

## SUNG-MIN SOHN, Ph.D.

550 E Orange St, Tempe, AZ 85281 (ISTB1 281F)  
Phone: 480-727-9284, Email: [sungmin.sohn@asu.edu](mailto:sungmin.sohn@asu.edu)  
Webpage: <https://isearch.asu.edu/profile/3359830>

---

### CURRENT APPOINTMENT

Assistant Professor (Tenure Track)  
School of Biological and Health Systems Engineering, Arizona State University

### RESEARCH INTERESTS

- RF/analog/digital circuits and systems for biomedical applications (primarily, MRI).
- Simultaneous RF transmit and receive for In-band Full-duplex system in MRI.
- RF/mixed-signal Integrated circuit (IC) design
- Automatic impedance matching and frequency tuning unit, RF power monitoring, PIN diode control
- RF coil (antenna) and RF front-end for the next-generation low cost, ultra-low RF power, and lightweight portable MRI

### EDUCATION

Ph.D. Feb. 2013  
Electrical Engineering, College of Science and Engineering, University of Minnesota (Minneapolis)  
- Thesis: RF and electronic design perspective on ultra-high field MRI systems. (Advisor: Anand Gopinath, Ph.D.)

M.S. Feb. 2004  
Program of Bio-Microsystem Engineering in Electrical Engineering, Korea University (Seoul, Korea)  
- Thesis: CMOS Image Sensor architecture with ultra-low power motion detection. (Advisor: Sukki Kim, Ph.D.)

B.S. Feb. 2002  
Electrical Engineering, Korea University (Seoul, Korea)

### RESEARCH AND WORK EXPERIENCE

School of Biological and Health System Engineering at Arizona State University Aug. 2018 - present  
Assistant Professor:  
- Manage the laboratory of Bio-inspired Circuits and Systems (BiCS) for biomedical imaging (primarily MRI), biomedical instrument development, RF coils and interface circuits, MRI electronics.

Center for Magnetic Resonance Research (CMRR) at University of Minnesota Mar. 2013 – Aug. 2018  
Postdoctoral Associate (Advisor: John Thomas Vaughan, Ph.D.), Research Associate, and Assistant Professor:  
- Novel RF coil (antenna in MRI) design and electronics for the next generation MRI.  
- RF/analog front-end circuits and systems for MRI: RF power monitoring, Low noise amplifier, RF leakage and interference cancelling, Impedance matching and frequency tuning, Automatic feedback system.  
- Digital circuits and systems: Digital micro-controller design based on FPGA using Verilog hardware language for automatic feedback systems.  
- Electromagnetic (HFSS) and circuit (ADS) simulation for MRI application

University of Minnesota (Minneapolis) Jun. 2008 - Feb. 2013  
Research Assistant (Advisor: Anand Gopinath, Ph.D.):  
- RF/Analog circuit design for MRI.  
- Electromagnetic simulations for RF circuits and systems.

LG Electronics (Seoul) Jan. 2004 - Aug. 2007  
Analog/Mixed circuit designer:  
- Analog and mixed signal circuits. (Data converters, Phase-locked loop, and chip-to-chip interface circuits).  
- Proficient in most of front/back-end design and verification tools (Cadence, Synopsys, and Mentor Graphics.)

Korea University (Seoul) Mar. 2002 - Feb. 2004  
Research Assistant (Advisor: Suki Kim)  
- Analog and mixed signal circuit design.  
- Low power CMOS image sensors and CMOS frequency synthesizer.

### **RESEARCH GRANT**

*Automatic RF signal tuning and matching system for MR imaging and spectroscopy*, K99EB020058 (PI: Sung-Min Sohn), National Institute of Health (NIH/NIBIB)

*Imaging Human Brain Function with Minimal Mobility Restrictions*, U01EB025153 (PIs: Michael Garwood), National Institute of Health (NIH/NIBIB)

### **TEACHING EXPERIENCE**

Lecturer, University of Minnesota Summer semester 2012  
EE2001 Introduction to Circuits and Electronics

Teaching Assistant, University of Minnesota Spring semester 2012  
EE5164 Semiconductor Properties and Devices and EE2301 Introduction to Digital System Design

Teaching Assistant, University of Minnesota Fall semester 2011  
EE2001 Introduction to Circuits and Electronics

### **INVITED TALKS**

*Automated RF coil and interface toward next-generation MRI* Jan. 2017  
(University of Minnesota, Department of Radiology)

*RF hardware-engineering perspective toward next-generation MRI* Feb. 2017  
(Northwestern University, Department of Biomedical Engineering and Radiology)

*RF/Analog Circuits and Systems toward Next-Generation MRI* Mar. 2017  
(Washington University in St. Louis, Department of Electrical & Systems Engineering)

*RF hardware-engineering perspective toward next-generation MRI* Mar. 2017  
(Georgia Institute of Technology and Emory University, Department of Biomedical Engineering and Radiology)

*RF/Analog Circuits and Systems toward Next-Generation MRI* Apr. 2017  
(University of California at Riverside, Department of Electrical & Computer Engineering and Bioengineering)

*Hardware-engineering perspective toward next-generation MRI* Oct. 2017  
(Cornell University, Department of Radiology)

*RF/electrical engineering perspective toward next-generation MRI* Feb. 2018  
(New York University, Department of Radiology)

### **HONORS AND AWARDS**

ISMRM merit award, Magma cum Laude 2015,2016

ISMRM annual meeting travel award 2014-2016

Travel fellowship, Department of Electrical and Computer Engineering at University of Minnesota 2012

Best paper award, System IC division at LG Electronics 2007

### **PROFESSIONAL AND SOCIAL ACTIVITIES**

Reviewer, IEEE Transactions on Biomedical Engineering, IEEE Microwave and Wireless Components Letters, Electronics letters, and IEEE transactions on Microwave Theory and Techniques.

Member, International Society of Magnetic Resonance in Medicine (ISMRM) 2011 - present

Member, Institute of Electrical and Electronics Engineers (IEEE) 2011 - present

President, the Korean Graduate Student Association at University of Minnesota 2010 - 2011  
(Volunteered for +600 graduate students, post-docs, and their families)

**PUBLICATIONS (Reverse Chronological)**

1. **Sohn S-M**, J. T. Vaughan, R. L. Lagore, M. Garwood, and D. Idiyatullin, "In vivo MR imaging with simultaneous RF transmission and reception," *Magnetic Resonance in Medicine*, vol. 76, pp. 1932-1938, 2016. (DOI: 10.1002/mrm.26464)
2. **S. M. Sohn**, A. Gopinath, and J.T. Vaughan, "A Compact, High Power Capable, and Tunable High Directivity Microstrip Coupler" *IEE Trans. on Microwave Theory and Techniques*, vol. 64, pp. 3217-3223, 2016. (DOI: 10.1109/TMTT.2016.2602835)
3. **Sung-Min Sohn**, Lance DelaBarre, Anand Gopinath, and J.Thomas Vaughan, "Design of Electrically Automated RF Transceiver Head Coil in MRI," *IEEE Trans. Biomedical Circuits and Systems*, vol.9, no.5, pp.725-732, Oct. 2015. (DOI: 10.1109/TBCAS.2014.2360383)
4. **Sung-Min Sohn**, Lance DelaBarre, Anand Gopinath, and J.Thomas Vaughan, "RF Head Coil Design with Improved RF Magnetic Near-Fields Uniformity for Magnetic Resonance Imaging (MRI) Systems," *IEEE Trans. Microw. Theory Techn.*, vol. 62, no. 8, pp. 1784-1789. Aug. 2014. (DOI: 10.1109/TMTT.2014.2331621)
5. Can E Akgun, Lance DelaBarre, Hyoungsuk Yoo, **Sung-Min Sohn**, Carl J Snyder, Gregor Adriany, Kamil Ugurbil, Anand Gopinath, and J Thomas Vaughan, "Stepped Impedance Resonators for High-Field Magnetic Resonance Imaging," *IEEE Trans. Biomed. Eng.*, vol. 61, no. 2, pp. 327-333, Feb. 2014. (DOI: 10.1109/TBME.2013.2250973)
6. **S-M. Sohn**, J. Thomas Vaughan and Anand Gopinath, "An interdigitated Split-Ring Resonator for Metamaterials," *Microwave and Optical Technology Letters*, Vol. 53, No. 1 page(s) 174-177, Jan. 2011. (DOI: 10.1002/mop.25683)
7. **Sung-Min Sohn**, Sung-Hyun Yang, Sang-Wook Kim, Kug-Hyun Baek, and Woo-Hyun Paik, "SoC design of an auto-focus driving image signal processor for mobile camera applications," *Consumer Electronics*, *IEEE Transactions on Volume 52*, Issue 1, Page(s):10 – 16, Feb. 2006. (DOI: 10.1109/TCE.2006.1605018)
8. **Sung-Min Sohn**, Soo-Hwan Kim, Suh-Ho Lee, Kwang-Jin Lee, and Suki Kim, "A CMOS image sensor (CIS) architecture with low power motion detection for portable security camera applications," *Consume Electronics* *IEEE Transactions on Volume 49*, Issue 4, Page(s): 1227 – 1233, Nov. 2003. (DOI: 10.1109/TCE.2003.1261221)

## Peer-Reviewed Conference Papers/Abstracts

1. **Sung-Min Sohn**, Michael Garwood, and John Thomas Vaughan, "Automatic RF leakage signal canceler in MRI applications," in *Microwave Symposium Digest (IMS), IEEE MTT-S International*, 2017
2. **Sung-Min Sohn**, J.Thomas Vaughan, Michael Garwood, and Djaudat Idiyatullin, "The first demonstration of simultaneous transmit and receive MRI in vivo," in *International Society for Magnetic Resonance in Medicine (ISMRM)*, 2016
3. J. Thomas Vaughan, Bert Wang, Djaudat Idiyatullin, **Sung-Min Sohn**, Albert Jang, Lance DelaBarre, and Michael Garwood, "Progress Toward a Portable MRI System for Human Brain Imaging," in *International Society for Magnetic Resonance in Medicine (ISMRM)*, 2016
4. V. Panda, **S.-M. Sohn**, J. T. Vaughan, and A. Gopinath, "A Zeroth Order resonant element for MRI transmisson line RF coil," in *2016 IEEE International Symposium on Antennas and Propagation (APSURSI)*, pp. 1389-1390, 2016.
5. **Sung-Min Sohn**, Lance DelaBarre, Anand Gopinath, and J.Thomas Vaughan, "2<sup>nd</sup> Prototype of an Automatically tune and matche RF transeive head coil: Design and Evaluation," in *International Society for Magnetic Resonance in Medicine (ISMRM)*, 2015
6. **Sung-Min Sohn**, Lance DelaBarre, and J.Thomas Vaughan, "Comparisons of RF Signal Tuning and Matching Networks," in *International Society for Magnetic Resonance in Medicine (ISMRM)*, 2015
7. **Sung-Min Sohn**, Anand Gopinath, and J.Thomas Vaughan, "On-coil Power Monitor with a High Directivity Coupler," in *International Society for Magnetic Resonance in Medicine (ISMRM)*, 2015
8. **Sung-Min Sohn**, Anand Gopinath, and John Thomas Vaughan, "Tunable and high directivity coupler for MRI applications," in *Microwave Symposium Digest (IMS), IEEE MTT-S International*, 2014
9. **Sung-Min Sohn**, Lance DelaBarre, Anand Gopinath, and J.Thomas Vaughan, "Automatically tuned and matched RF transeive head coil at 7T," in *International Society for Magnetic Resonance in Medicine (ISMRM)*, 2014

10. J Thomas Vaughan, Lance DelaBarre, Jinfeng Tian, **Sungmin Sohn**, Devashish Shrivastava, Gregor Adriany, and Kamil Ugurbil, "RF technology for human MRI at 10.5 T," in IEEE MTT-S international RF and wireless technologies for biomedical and healthcare applications (IMWS-BIO), 2013
11. **Sung-Min Sohn**, Lance DelaBarre, John Thomas Vaughan, and Anand Gopinath, "8-Channel RF head coil of MRI with automatic tuning and matching," Microwave Symposium Digest, 2013 IEEE MTT-S International, 2-7 June 2013
12. **Sung-Min Sohn**, Lance DelaBarre, Anand Gopinath, and John Thomas Vaughan, "RF coil design with automatic tuning and matching," 21<sup>st</sup> Annual Meeting of ISMRM, Salt Lake City, Utah, USA, 20-26 April 2013
13. **Sung-Min Sohn**, Lance DelaBarre, John Thomas Vaughan, and Anand Gopinath, "RF multi-channel head coil design with improved B1<sup>+</sup> fields uniformity for high field MRI systems," Microwave Symposium Digest, 2012 IEEE MTT-S International, 17-22 June 2012
14. **Sung-Min Sohn**, Lance DelaBarre, John Thomas Vaughan, and Anand Gopinath, " $\pi$ (Pi)-matching technique for RF coil of MRI systems," Microwave Symposium Digest (MTT), 2012 IEEE MTT-S International, 17-22 June 2012
15. **S-M. Sohn**, A. Gopinath, and J. Thomas Vaughan, "Electrically auto-tuned RF coil design," 19th Annual Meeting of ISMRM, Montreal, Canada, 7-13 May 2011
16. **Sung-Min Sohn**, J. Vaughan, A. Gopinath, "Auto-tuning of The RF Transmission Line Coil for High-Fields Magnetic Resonance Imaging (MRI) Systems," Microwave Symposium Digest, 2011 IEEE MTT-S International, 5-10 June 2011
17. Can Eyup Akgun, Lance Delabarre, Carl Snyder, **Sung-Min Sohn**, Gregor Adriany, Kamil Ugurbil, Anand Gopinath, John Thomas Vaughan, "Alternating Impedance Multi-Channel Transmission Line Resonators for High Field Magnetic Resonance Imaging," Microwave Symposium Digest, 2010 IEEE MTT-S international, pp.756-759, May 2010
18. Can Eyup Akgun, Lance DelaBarre, **Sung-Min Sohn**, Carl Snyder, Gregor Adriany, Kamil Ugurbil, John Thomas Vaughan, Anand Gopinath, "Novel Multi-channel Transmission Line Coil for High Field Magnetic Resonance Imaging," Microwave Symposium Digest, 2009 IEEE MTT-S international, pp. 1425-1428, May 2009
19. Sung-Hyun Yang, **Sung-Min Sohn**, Kuk-Tae Hong, Hyoung-Soo Lee, and Bo-Ik Sohn, "On-Chip Voice-Coil Motor Driver for Mobile Auto-Focus Camera Applications," Asian Solid-State Circuits Conference, 2005 Nov. 2005 Page(s):101 – 104

#### **PATENT DISCLOSURES**

1. **Sung Min Sohn**, Djaudat S. Idiytullin, J. Thomas Vaughan, and Michael Garwood, "System and method for simultaneous radio frequency transmission and reception in magnetic resonance imaging" (in process)
2. **Sung-Min Sohn**, John Thomas Vaughan, Anand Gopinath, "System and method for automatic tuning of RF coil circuits for us with MRI system" US20130285659 A1 (2013)
3. **Sung-Min Sohn**, "Auto-focus apparatus and method for camera" Korea patent 1006772290000 (2007)
4. **Sung-Min Sohn**, "Compensation apparatus and method for motion in the mobile terminal" Korea patent 1006840090000 (2007)
5. **Sung-Min Sohn** and Suki Kim, "CMOS image sensor having motion detection function inside and the method for detecting the motion" Korea patent 1006153970000 (2006)