," *IEEE Transactions on Microwave Theory and Techniques*, vol. 48, No.12, December 2000, pp. 2721-2729.
9. **M. J. Akhtar** and A. S. Omar, "Reconstructing permittivity profiles using integral transforms and improved renormalization techniques," *IEEE Transactions on Microwave Theory and Techniques*, vol. 48, No.8, August 2000, pp. 1385-1393.
10. **M. J. Akhtar** and V. Srivastava, "Analysis of a coupled-cavity slow wave structure for a high power TWT," *IETE Technical Review*, New Delhi, vol. 16, No. 2, March 1999, pp. 255-262.
11. V. Srivastava, T. K. Ghosh, **M. J. Akhtar** and S. N. Joshi, "Design of a high efficiency space TWT," *IETE Technical Review*, New Delhi, vol. 16, No. 2, March 1999, pp. 249-254.
12. **M. J. Akhtar**, M. Madheswaran, and P. Chakravarti, "Large signal model of an optically controlled GaAs IMPATT diode," *IETE Journal of Research*, New Delhi, vol. 43, No. 4, July 1997, pp. 319-325.

Papers presented at various International conferences (Conference Proceedings)

1. **M. J. Akhtar**, L. Feher and M. Thumm, "A novel approach for measurement of temperature dependent dielectric properties of polymer resins at 2.45 GHz," Proceedings Global Congress on Microwave Energy Applications GCMEA 2008, MAJIC 1st, Aug. 4-8 2008, Otsu, Japan, pp. 529-532.
2. L. Feher, V. Nuss, T. Seitz, **J. Akhtar** et al., "Microwave curing of aerospace and automotive composite structures at HEPHAISTOS experimental centre (HEC)," Proceedings Global Congress on Microwave Energy Applications GCMEA 2008, MAJIC 1st, Aug. 4-8 2008, Otsu, Japan, pp. 741-744.
3. V. Komarov, M. Thumm, L. Feher and **J. Akhtar**, "Heating patterns of microwave exposed liquid polymers," Proceedings Global Congress on Microwave Energy Applications GCMEA 2008, MAJIC 1st, Aug. 4-8 2008, Otsu, Japan, pp. 845-848.
4. **M. J. Akhtar**, L. Feher and M. Thumm, "Measurement of dielectric properties of liquid polymers with their temperature dependence at 2.45 GHz," IEEE International Conference on Plasma Science (ICOPS 2008), June 15-19, 2008, Karlsruhe (Germany), pp. 371.
5. **M. J. Akhtar**, L. Feher and M. Thumm, "Simple analytical approach for measurement of the complex permittivity of resins and viscous liquids," Proceedings 37th European Microwave Conference 2007, October 2007, Munich, Germany, pp. 206-209.
6. **M. J. Akhtar**, L. Feher and M. Thumm, "Nondestructive measurement of temperature-dependent dielectric parameters of epoxy resins at 2.45 GHz," Proceedings 11th International Conference on Microwave and High Frequency Heating, Oradea, Romania, September 3-6, 2007, pp. 351.
7. **M. J. Akhtar**, L. Feher and M. Thumm, "Electromagnetic measurement of temperature-dependent dielectric properties of aerospace grade epoxy resins and catalysts at 2.45 GHz," Proceedings 41st Annual International Microwave Symposium, International Microwave Power Institute (IMPI), Vancouver, BC, Canada, August 1-3, 2007, pp. 68-73.
8. **M. J. Akhtar**, L. Feher and M. Thumm, "Electromagnetic characterization of aerospace certified epoxy resins at 2.45 GHz," Proceedings 40th Annual Microwave Symposium, International Microwave Power Institute (IMPI), Boston, USA, August 9-11, 2006, pp. 11-14.
9. **M. J. Akhtar**, L. Feher and M. Thumm, "Measurement of dielectric constant and loss tangent of epoxy resins using a waveguide approach," Proceedings 2006 IEEE AP-S International Symposium, July 9-14, 2006, USA, pp. 3179-3182.
10. **M. J. Akhtar**, L. Feher and M. Thumm, "Measurement of complex permittivity tensor of uniaxial anisotropic composite materials using a waveguide method," Proceedings 10th International Conference on Microwave and High Frequency Heating, Modena, Italy, September 12-15, 2005, pp. 24-27.
11. **M. J. Akhtar**, L. Feher and M. Thumm, "Measurement of dielectric and conductive properties of avionic materials at 2.45 GHz using two-step approach," Proceedings 39th Annual Microwave Symposium, International Microwave Power Institute (IMPI), Seattle, USA, July 13-15, 2005, pp. 58-61.
12. **M. J. Akhtar**, L. Feher and M. Thumm, "A generalized approach for measuring the dielectric properties of lossy composite materials," Abstracts of the 4th World Congress on Microwave and RF Applications, Austin, USA, November 7-11, 2004, pp. 146-147.
13. **M. J. Akhtar**, L. Feher and M. Thumm, "A robust optimization algorithm for the reconstruction of dielectric properties of lossy composite materials," Conference Digest of the 2004 Joint 29th International Conference on Infrared and Millimeter Waves, Karlsruhe, Germany, Sep. 2004, pp. 387-388.
14. **M. J. Akhtar**, N.G. Spiliotis and A.S. Omar, "An experimental setup for the microwave imaging of inhomogeneous dielectric bodies," Proceedings 2004 IEEE AP-S International Symposium (USA), vol. 1, June 2004, pp. 225-228.

15. **M. J. Akhtar** and A.S. Omar, "An automated technique for the active imaging of dielectric layered media," *Proceedings 2003 IEEE AP-S International Symposium* (Ohio, USA), vol. 1, June 2003, pp. 527-530.
16. **M. J. Akhtar** and A.S. Omar, "An analytical method for the microwave imaging of cylindrically stratified media," *IMS Digest, 2002 IEEE MTT-S International Microwave Symposium* (USA), June 2002, pp. 2005-2008.
17. **M. J. Akhtar** and A.S. Omar, "Nondestructive imaging of dielectric objects using band-limited noisy scattering data," *Proceedings 31st European Microwave Conference* (London), vol.3, pp. September 2001, pp. 413-416.
18. **M. J. Akhtar** and A.S. Omar, "Estimation of inhomogeneous permittivity profiles of spherical objects from noisy scattering data," *Proceedings 2001 IEEE AP-S International Symposium*, vol. 2, 2001, pp. 670-673.
19. **M. Jaleel Akhtar**, "Microwave tomography of biological bodies," presented at the IEE European Younger Members Short Papers Competition organized by the IEE European Regional Board, Aachen, Germany October 28-29, 2000.
20. **M. J. Akhtar** and A.S. Omar, "Wide band microwave imaging of spherically shaped biological bodies," *Proceedings 30th European Microwave Conference* (Paris), vol. 3, Oct. 2000, pp. 185-189.
21. **M. J. Akhtar** and A.S. Omar, "Profile inversion of spherical objects illuminated by TE- and TM-polarized waves," *Proceedings. IEEE AP-S International Symposium* (USA), vol. 3, Jul. 2000, pp. 1764-1767.
22. **M. J. Akhtar** and A.S. Omar, "Microwave imaging of radially inhomogeneous cylindrical bodies," *Proceedings. 2000 IEEE AP-S International Symposium* (USA), vol. 1, Jul. 2000, pp. 304-307.
23. **M. J. Akhtar** and A.S. Omar, "Reconstruction of permittivity profiles in cylindrical objects illuminated by higher order modes," *Microwave Symposium Digest, 2000 IEEE MTT-S International Microwave Symposium* (USA), vol. 2, 2000, pp. 1085-1088.
24. A. S. Omar and **M. J. Akhtar**, "A Hankel transform reconstruction technique for radially dependent permittivity profiles in cylindrical objects," *European Microwave Conference Proceedings* (Munich), 1999.
25. **M. J. Akhtar** and A. S. Omar, "An improved renormalization technique for profile inversion," *Proceedings, 1999 IEEE AP-S International Symposium* (USA), vol. 3, 1999, pp. 2136-2139.
26. **M. J. Akhtar** and A. S. Omar, "Reconstructing permittivity profiles using an improved renormalization technique," *Proceedings, 1999 IEEE MTT-S International Microwave Symposium* (USA), vol. 4, 1999, pp. 1815-1818.
27. **M. J. Akhtar**, L. Kumar, A.K. Sharma et. al. "Computer Aided Design of gridded electron gun for a PPM focused traveling wave tube," *Asia Pacific Microwave Conference Proceedings*, (New Delhi, India), Dec. 1996, pp. 903-907.

Papers presented at various National conferences (Conference Proceedings)

1. **M. J. Akhtar**, L. Feher and M. Thumm, "Approximate closed form expressions for nondestructive evaluation of dielectric properties of epoxy resins and common liquids," Proceedings *German Microwave Conference (GeMic 2008)*, Hamburg, March 10-12, 2008, pp. 228-231.
2. **M. J. Akhtar**, L. Feher and M. Thumm, "A multi-layered waveguide technique for determining permittivity and conductivity of composite materials," Proceedings *German Microwave Conference (GeMic 2005)*, Ulm, April 5-7, 2005, pp. 37-40.
3. **M. J. Akhtar**, T. K. Ghosh, V. Srivastava, et. al. "Design of electron gun for a high efficiency space TWT," Proceedings of *National Symposium on Advances in Microwaves and Light waves*, (New Delhi, India), March 2-4, 1998, pp. 405-408.
4. R. S. Raju, A. K. Sharma, **M. J. Akhtar**, et. al. "Design and development of beam stick coupled-cavity TWT," Proceedings of *National Symposium on Advances in Microwaves and Light waves*, (New Delhi, India), March 2-4, 1998.