

Zhenyun Qian

Research Assistant Professor, Northeastern University
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Education

Ph.D. in Electrical Engineering, September 2013 – May 2017

Northeastern University, Boston, MA, USA.

Dissertation: *Micro and Nano Electromechanical Systems for Near-Zero Power Infrared Detection*

Advisor: Prof. Matteo Rinaldi

M.S. in Electrical Engineering, September 2011 – August 2013

Northeastern University, Boston, MA, USA.

Thesis: *Graphene-Aluminum Nitride Nano Plate Resonators*

Advisor: Prof. Matteo Rinaldi

B.S. in Electronic Science and Engineering, September 2007 – June 2011

Southeast University, Nanjing, Jiangsu, China.

Professional Experience

Research Assistant Professor in the Department of Electrical and Computer Engineering

Northeastern University, Boston, MA, USA, November 2018 – present.

Research interests: Zero-power sensors, infrared detectors, piezoelectric transducers, nano/micro hybrid electromechanical devices, flexible electronics.

Post-doctoral Researcher in Northeastern Sensors & Nano System Laboratory

Northeastern University, Boston, MA, USA, May 2017 – October 2018.

Worked on the development and optimization of Zero-Power Wireless Infrared (IR) Sensors for Internet of Things applications. Responsible for proposal preparation, project planning/reporting and supervising PhD students.

- Demonstrated **zero-power infrared (IR) digitizing sensors** with over 5x improved detection threshold (~100 nW).
- Demonstrated compatibility of the IR sensors with commercial sub-1 mTorr vacuum packaging process.
- Designed and demonstrated a complete coin battery-powered palm-sized **IR wireless sensor node with near-zero standby power consumption** (2.6 nano-Watts).
- Demonstrated ultra-low threshold devices working at long-wavelength IR spectral regions suitable for **zero-power human detection**.
- Demonstrated tunable micromechanical photoswitches with electrostatic bias, resulting in ultra-low threshold devices suitable for zero-power human detection at up to 5-meter distance.

Graduate Research Fellow in Northeastern Sensors & Nano System Laboratory

Northeastern University, Boston, MA, USA, May 2012 – May 2017.

Led a team to the development of Plasmonic Microelectromechanical Infrared Digitizer (PLASMID) based on micromechanical switches – a project funded by DARPA Near Zero Power RF and Sensor

Operations (N-ZERO) program. (The team met all phase 2 goals in 2 years.) Worked on the development of multi-function Aluminum Nitride (AlN) MEMS wireless sensing platform (including infrared detectors, chemical sensors, magnetometers and RF filters) based on AlN MEMS resonators.

- Designed and demonstrated first-of-their-kind **zero-power IR digitizing sensors** based on **plasmonically-enhanced micromechanical photoswitches** with an ultra-low detection threshold power, high spectral selectivity and high reliability (**published in *Nature Nanotechnology* and selected as cover image for the October 2017 issue**).
- Designed and demonstrated **uncooled narrowband NEMS resonant IR detectors** based on 500-nm thick AlN NEMS resonators integrated with spectrally selective plasmonic absorbers.
- Designed and demonstrated **ultra-fast and pico-watts resolution thermal detectors** based on scaled 50-nm thick AlN NEMS resonators.
- Designed and demonstrated **Graphene-Aluminum Nitride (G-AlN) NEMS resonators** with a significantly improved figure of merit compared to their metal-electrode counterparts.
- Designed and demonstrated a single transistor oscillator based on a G-AlN NEMS resonator with improved phase noise performance compared to that of a reference oscillator built with a conventional AlN resonator.
- Designed and demonstrated uncooled IR detectors and chemical sensors based on G-AlN NEMS resonators.
- Fabricated and characterized ultra-sensitive MEMS magnetometers based on delta-e effect in FeGaB-AlN nano-plate resonators.
- Fabricated and characterized **cross-sectional Lamé mode resonators (CLMRs)**, a new type of AlN MEMS resonators capable of achieving high electromechanical coupling coefficient and multiple operating frequencies on the same chip, without additional fabrication costs.
- Designed and prototyped bio-compatible wafer-level packaging of AlN MEMS resonators.

Undergraduate Research Assistant in the Key Laboratory of MEMS of Ministry of Education Southeast University, Nanjing, China, September 2010 – June 2011.

Worked on the development of In-situ Testing Structures for Mechanical Properties of MEMS Materials.

- Optimized the performance of a thermally-actuated V-shaped clamped-clamped beam for in-situ measurement of fracture strength of polysilicon.

Professional Skills

MEMS/NEMS Design

Specialized in design, modelling and simulation of piezoelectric and thermomechanical microsystems. Skilled in use of COMSOL Multiphysics, CoventorWare, Layout, Advanced Design System, and Altium Designer.

Micro/Nano Fabrication

Extensive experience in process development. Skilled in use of magnetron sputtering systems, e-beam evaporation systems, reactive ion etching tools, mask aligner, XeF₂ etcher, scanning electron microscope, and optical profilometers.

Device Characterization

Capable of developing experimental setup for efficient device characterization. Skilled in use of RF probe station, network analyzer, semiconductor analyzer, frequency counter, oscilloscope, and spectral analyzer.

Data Analysis and Presentation

Expert in data analysis, intuitive visualization of results and effective presentation. Skilled in technical writing and use of MATLAB, Origin, 3D CAD tools, and Photoshop.

Project Management

Experienced in funding proposal preparation and leading a team to proof-of-concept demonstration and prototype development.

Teaching

Three-year experience as a lab instructor for the graduate course *Nano and Micro Fabrication*. Guest lecturer for graduate course *Introduction to Microelectromechanical System* in three semesters.

Honors and Awards

- ***DARPA Riser*** at DARPA's 60th Anniversary Symposium (D60, Sept. 2018).
- Winner of the ***2017 Chinese Government Award for Outstanding Self-financed Students Abroad***.
- Winner of the ***Best Paper Award*** at the 2017 European Frequency and Time Forum & International Frequency Control Symposium (IFCS-EFTF 2017), Besancon, France.
- Recipient of the NMC/2017 ***Scholarships for Graduate Students*** at the 14th International Workshop on Nanomechanical Sensors, Kailua-Kona, Hawaii, USA.
- ***Best Paper Award Finalist*** at the IEEE SENSORS 2016 Conference, Orlando, USA.
- Winner of the ***Outstanding Paper Award*** at the 18th International Conference on Solid-State Sensors, Actuators and Microsystems (Transducers 2015), Anchorage, USA.
- ***Best Paper Award Finalist*** at 2015 IEEE International Frequency Control Symposium - European Frequency and Time Forum (IFCS-EFTF 2015), Denver, USA.
- Recipient of ***College of Engineering Dean's Fellowship*** at Northeastern University (2013).
- ***Best Paper Award Finalist*** at 2013 IEEE International Frequency Control Symposium - European Frequency and Time Forum (IFCS-EFTF 2013), Prague, Czech Republic.

Publications (Citations \geq 358; h-index = 10; i10-index = 12)

Peer-Reviewed Journal Papers

1. S. Kang, **Z. Qian**, V. Rajaram, S. Calisgan, A. Alù, M. Rinaldi, "***Ultra-narrowband Metamaterial Absorbers for High Spectral Resolution Infrared Spectroscopy***", *Advanced Optical Materials*, 2018, in press.
2. V. Rajaram, **Z. Qian**, S. Kang, S. Calisgan, N. McGruer, and M. Rinaldi, "***Zero-Power Electrically Tunable Micromechanical Photoswitches***", *IEEE Sensors Journal*, vol.18, issue 19, pp. 7833 – 7841, 2018, doi: 10.1109/JSEN.2018.2850898.
3. **Z. Qian**, S. Kang, V. Rajaram, C. Cassella, N. McGruer and M. Rinaldi, "***Zero Power Infrared Digitizers Based on Plasmonically-enhanced Micromechanical Photoswitches***", *Nature Nanotechnology*, 12(10), pp. 969 – 973, 2017, doi: 10.1038/NNANO.2017.147. [This work was featured in over 20 news articles and scientific blogs worldwide, and selected as cover image for the October 2017 issue of *Nature Nanotechnology*]
4. T. Nan, H. Lin, Y. Gao, A. Matyushov, G. Yu, H. Chen, N. Sun, S. Wei, Z. Wang, M. Li, X. Wang, A.

- Belkessam, R. Guo, B. Chen, J. Zhou, **Z. Qian**, Y. Hui, M. Rinaldi, M. E. McConney, B. M. Howe, Z. Hu, J. G. Jones, G. J. Brown and N. X. Sun, “*Acoustically actuated ultra-compact NEMS magnetoelectric antennas*”, *Nature Communications*, 8, Article number: 296 (2017), doi:10.1038/s41467-017-00343-8.
5. M. Li, A. Matyushov, C. Dong, H. Chen, H. Lin, T. Nan, **Z. Qian**, M. Rinaldi, Y. Lin, and N. X. Sun. “*Ultra-sensitive NEMS magnetoelectric sensor for picotesla DC magnetic field detection*”, *Applied Physics Letters*, 110, no. 14 (2017): 143510.
 6. G. Chen, C. Cassella, **Z. Qian**, G. Hummel and M. Rinaldi, “*Lithographically defined aluminum nitride cross-sectional Lamé mode resonators*”, *Journal of Micromechanics and Microengineering*, 27, no. 3 (2017): 034003.
 7. C. Cassella, G. Chen, **Z. Qian**, G. Hummel and M. Rinaldi, “*RF Passive Components Based on Aluminum Nitride Cross-Sectional Lamé-Mode MEMS Resonators*”, *IEEE Transactions on Electron Devices*, Vol. 64, issue 1, pp. 237 – 243, 2016, doi: 10.1109/TED.2016.2621660.
 8. **Z. Qian**, Y. Hui, F. Liu, S. Kang, S. Kar and M. Rinaldi, “*Graphene Aluminum Nitride NEMS Resonant Infrared Detector*”, *Microsystems & Nanoengineering*, doi: 10.1038/micronano.2016.26, 2016.
 9. C. Cassella, G. Chen, **Z. Qian**, G. Hummel and M. Rinaldi, “*Cross-Sectional Lamé Mode Ladder Filters for UHF wideband applications*”, *IEEE Electron Device Letters*, vol. 37, issue 5, pp. 681 – 683, 2016.
 10. Y. Hui, J. S. Gomez-Diaz, **Z. Qian**, A. Alu and M. Rinaldi, “*Plasmonic Piezoelectric Nanomechanical Resonator for Spectrally Selective Infrared Sensing*”, *Nature Communications*, 7:11249 doi: 10.1038/ncomms11249 (2016).
 11. C. Cassella, Y. Hui, **Z. Qian**, G. Hummel and M. Rinaldi, “*Aluminum Nitride Cross-Sectional Lamé Mode Resonators*”, *IEEE Journal of Microelectromechanical Systems*, vol. 25, issue 2, pp. 275 – 285, 2015. [This paper was identified as a work of excellent quality, hence being highlighted as a JMEMS RightNow-Paper to a large community of readers and being released as open access for a limited time.]
 12. **Z. Qian**, F. Liu, Y. Hui, S. Kar and M. Rinaldi, “*Graphene as a Massless Electrode for Ultrahigh-Frequency Piezoelectric Nanoelectromechanical Systems*”, *Nano Letters*, 15 (7), pp. 4599–4604, 2015. [This technology was featured in a spotlight article on Nanowerk.com]
 13. J. Qian, K. Rong, **Z. Qian**, C. Wen and S. Zhang, “*Effects of a multichannel dynamic functional electrical stimulation system on hemiplegic gait and muscle forces*”, *Journal of physical therapy science* 27, no. 11 (2015): 3541.

Peer-Reviewed Conference Papers

1. S. Kang, **Z. Qian**, V. Rajaram, S. Calisgan, M. Rinaldi, “*Chip-scale MEMS-CMOS Multispectral Infrared Chemical Sensor*”, *Proceedings of the 32nd IEEE International Conference on Micro Electro Mechanical Systems (MEMS 2019)*, Seoul, Korea on January 27-31, 2019, in press.
2. V. Rajaram, **Z. Qian**, S. Kang, S. Calisgan, N. McGruer and M. Rinaldi, “*MEMS-Based Battery-less RFID Infrared Sensor Tag with Memory Function*”, *Proceedings of the 32nd IEEE International Conference on Micro Electro Mechanical Systems (MEMS 2019)*, Seoul, Korea on January 27-31, 2019, in press.

3. V. Rajaram, **Z. Qian**, S. Kang, S. Calisgan, N. McGruer and M. Rinaldi, “*A False Alarm-Free Zero-Power Micromechanical Photoswitch*”, IEEE SENSORS 2018, New Delhi, India, October 28-31, 2018, in press.
4. S. Calisgan, V. Villanueva-Lopez, V. Rajaram, **Z. Qian**, S. Kang, S. Hernandez-Rivera, and M. Rinaldi, “*Spectroscopic Chemical Sensing Based on Narrowband MEMS Resonant Infrared Detectors*”, IEEE SENSORS 2018, New Delhi, India, October 28-31, 2018, in press.
5. S. Kang, S. Calisgan, **Z. Qian**, V. Rajaram, N. McGruer and M. Rinaldi, “*Broadband Long-Wavelength Infrared Micromechanical Photoswitch for Zero-Power Human Detection*”, *Hilton Head Workshop 2018: A Solid-State Sensors, Actuators and Microsystems Workshop*, Hilton Head Island, June 3-7, 2018, pp.187 -189.
6. **Z. Qian**, and M. Rinaldi, “*Effects of Bottom Electrode Topography in AlN Nano Plate Resonators on Quality Factor*”, *Proceedings of the 2018 IEEE International Frequency Control Symposium (IFCS 2018)*, Olympic Valley, CA, May 21-24, 2018, pp. 93 - 94.
7. T. Wu, **Z. Qian**, and M. Rinaldi, “*Low Cost Thin Film Encapsulation for AlN Resonators*”, *Proceedings of the 31st IEEE International Conference on Micro Electro Mechanical Systems (MEMS 2018)*, Belfast, UK, 21-25 January 2018, pp.1024-1027.
8. V. Rajaram, **Z. Qian**, S. Kang, and M. Rinaldi, “*MEMS-Based Near-Zero Power Infrared Wireless Sensor Node*”, *Proceedings of the 31st IEEE International Conference on Micro Electro Mechanical Systems (MEMS 2018)*, Belfast, UK, 21-25 January 2018, pp.17-20.
9. Y. Yu, G. Michetti, A. Kord, D. Sounas, F. Pop, P. Kulik, M. Pirro, **Z. Qian**, A. Alu and M. Rinaldi, “*Magnetic-Free Radio Frequency Circulator based on Spatiotemporal Commutation of MEMS Resonators*”, *Proceedings of the 31st IEEE International Conference on Micro Electro Mechanical Systems (MEMS 2018)*, Belfast, UK, 21-25 January 2018, pp. 154-157. [Nominated for the Best Paper Award]
10. V. Rajaram, **Z. Qian**, S. Kang, N. McGruer and M. Rinaldi, “*Threshold Scaling of Near-Zero Power Micromechanical Photoswitches Using Bias Voltage*”, *Proceedings of the IEEE Sensors 2017*, Glasgow, Scotland UK, October 29 – November 1, 2017, pp. 1-3. [Nominated for the Best Paper Award]
11. **Z. Qian**, V. Rajaram, S. Kang and M. Rinaldi, “*NEMS Infrared Detectors based on High Quality Factor 50 nm Thick AlN Nano-Plate Resonators*”, *Proceedings of the 2017 European Frequency and Time Forum & International Frequency Control Symposium (IFCS-EFTF 2017)*, Besancon, France, July 9 – July 13, 2017, pp. 500-501. [Winner of the Best Paper Competition]
12. T. Wu, G. Chen, **Z. Qian**, W. Zhu, M. Rinaldi, and N. McGruer, “*A Microelectromechanical AlN Resoswitch for RF Receiver Application*”, *Proceedings of the 19th International Conference on Solid-State Sensors, Actuators and Microsystems (Transducers 2017)*, Kaohsiung, Taiwan, June 18-22, 2017, pp. 2123-2126.
13. C. Cassella, G. Chen, T. Wu, **Z. Qian**, and M. Rinaldi, “*Low Impedance Arrays of Coupled Cross-Sectional Lamé Mode Resonators with High Figure of Merit in Excess of 100*”, *Proceedings of the 19th International Conference on Solid-State Sensors, Actuators and Microsystems (Transducers 2017)*, Kaohsiung, Taiwan, June 18-22, 2017, pp. 1935-1838.
14. V. Rajaram, **Z. Qian**, S. Kang, C. Cassella, N. McGruer and M. Rinaldi, “*Microelectromechanical Detector of Infrared Spectral Signatures with Near-Zero Standby Power Consumption*”,

Proceedings of the 19th International Conference on Solid-State Sensors, Actuators and Microsystems (Transducers 2017), Kaohsiung, Taiwan, June 18-22, 2017, pp. 846-849.

15. S. Kang, **Z. Qian**, V. Rajaram, A. Alu, and M. Rinaldi, “**Ultra Narrowband Infrared Absorbers for Omni-Directional and Polarization Insensitive Multi-Spectral Sensing Microsystems**”, *Proceedings of the 19th International Conference on Solid-State Sensors, Actuators and Microsystems (Transducers 2017)*, Kaohsiung, Taiwan, June 18-22, 2017, pp. 886-889.
16. **Z. Qian**, S. Kang, V. Rajaram, C. Cassella, N. McGruer and M. Rinaldi, “**Light-actuated Micromechanical Relays for Zero-Power Infrared Detection**”, *Proceedings of the 40th Annual GOMACTech Conference*, Reno, NV, USA, March 20-23, 2017, pp. 112-114.
17. **Z. Qian**, S. Kang, V. Rajaram, C. Cassella, N. McGruer and M. Rinaldi, “**Zero-power Light-actuated Micromechanical Relay**”, *Proceedings of the 30th IEEE International Conference on Micro Electro Mechanical Systems (MEMS 2017)*, Las Vegas, USA, 22-26 January 2017, pp. 940-941.
18. **Z. Qian**, S. Kang, V. Rajaram and M. Rinaldi, “**Narrowband MEMS Resonant Infrared Detectors based on Ultrathin Perfect Plasmonic Absorbers**”, *Proceedings of the IEEE Sensors 2016 conference*, Orlando, FL, Oct. 30 – Nov. 2, 2016, pp. 1-3. [Nominated for the Best Paper Award]
19. **Z. Qian**, S. Kang, V. Rajaram and M. Rinaldi, “**50 nm Thick Aluminum Nitride Piezoelectric Nano-Plate Resonant Thermal Detectors**”, *Proceedings of the 2016 Solid-State Sensors, Actuators and Microsystems Workshop (Hilton Head 2016)*, Hilton Head Island, 5-9 June 2016, pp. 58-59.
20. C. Cassella, G. Chen, **Z. Qian**, G. Hummel and M. Rinaldi, “**Unprecedented Figure of Merit in Excess of 108 in 920 MHz Aluminum Nitride Cross-Sectional Lamé Mode Resonators Showing k_t^2 in Excess of 6.2%**”, *Proceedings of the 2016 Solid-State Sensors, Actuators and Microsystems Workshop (Hilton Head 2016)*, Hilton Head Island, 5-9 June 2016, pp. 94-96.
21. C. Cassella, G. Chen, **Z. Qian**, G. Hummel and M. Rinaldi, “**920 MHz Aluminum Nitride Cross-Sectional Lamé Mode Piezoelectric MEMS Transformer with High Open-Circuit Voltage Gain in Excess of 39**”, *Proceedings of the 2016 Solid-State Sensors, Actuators and Microsystems Workshop (Hilton Head 2016)*, Hilton Head Island, 5-9 June 2016, pp. 412-415.
22. H. Lin, T. Nan, **Z. Qian**, et al. “**Tunable RF band-pass filters based on NEMS magnetoelectric resonators**”, *Proceedings of the 2016 IEEE International Microwave Symposium (IMS2016)*, San Francisco, California, May 22-27, 2016, pp. 1-4.
23. **Z. Qian**, Y. Hui and M. Rinaldi, “**Effects of Volume Scaling in AlN Nano Plate Resonators on Quality Factor**”, *Proceedings of the 2016 IEEE International Frequency Control Symposium*, New Orleans, Louisiana, USA, May 9-12, 2016, pp. 1-3.
24. G. Chen, C. Cassella, **Z. Qian**, G. Hummel and M. Rinaldi, “**Aluminum Nitride Cross-Sectional Lamé Mode Resonators With 260 MHz Lithographic Tuning Capability and High $k_t^2 > 4%$** ”, *Proceedings of the 2016 IEEE International Frequency Control Symposium*, New Orleans, Louisiana, USA, May 9-12, 2016, pp. 1-3.
25. C. Cassella, G. Chen, **Z. Qian**, G. Hummel and M. Rinaldi, “**Cross-Sectional Lamé Mode Filters for UHF Wideband Applications**”, *Proceedings of the 2016 IEEE International Frequency Control Symposium*, New Orleans, Louisiana, USA, May 9-12, 2016, pp. 1-3.
26. C. Cassella, **Z. Qian**, G. Hummel, and M. Rinaldi, “**1.02 GHz Aluminum Nitride Cross Sectional Lamé Mode Resonator with High k_t^2 Exceeding 4.6%**”, *Proceedings of the 29th IEEE International*

Conference on Micro Electro Mechanical Systems (MEMS 2016), Shanghai, China, 24-28 January 2015, pp. 659-662.

27. **Z. Qian**, Y. Hui, F. Liu, S. Kar and M. Rinaldi, “**Chemical Sensing Based on Graphene-Aluminum Nitride Nano Plate Resonators**”, *Proceedings of the 14th IEEE Sensors Conference (Sensors 2015)*, Busan, South Korea, November 1-4, 2015, pp. 1-4.
28. **Z. Qian**, Y. Hui, F. Liu, S. Kar and M. Rinaldi, “**1.27 GHz Graphene-Aluminum Nitride Nano Plate Resonant Infrared Detector**”, *Proceedings of the 18th International Conference on Solid-State Sensors, Actuators and Microsystems (Transducers 2015)*, Alaska, USA, June 21-25, 2015, pp. 1429-1432. [Winner of the Outstanding Paper Award]
29. Y. Hui, **Z. Qian**, and M. Rinaldi, “**Resonant Infrared Detector Based on a Piezoelectric Fishnet Metasurface**”, *Proceedings of the 2015 Joint conference of the IEEE International Frequency Control Symposium and the European Frequency and the Time (IFCS-EFTF 2015)*, Denver, USA, April 12-16, 2015, pp. 630-632. [Nominated for the Best Paper Award]
30. **Z. Qian**, R. Vyas, Y. Hui and M. Rinaldi, “**High Resolution Calorimetric Sensing Based on Aluminum Nitride MEMS Resonant Thermal Detectors**”, *Proceedings of the 2014 IEEE Sensors Conference*, Valencia, Spain, 2-5 November 2014, pp. 986-989.
31. Y. Hui, **Z. Qian**, G. Hummel and M. Rinaldi, “**Pico-Watts Range Uncooled Infrared Detector Based on a Freestanding Piezoelectric Resonant Microplate with Nanoscale Metal Anchors**”, *Proceedings of the 2014 Solid-State Sensors, Actuators and Microsystems Workshop (Hilton Head 2014)*, Hilton Head Island, 8-12 June 2014, pp. 387-390.
32. G. Hummel, Y. Hui, **Z. Qian**, and M. Rinaldi, “**Switchable Aluminum Nitride MEMS Resonator Using Phase Change Materials**”, *Proceedings of the 2014 Solid-State Sensors, Actuators and Microsystems Workshop (Hilton Head 2014)*, Hilton Head Island, 8-12 June 2014, pp. 431-434.
33. Y. Hui, **Z. Qian**, and M. Rinaldi, “**A 2.8 GHz Combined Mode of Vibration Aluminum Nitride MEMS Resonator with High Figure of Merit Exceeding 45**”, *Proceedings of the Joint conference of the 2013 European Frequency and the Time Forum & International Frequency Control Symposium (EFTF/IFC 2013)*, Prague, Czech Republic, July 21-25, 2013, pp. 930-932. [Nominated for the Best Paper Award]
34. **Z. Qian**, Y. Hui, F. Liu, S. Kar and M. Rinaldi, “**Single Transistor Oscillator Based on a Graphene-Aluminum Nitride Nano Plate Resonator**”, *Proceedings of the Joint conference of the 2013 European Frequency and the Time Forum & International Frequency Control Symposium (EFTF/IFC 2013)*, Prague, Czech Republic, July 21-25, 2013, pp. 559-561.
35. **Z. Qian**, Y. Hui, F. Liu, S. Kar and M. Rinaldi, “**245 MHz Graphene-Aluminum Nitride Nano Plate Resonator**”, *Proceedings of the 17th International Conference on Solid-State Sensors, Actuators and Microsystems (Transducers 2013)*, Barcelona, Spain, June 16-20, 2013, pp. 2005-2008.

Peer-Reviewed Conference Abstracts

1. **Z. Qian**, S. Kang, V. Rajaram, C. Cassella, N. McGruer, and M. Rinaldi, “**Zero-Power Infrared Digitizing Sensor based on Plasmonically-Enhanced Micromechanical Relays**”, accepted for poster presentation at the 14th International Workshop on Nanomechanical Sensors (NMC/2017), Kailua-Kona, Hawaii, USA, 4-7 April 2017. [Winner of the TRF Scholarships for Graduate Students]
2. **Z. Qian**, Y. Hui, F. Liu, S. Kar and M. Rinaldi, “**GHz Range Graphene-Aluminum Nitride Nano**

Plate Resonators”, accepted for poster presentation in *2015 Joint conference of the IEEE International Frequency Control Symposium and the European Frequency and the Time (IFCS-EFTF 2015)*, Denver, USA, April 12-16, 2015. [**Nominated for the Best Paper Award**]

3. **Z. Qian**, X. Yu and J. Qian, “*Rehabilitation Mechanics with Muscle Electrical Stimulation*”, accepted for oral presentation in *13th International Conference on Mesomechanics*, Vicenza, Italy, July 6-8, 2011.

Patents

1. M. Rinaldi, C. Cassella, **Z. Qian**, Y. Hui, “*Nano- and microelectromechanical resonators*”, U.S. Patent No. 9,712,136, granted in July 2017.
2. M. Rinaldi, C. Cassella, **Z. Qian**, Y. Hui, “*Nano- and micro-electromechanical resonators*”, U.S. Patent No. 9,419,583, granted in August 2016.
3. M. Rinaldi, **Z. Qian**, Y. Hui, “*Nano- and micro-electromechanical resonators*”, U.S. Patent No. 9,705,469, granted in July 2017.
4. M. Rinaldi, **Z. Qian**, Y. Hui, “*Nano- and micro-electromechanical resonators*”, U.S. Patent No. 9,425,765, granted in August 2016.
5. M. Rinaldi, **Z. Qian**, S. Kang, and V. Rajaram, “*Zero Power Plasmonic Microelectromechanical Device*”, U.S. Patent application No. PCT/US2016/048083, published in May 2017.
6. J. Qian and **Z. Qian**, “*Electrical stimulation device for walking anterior tibial muscle*”, China patent No. ZL 2009 2 0231896.9, issued in May 2011.

Affiliations

Institute of Electrical and Electronics Engineering (IEEE), Member
IEEE Ultrasonics, Ferroelectrics and Frequency Control Society (UFFC), Member

Review Service for Journals and Conferences

- IEEE/ASME Journal of Microelectromechanical Systems (JMEMS)
- Nanotechnology
- IEEE Sensors Letters
- Sensors
- Journal of Electronic Materials
- Micromachines
- International Journal of Electronics and Communications
- 60th IEEE International Midwest Symposium on Circuits and Systems
- IEEE SENSORS 2017 Conference