

Ananda Kumar

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Doctoral Work: The doctoral dissertation work was focused on analysis and optimization of MRI signal detectors using analytical methods and computational electromagnetic methods with experimental validations.

Education:

Doctor of Philosophy in Electrical Engineering Johns Hopkins University Baltimore, Maryland	May 2009
Master of Science in Bioengineering Specialty in Medical Imaging University of Toledo Ohio	December 1999
B.S.E in Biomedical Engineering (BME) Minor in Electrical Engineering (EE) Mercer University Georgia	March 1996
A.S. in Electronic Engineering Institute of Technological Studies, Colombo, Sri Lanka (Affiliate institution of University of Houston, Clearlake, Texas)	May 1992

Principal/ Tech. Director: **Resonant Research LLC**, specializes in custom designed high resolution, multi-nuclear, high field MRI coils and antennas, receivers and front end electronics for MRI research involving animals and humans.

Principal/ Consultant: **Lambda Z Technologies Inc.**, MRI safety of implantable devices, magnetic field induced hyperthermia cancer treatment coil, electromagnet design and safety analysis. EM modeling and simulation of RF safety using frequency and time domain methods including FEM, Method of Moments, and FDTD. Clientele include MR Interventions, Inc., Baltimore, MD
EM Software & Systems, Hampton, VA
Mount Sinai Hospital, NY
Johns Hopkins Univ., Radiation Oncology

Visiting Research Associate: Johns Hopkins University, Department of Radiology

Research Experience : **Research Associate** (Mar.'00- July'08): *Department of Radiology, Johns Hopkins University, Baltimore, MD.*
Research and development in RF circuits and antenna designs for MR imaging. In charge of the operation of RF electronics laboratory.

- Designed and developed biopsy needle antenna for high resolution *in situ* imaging.
- Designed and developed high-resolution surface coil for imaging skin lesions and pathology samples.
- Developed intra-vascular RF coils, matching circuits, and other peripheral electronics for imaging.
- Development of optimally performing tunable planar strip array antenna using Method of Moment Electromagnetic (EM) modeling and simulations.
- Developed "Phi-coil", a novel quadrature MR detector and determined optimal design rules for figure 8 shaped loop detectors at 3T.
- Determined the Noise Figure (NF) limits of circular loop coils in MR conventional and phased-array applications.
- Research and development of optical imaging system for fluorescence imaging to monitor vascular gene expression. Monte-Carlo modeling and design of optical probes for imaging fluorescence markers in vascular tissue.

Philips Healthcare, Cleveland, OH: RF coil workshop. June, 2008.

GE Medical Systems, Applied Science Laboratory, Waukesha, WI: designed and built 6 channel phased array coils for carotid artery imaging. Oct.-Nov.2004

Research Assistant (Jan.'98 – Dec., '99): *Medical Imaging and Informatics Laboratory, Department of Bioengineering, University of Toledo, OH.*

Worked on multi-spectral non-invasive optical imaging of skin lesions for early diagnosis of malignant melanoma. Research work involves development of multi-spectral optical imaging. Multi-spectral image processing and image restoration. 3D-image reconstruction from 2 D-projections obtained by Nevoscope, an optical non-invasive imaging device for skin lesions.

- Designed and developed optical imaging assemblies.
- Patient image data collection, archiving and data base maintenance at Medical College of Ohio, surgical oncology clinic.
- Image processing in C and C++

Research Assistant (Sep.'96 – Dec.'97): *Roger's Magnetic Resonance Center, University of Texas- Southwestern Medical Center, Dallas, TX.*

Research work involved in Sodium - 23 Multiple Quantum NMR imaging to diagnose tumor and lung edema.

- Gained experience in NMR imaging/spectroscopy and operation of GE 4.7 T MR equipment and Varian 600 MHz spectrometer.
- Designed and built RF transmitter/receiver coils for small animal imaging and spectroscopy.
- Animal preparation and surgery for imaging experiments.

Senior Design Project (Sep.'95 - Apr.'96): *Mercer University, Macon, GA*

Designed and built an electronic occupational therapy device for children who lack fine motor control and visual sequential memory.

- Gained experience and exposure to engineering design process.
- Designed electronic circuitry; interfaced and programmed 87C51 micro-controller.
- Precision manufactured plastic components by programming and using CAD/CAM tool.
- The design won the first place in IEEE- Whitaker foundation student design competition.

Computer Skills:

Programming Languages :

C++/C, Pascal, FORTRAN, BASIC, Assembly language, HTML

Technical Softwares on Unix and Windows platforms:

Matlab, Mathcad, FEKO, SEMCAD- *for EM simulations*, COMSOL Multi-Physics, ADS, SiMetrix, Altium *-for RF/Analog circuit modeling and simulation*

Awards and Scholarships:

2001 American Heart Association Melvin A. Judkins Young Investigator Award, X. Yang, Ergin Atalar, D Li, JM Serfaty, D Wang, **A. Kumar**, L Cheng, In vivo MR imaging of catheter-based vascular gene transfer.

Research Assistantship - University of Toledo, OH, Department of Bioengineering.

Dean's List, National Engineering Honor Society - Tau Beta Phi

1st Place IEEE (EMBS)-Whitaker Foundation Student Design competition, IEEE-EMBS conference, Amsterdam, Netherlands, 1996.

Transfer University Scholarship, Continuing Student Scholarship - Mercer University Macon GA

Patents:

“Optimized MRI strip array detectors and apparatus, systems and methods related thereto.”,

P.A. Bottomley, **A. Kumar**, US Patent 8,004,281B2; Aug 23, 2011

“Optimized MRI strip array detectors and apparatus, systems and methods related thereto.”,

P.A. Bottomley, **A. Kumar**, US Patent 7,816,918B2; Oct 19, 2010.

"Shielding methods to reduce power deposition in tissue exposed to radio frequency electromagnetic fields"

R. Ivkov, **A. Kumar**, (Provisional application 61/253,869, October 2009)

“Biopsy and Sampling Needle Antennas for Magnetic Resonance Imaging-Guided Biopsies”

A. Kumar, E. Atalar, O. Ocali , US Patent No.: 7236816 B2

“Digital Optical Imaging for Tracking Vascular Gene Expression and Early Diagnosis of Atherosclerosis”

X. Yang, **A. Kumar**, H.H. Chen (International application Serial No. WO 02/080756)

Publications:

P.A. Bottomley, **A. Kumar**, W. A. Edelstein, J.M. Allen, P.V. Karmarkar, "Designing passive MRI-safe implantable conducting leads with electrodes", *Medical Physics*, 37 (7), July 2010.

A. Kumar, W.A. Edelstein, P.A. Bottomley, "Noise Figure Limits for Circular Loop MR Coils" *Magnetic Resonance in Medicine*, vol. 61, pp.1201-1209, May 2009.

A. Kumar, P.A. Bottomley, "Optimized Quadrature Surface Coil Designs" *Magnetic Resonance Materials in Physics, Biology and Medicine (MAGMA)*, vol.21, pp. 41-52, March 2008.

A. Kumar, P.A. Bottomley, "Optimizing the Intrinsic Signal-to-Noise Ratio of MRI Strip Detectors" *Magnetic Resonance in Medicine*, vol.56(1), pp. 157-166, July 2006. (Times cited 2).

J. M. Serfaty, X. Yang, T. Foo, **A. Kumar**, A. Derbyshire, E. Atalar, "Coronary Artery Intervention Guided With Magnetic Resonance Imaging", *Magnetic Resonance in Medicine*, vol.49, pp. 258-263, February 2003. (Times cited 18)

S. Kar, **A. Kumar**, F. Gao, X. Zhan, B. Qiu, XM Yang, "Development of a Percutaneous Optical Imaging System to Track Vascular Reporter Gene Expression In Vivo", *Journal of Biomedical Optics*, vol.11, June 2006.

H. H. Chen, XJ. Zhen, **A. Kumar**, XY Du, LZ . Cheng, XM. Yang, "Detection of dual gene expression in arteries using a simple optical imaging method", *Journal of Biomedical Optics*, vol.9, pp. 1223-1229, December 2004, (Times cited 1).

XM Yang, E. Atalar, D. Li, J. M. Serfaty, D. Wang; **A. Kumar**, L. Cheng, "Magnetic Resonance Imaging Permits In Vivo Monitoring of Catheter-Based Vascular Gene Delivery", *Circulation*, 104(17), pp.1588-1590, October, 2001. (Times cited 38)

A. Kumar, HH Chen, D Wang, XM Yang, "Non-invasive Optical imaging of Green Fluorescent Protein Markers in Vascular Gene Therapy: A feasibility study in human tissue-like phantoms", *SPIE – Proceedings of SPIE* vol. 4623, pp. 339-345.

Conferences:

P. A. Bottomley, **A. Kumar**, W.A. Edelstein, J.M. Allen, P. Karmarkar, " Towards MRI-safe implanted leads: a comparative evaluation of four designs", 18th Annual ISMRM Meeting, Stockholm, Sweden, May 3-7, 2010.

A. Kumar, P. Karmarkar, W.A. Edelstein, P.A. Bottomley, "Insulation, lead-length, and sample-size affect the MRI-safety of implanted leads", 18th Annual ISMRM Meeting, Stockholm, Sweden, May 3-7, 2010.

A. Kumar, W. A. Edelstein, P. A. Bottomley, "Noise Figure Limits of Circular Loop MR Coils", 17th Annual ISMRM Meeting, Honolulu, Hawaii, April 18-24, 2009.

P. A. Bottomley, W. A. Edelstein, **A. Kumar**, J. M. Allen, P. Karmarkar, " Resistance and Inductance Based MRI-safe Implantable Lead Strategies", 17th Annual ISMRM Meeting, Honolulu, Hawaii, April 18-24, 2009.

A. Kumar, P. A. Bottomley, "Optimized Quadrature Surface Coils incorporating, Circular loops, Figure-8's and Strips", 15th Annual ISMRM Meeting, Berlin, Germany, May 19-24, 2007.

A. Kumar, P. A. Bottomley, "Optimizing the SNR performance of the Tunable Strip Detector", 14th Annual ISMRM Meeting, Seattle, Washington, May 6-12, 2006.

S. Kar, **A. Kumar**, F. Gao, X. Zhan, B.S. Qiu, X.M. Yang, "Development of a Percutaneous Optical Imaging System to Track Vascular Reporter Gene Expression In Vivo", Third Annual Meeting of the Society for Molecular Imaging. St. Louis, September 9-12, 2004.

S. Kar, **A. Kumar**, F.B Gao, B.S. Qiu, X.M. Yang , "Optical imaging of marker gene expression in vasculatures", IEEE/ISBI/NIH workshop on optical imaging. Bethesda, September 20-22, 2004.

S. Kar, **A. Kumar**, X.M. Yang, "Development of a percutaneous optical imaging system for tracking vascular gene expression: An ultrasound-guided ex vivo feasibility study", ISBI 2004, Richmand, VA.

S. Kar, **A. Kumar**, X.M. Yang, "Development of a percutaneous optical imaging system for tracking vascular gene expression: a feasibility study using human tissue like phantoms", SPIE, San Diego, CA, February 14-18, 2004

A. Kumar, H. H. Chen, E. Long, X. Yang, “Design of Minimally Invasive Optical Imaging Probes to Track Vascular Gene Expression: A Monte Carlo Simulation Analysis”, Proceedings. 2002 IEEE International Symposium 2002, Page(s): 285 - 288

A. Kumar, H.H. Chen, D. Wang, X. Yang. “Monitoring of Vascular Gene Expression via optical imaging”, Progress in Biomedical Optics and Imaging, 2002.

A. Kumar, P. A. Bottomley, “Tunable Planar Strip Array Antenna”, Annual ISMRM Meeting, Honolulu, Hawaii, May 18-24, 2002.

X.M. Yang, E. Atalar, D. Li, J.M. Serfaty, D. Wang, **A. Kumar**, L. Cheng, “In vivo MR Imaging of Catheter-based Vascular Gene Transfer”, 23rd Annual International Conference of the IEEE Engineering in Medicine and Biology Society, October 25-28, 2001.

H.H. Chen, **A. Kumar**, Y. Yang, D. Wang, D. Maouyo, N.M. Fried, X.M. Yang , “Development of a non-invasive Optical Imaging Method for Tracking Vascular Gene Expression”, 23rd Annual International Conference of the IEEE Engineering in Medicine and Biology Society, October 25-28, 2001.

X.M. Yang, E. Atalar, D. Li, J.M. Serfaty, **A. Kumar**, L. Cheng, “Magnetic Resonance Imaging Permits in vivo Monitoring Catheter-based Vascular Gene Transfer”, 87th Scientific Assembly and Annual Meeting, Radiological Society of North America, Chicago, Illinois, USA. November 26-December 1, 2001.

A. Kumar, E. Atalar, “MR Imaging with a Biopsy Needle”, in Proceeding of the Annual ISMRM Meeting, p. 2148 Glasgow, Scotland, 2001

A. Kumar, A.P. Dhawan, P. Relue, P.K. Chaudhuri, “Restoration of Inhomogeneously Trans-illuminated Color Images of Skin Lesions”, Poster session at the World Congress on Medical Physics and Biomedical Engineering 2000, Chicago, IL

A. Kumar, A.P. Dhawan, P. Relue, P.K. Chaudhuri, “Multi-Spectral Optical Imaging of Skin to Diagnose Malignant Melanoma”, Paper presented at the IEEE-EMBS/BMES conference, Atlanta, October 1999.

S. Maganti, **A. Kumar**, A.P. Dhawan, “New Model for Optical Image Reconstruction for Nevoscope Images”, Poster session at SPIE’s International Symposium on Medical Imaging 1999, San Diego, Symposiums:CA, February 1999:

A. Kumar, G. Mercado, G. Hart, “Hook’em up – a game board approach to promote hand-eye coordination and visual sequential memory”, presented the senior design project at the 18th Annual IEEE - Engineering in Medicine and Biology Society conference in Amsterdam, Netherlands, November 1996.

Technical Reports:

“Effects of Sampling on MR Image Reconstruction”, (Spring 1998). **A. Kumar**, Dept. of Bioengineering, University of Toledo, OH.

“Magnetic Resonance Imaging and K-space: Exploring Scan time reduction and its Effects on Image Quality”, (Fall, 1997), **A. Kumar**, B. Sakowski, R. Tamhane, Biomedical Engineering program, University of Texas – Southwestern Medical Center, Dallas, TX.

Professional Memberships:

Institute of Electrical Electronics Engineers (IEEE), Antennas and Propagation Society.
International Society of Magnetic Resonance in Medicine (ISMRM)
Applied Computational Electromagnetics Society (ACES)

Special Session Organizer: “Computational Electromagnetics in MRI” at the Applied Computational Electromagnetic Society (ACES) Conference, Columbus, OH, April 2012

Personal information:

US permanent resident eligible for citizenship Feb.2012