

EDUCATION

Massachusetts Institute of Technology (MIT) – Cambridge, MA

Bachelor of Science in Electrical Engineering – GPA: 4.4/5.0

June 2013

Master of Engineering in Electrical Engineering – GPA: 5.0/5.0

June 2017

Thesis: Broadband Acoustic Energy Harvesting via Synthesized Electrical Loading

Doctor of Philosophy in Electrical Engineering

December 2021

Thesis: High Angular Resolution Beam Steering Terahertz Antenna Arrays for Imaging Applications

EXPERIENCE

Cambridge Terahertz, Inc. – Cambridge, MA

January 2022 - Present

- Day-one Founder and CEO of deeptech semiconductor company
- Leads seed-stage startup through complex and dynamic process of pairing novel technologies with market need
- Fundraising, team building, company building, management leadership
- Successful award and performance on government and military grants
- Company building, culture setting
- Marketing, product development

Playground Global – Palo Alto, CA

May 2018 – August 2018

- Electrical Engineering consultant for venture capital firm portfolio companies
- Defined product requirements, drove cross-functional product development

Microsoft Corporation Xbox Sensor Development – Redmond, WA

August 2013 – April 2015

- Focus on high performance and mobile audio system design, characterization
- Architecture, schematic, board design for sensor-based systems
- High-speed and high layer count board design
- Electrical engineering project lead (unannounced project)
- DFM, on-site factory build support
- Focus on low-noise audio electronics and rapid prototyping
- Optimized cost for high-volume production

Microsoft Corporation Xbox Silicon Development – Mountain View, CA

May 2012 – August 2012

- Contributed to test bench and developed test cases in SystemVerilog and C++ for verification and validation of mixed-signal ASIC design
- improved test coverage for digital and analog verification and validation

Bar-Ilan University Molecular Photonics Lab – Ramat Gan, Israel

May 2011 – August 2011

- Developed first ever photovoltaic cell based on ordered carbon nanotubes
- Studied UV-induced carbon nanotube functionalization

MIT Laboratory of Organic and Nanostructured Electronics – Cambridge, MA

May 2010 – August 2010

- Optimized organic solar cell efficiency
- Independently designed experimental processes for device optimization

University of Florida Laboratory of Organic Optoelectronics – Gainesville, FL

September 2006 – February 2009

- Improved Polymer solar cell efficiency via optimization of device composition and morphology
- Developed procedure to precisely tune spin-casted thin film thickness and Zinc Oxide nanostructure morphology

LEADERSHIP

Co-founder, Co-President - MIT Live Music Connection

- Director, Open Source Music Project- expanding musical interest/skills on campus *January 2010 – June 2013*
- Taught and organized free guitar lessons for MIT community
- Designed course and taught guitar curriculum to 100+ students

ACTIVITIES / ACCOLADES

Winning Team, MIT Kickstart Pitch Competition	2016
Intel International Science and Engineering Fair	2008, 2009
• Second Place Grand Award Winner, two-time	
International Sustainable World Energy, Engineering, Environment Project Olympiad	2008
• Gold medalist	
Armed Forces Communications and Electronics Association National Science Fair (AFCEA)	2008
• Grand prize winner	

PUBLICATIONS / PATENTS / CONFERENCE PRESENTATIONS

- Eunseok Lee, Muhammad Ibrahim Wasiq Khan, Xibi Chen, Utsav Banerjee, Nathan Monroe, Rabia Tugce Yazicigil, Ruonan Han, Anantha P Chandrakasan., "A 1.54-mm², 264-GHz Wake-Up Receiver With Integrated Cryptographic Authentication for Ultra-Miniaturized Platforms," in *IEEE Journal of Solid-State Circuits*, vol. 59, no. 3, pp. 653-667, March 2024, doi: 10.1109/JSSC.2023.3332504.
- Eunseok Lee, Muhammad Ibrahim Wasiq Khan, Xibi Chen, Utsav Banerjee, Nathan Monroe, Rabia Tugce Yazicigil, Ruonan Han, Anantha P Chandrakasan, "A 1.54mm² Wake-Up Receiver Based on THz Carrier Wave and Integrated Cryptographic Authentication," *2023 IEEE Custom Integrated Circuits Conference (CICC)*, San Antonio, TX, USA, 2023, pp. 1-2, doi: 10.1109/CICC57935.2023.10121285.
- Invited speaker, International Microwave Symposium 2023, San Diego, CA. Workshop: *History and Recent Advances in Reflect Arrays for SATCOM, 5G/6G and Imaging Systems*. Talk title: *Sub-THz and THz Reflect Arrays for Imaging Systems: Challenges and Opportunities*.
- Jinchun Wang, Mohamed I Ibrahim, Isaac B Harris, Nathan M Monroe, Muhammad Ibrahim Wasiq Khan, Xiang Yi, Dirk R Englund, Ruonan Han, "34.1 THz Cryo-CMOS Backscatter Transceiver: A Contactless 4 Kelvin-300 Kelvin Data Interface," *2023 IEEE International Solid-State Circuits Conference (ISSCC)*, San Francisco, CA, USA, 2023, pp. 504-506, doi: 10.1109/ISSCC42615.2023.10067445.
- Xibi Chen, Xiang Yi, Muhammad Ibrahim Wasiq Khan, Xingcun Li, Wenhua Chen, Jianfeng Zhu, Yang Yang, Kenneth E. Kolodziej, Nathan M. Monroe, Ruonan Han, "A 140-GHz FMCW TX/RX-Antenna-Sharing Transceiver With Low-Inherent-Loss Duplexing and Adaptive Self-Interference Cancellation," in *IEEE Journal of Solid-State Circuits*, vol. 57, no. 12, pp. 3631-3645, Dec. 2022, doi: 10.1109/JSSC.2022.3202814.
- Qiang Yu, Gwang-Soo Kim, Jeffrey Garrett, Derek Thomson, Georgios Dogiamis, Nathan Monroe, Ruonan Han, Yunzhe Ma, James Waldemer, Ye Seul Nam, Gustavo Beltran, Vijaya Neeli, Surej Ravikumar, Said Rami, Chris Peltó, Eric Karl, "Low-Loss On-Chip Passive Circuits Using C4 Layer for RF, mmWave and sub-THz Applications," *2022 IEEE/MTT-S International Microwave Symposium - IMS 2022*, Denver, CO, USA, 2022, pp. 325-328, doi: 10.1109/IMS37962.2022.9865589.
- M. I. W. Khan, E. Lee, N. M. Monroe, A. P. Chandrakasan and R. Han, "A Dual-Antenna, 263-GHz Energy Harvester in CMOS for Ultra-Miniaturized Platforms with 13.6% RF-to-DC Conversion Efficiency at -8 dBm Input Power," *2022 IEEE Radio Frequency Integrated Circuits Symposium (RFIC)*, Denver, CO, USA, 2022, pp. 291-294, doi: 10.1109/RFIC54546.2022.9863171.
- Xibi Chen, Muhammad Ibrahim Wasiq Khan, Xiang Yi, Xingcun Li, Wenhua Chen, Jianfeng Zhu, Yang Yang, Kenneth E Kolodziej, Nathan M Monroe, Ruonan Han, "A 140GHz Transceiver with Integrated Antenna, Inherent-Low-Loss Duplexing and Adaptive Self-Interference Cancellation for FMCW Monostatic Radar," *Dig. Tech. Pap. - IEEE Int. Solid-State Circuits Conf.*, vol. 2022-Febru, pp. 80-82, 2022, doi: 10.1109/ISSCC42614.2022.9731637.
- N. M. Monroe, G. C. Dogiamis, R. Stingel, P. Myers, X. Chen, and R. Han, "Electronic THz Pencil Beam Forming and 2D Steering for High Angular-Resolution Operation: A 98×98-Unit 265GHz CMOS Reflectarray with In-Unit Digital Beam Shaping and Squint Correction," in *ISSCC*, 2022, pp. 15-17.
- N. M. Monroe, "High Angular Resolution Beam Steering Terahertz Antenna Arrays for Imaging Applications," Massachusetts Institute of Technology, 2022. [Online]. Available: <https://dspace.mit.edu/handle/1721.1/143401>

- Q. Yu, S. Rami, V. Neeli, J. Garret, J. Koo, M. Marulanda, S. Ravikumar, S. Moraka, Y. Ma, J. Waldemer, G. Liu, S. Joglekar, M. Armstrong, D. Ali, N. Monroe, R. Han, B. Sell and E. Karl, “mmWave and Sub-THz Technology Development in Intel 22nm Low-Power FinFET Process,” *IEEE Intl. Electron Device Meetings (IEDM)*, Dec. 2020.
- N.M. Monroe, J.H. Lang. Broadband, Large Scale Acoustic Energy Harvesting via Synthesized Electrical Load: Part I. Harvester Design and Model. *Smart Materials and Structures*. 2019. doi: 10.1088/1361-665X/ab114a
- N.M. Monroe, J.H. Lang. Broadband, Large Scale Acoustic Energy Harvesting via Synthesized Electrical Load Part II: Electrical Load. *Smart Materials and Structures*. 2019. doi: 10.1088/1361-665X/ab1158
- Monroe, N. (2010, August 25). Increasing the efficiency of a hybrid polymer photovoltaic cell with polymer nanofiber complexes of varied thickness. *Young Scientists Journal*, 3(8), 26-32.
- Presenter, *AFCEA International Joint Warfighting Conference – Virginia Beach, VA* June 2008

SKILLS

- | | | |
|---|------------------------------------|--|
| • Audio system design, modeling, optimization, test | • Power Electronics design | • Thin-film device fabrication |
| • Audio Precision, anechoic audio system test | • RF Integrated Circuit Design | • Semiconductor fabrication processes/equipment |
| • Board-level system integration | • Analog Integrated Circuit Design | • Kicad, Eagle, LTSPICE, Abaqus, Solidworks, MATLAB, Python, C++ |
| • Design for manufacturing | • System architecture | • Mixed signal chip verification/validation |
| • Cadence-based CAD toolchain | • High-speed PCB design | • Working Knowledge: Tensorflow, Mechanical design, machine shop fabrication |
| • Low power electronics | • FPGA development | • RF Systems |
| • Optoelectronics | • Computer Vision | |
| • High performance digital system design | • Embedded system development | |
| • FinFET Circuit Design | • Design for EMC | |
| | • RF IC Design | |
| | • Cadence Virtuoso | |
| | • Ansys HFSS | |

TEACHING

- FAA Advanced Ground Instructor
- Graduate Teaching Assistant - MIT
 - *MIT 6.152 – Microelectronics Processing Technology* *Fall 2015*
 - Instructor Rating: 6.3 / 7
 - *MIT 2.678 – Electronics for Mechanical Systems* *Spring 2018*
 - Instructor Rating: 6.6 / 7
 - *MIT 2.678 – Electronics for Mechanical Systems* *Fall 2018*
 - Instructor Rating: 6.8 / 7

AVIATION

- FAA Commercial Pilot | Multi Engine | High Performance | Complex
- Instrument Rated | Advanced Ground Instructor
- FAA Second Class Medical
- 460 Flight Hours | 390 Hours Pilot in Command

PERSONAL

Classical / Spanish Flamenco Guitar | Audio Production | Rock Climbing | Hiking

Languages

Spanish (Intermediate), Mandarin Chinese (Intermediate)