

---

# Hwaider Lin

---

626-375-3269

whyderlin@gmail.com

---

## Summary

---

Hwaider Lin has been working on designing, fabricating, and testing in RF microwave projects funded by different agencies, like NSF ERC, DARPA, AFOSR on topics such as NEMS antennas (BAW), NEMS sensors, NEMS SAW devices, NEMS filters, integrated bandpass filters, circular polarization antennas, phase shifters, isolators, circulators, RFID system, and Bio-medical applications. He has 6 years HFSS and Comsol simulation experience, 3 years cleanroom experience, and more than 10 Grant writing experience. He has given 25 presentations at international conferences and published over 32 papers

---

## Education

---

### **Northeastern University, Boston, MA, USA**

*Doctoral Degree, Electrical Engineering (Expected graduation: Dec 2018)*

- Outstanding Graduate Student Award, 2018
  - In Life Sciences, Physical Sciences, and Engineering
  - Highest honor at Northeastern University
- ECE Department Distinguished Research Assistant Award, 2017
- President of Taiwanese Graduate Student Association

### **National Tsing Hua University, Hsinchu, Taiwan**

*Bachelor's Degree, Power Mechanical Engineering*

---

## Research Experience

---

2014-2018	<b>Translational Applications of Nanoscale Multiferroic Systems Research Center (TANMS), Boston, MA</b> <i>Research Associate</i>
2012-2018	<b>Northeastern University, Boston, MA</b> <i>Research Assistant</i>

---

## Work Experience

---

2016	<b>Northeastern University, Boston, MA</b> <i>Mentor of Undergraduate Research Program (URP) for TANMS</i>
2015	<b>Materials Research Society Symposium, Boston, MA</b> <i>Symposium Assistant / Presenter</i>
2015	<b>Winchester Technologies LLC, Winchester, MA</b> <i>Research and Development intern</i>
2014-2015	<b>Northeastern University, Boston, MA</b> <i>Teaching Assistant</i>
2013-2015	<b>Taiwanese Graduate Student Association in Northeastern, Boston, MA</b> <i>President</i>
2010-2011	<b>RTI Electronics Inc, Anaheim, CA</b> <i>Electrical Engineering Intern</i>
2009-2010	<b>Mathobotix, Irvine, CA</b> <i>Educational Robotics Instructor</i> <i>Referee of OCRL/SMI Vex Robotics Competition</i>

## Honors and Awards

---

- **NASA Tech Briefs - Create the Future Design Contest: First Prize, 2018**
  - *In Electronics/Sensors/IoT Category with over 800 entries from 60 countries*
  - *Featured in NASA Tech Briefs magazine*
- **Northeastern University Outstanding Graduate Student Award, 2018**
  - *In Life Sciences, Physical Sciences, and Engineering*
  - *Highest honor at Northeastern University*
- **Three Minute Thesis (3MT®) Competition Finalist, 2018**  
*International Microwave Symposium (IMS), IEEE MTT-S International*
- **Best Student Paper Finalist, 2018**  
*International Microwave Biomedical Conference (IMBioC), IEEE MTT-S International*
- **ECE Department Distinguished Research Assistant Award, 2017**  
*Northeastern University*
- **Comsol Best Poster Award, 2017**  
*Comsol Conference*
- **The APS GMAG-sponsored Best Student Presentation Award Finalist, 2017**  
*Annual Conference on Magnetism and Magnetic Materials*

## Publications and Citations

---

- T. Nan\*, H. Lin\*, et al. "Acoustically Actuated Ultra-Compact NEMS Magnetolectric Antennas", *Nature Communications*, 8, 296, 2017. <Select>
  - Co-First Author with T. Nan (\*Equal Contribution)
  - Selected for highlight in press release of Nature Communications
  - News on NATURE (Ultra-small antennas point way to miniature brain implants)
  - News on SCIENCE (Mini-antennas could power brain-computer interfaces, medical devices)
- H. Lin, et al. "Magnetolectric Antennas: A Novel Antenna Miniaturization Approach for Sensing, IoT, and Bio-medical Applications", *IEEE Transactions on Antennas & Propagation*, 2018, under review.
- M. Zaeimbashi, H. Lin, et al. "NanoNeuroRFID: A Wireless Implantable Device Based on Magnetolectric Antennas", *IEEE Journal of Electromagnetics, RF, and Microwaves in Medicine and Biology*, 2018, under review.
- H. Lin, et al. "Integrated Magnetolectric Devices: Filters, PicoTasla Magnetometers and Ultracompact Acoustic Antennas", *MRS Bulletin, Invited Issue, Nov. 2018, in press.*
- Y. Guo, et al. "Integrated Ferroics for Sensing, Power, RF and  $\mu$ -Wave Electronics", *Journal of Materials Research, Invited Feature Paper, Nov. 2018, in press.*
- D. A. Bas, H. Lin, et al. "All-optical probing of GHz acoustic waves in multiferroic MEMS", *MOEMS and Miniaturized Systems XVII 10545, 1054506, 2018.*
- H. Lin, et al. "Future Antenna Miniaturization Mechanism: Magnetolectric Antennas", *IEEE MTT-S International Microwave Symposium (IMS), 2018.*
- H. Lin, et al. "NEMS Magnetolectric Antennas for Biomedical Application", *IEEE MTT-S International Microwave Biomedical Conference (IMBioC), 2018.*
- X. Wang, et al. "Voltage control of magnetism in NiZn ferrite/mica/PMNPT heterostructure with giant tunability and narrow linewidth", *Applied Physics Letters* 112 (19), 192903, 2018.
- Y. He, et al. "Integrated Tunable Bandstop Filter Using Self-Biased FeGaB/Al<sub>2</sub>O<sub>3</sub> Multilayer Thin Film", *IEEE Transactions on Magnetics*, 54, 9, 2018.
- X. Wang, et al. "Size-dependent magnetic properties of FeGaB/Al<sub>2</sub>O<sub>3</sub> multilayer micro-islands", *Physics Letters A, Volume 382, Issue 27, 1835, 2018.*

- G. Yu, H. Lin, et al. "Voltage-Driven 180° Magnetization Switching in Magnetoelectric Heterostructures", *IEEE Transactions on Magnetics*, 53, 11, 2017.
- R. Guo, H. Lin, et al. "An Integrated Tunable Isolator Based on NiZn Film Fabricated by Spin-spray Plating", *AIP Advances*, 8, 5, 2017.
- S. Li, et al. "Electric Field Tuning Ferromagnetic Resonance Frequency Shift in Oblique Sputtered Fe<sub>42</sub>Co<sub>46</sub>Hf<sub>12</sub>/PZN-PT Multiferroic Heterostructures", *IEEE Transactions on Magnetics*, 53, 11, 2017.
- M. Li, et al. "Ultra-Sensitive NEMS Magnetoelectric Sensor for Picotesla DC Magnetic Field Detection", *Applied Physics Letters*, 110, 143510, 2017.
- H. Wang, et al. "Band-notched ultrawide band antenna loaded with ferrite slab", *AIP Advances*, 7, 056408, 2017.
- R. Yang, et al. "Self-biased Microwave Ferromagnetic Performance of Patterned Ni<sub>80</sub>Fe<sub>20</sub> Thin Films", *AIP Advances*, 7, 056301, 2017.
- X. Wang, et al. "A Novel NiZn Ferrite Integrated Magnetic Solenoid Inductor with a High-quality Factor at 0.7–6 GHz", *AIP Advances*, 7 (5), 056606, 2017.
- H. Lin, et al. "Tunable RF Multiferroic Band-Pass Filters Based on NEMS Magnetoelectric Resonators", *IEEE MTT-S International Microwave Symposium (IMS)*, 2016.
- H. Lin, et al. "Integrated Magnetics and Multiferroics for Compact and Power Efficient Sensing, Memory, Power, RF and Microwave Electronic", *IEEE Transactions on Magnetics* 52 (7), 1-8, 2016.
- S. Emori, et al. "Interfacial Spin-Orbit Torque without Bulk Spin-Orbit Coupling", *Physical Review B*, 93, 180402, 2016.
- Z. Hu, et al. "Non-volatile ferroelectric switching of ferromagnetic resonance in NiFe/PLZT multiferroic thin film heterostructures", *Scientific reports* 6, 32408, 2016.
- T. Sun, H. Lin, et al. "Voltage tunable magnetoelectric devices", *IEEE National Aerospace and Electronics Conference (NAECON) and Ohio Innovation Summit (OIS)*, 2016.
- Y. Gao, et al. "Giant electric field control of magnetism and narrow ferromagnetic resonance linewidth in FeCoSiB/Si/SiO<sub>2</sub>/PMN-PT multiferroic heterostructures", *Applied Physics Letters* 108 (23), 232903, 2016.
- T. Nan, et al. "Control of magnetic relaxation by electric-field-induced ferroelectric phase transition and inhomogeneous domain switching", *Materials Science*, arXiv:1508.07290, 2016.
- H. Lin, et al. "Integrated Non-Reciprocal Dual H- and E-Field Tunable Bandpass Filter with Ultra-Wideband Isolation", *IEEE MTT-S International Microwave Symposium (IMS)*, 2015.
- H. Lin, et al. "Voltage Tunable Magnetoelectric Inductors with Improved Operational Frequency and Quality Factor for Power Electronics", *IEEE Trans. Magn.* 51, 4002705, 2015.
- T. Nan, et al. "Control of magnetic relaxation by electric-field-induced ferroelectric phase transition and inhomogeneous domain switching", *Materials Science*, arXiv:1508.07290, 2015.
- X. Wang, et al. "Growth behavior and RF/microwave properties of low temperature spin-sprayed NiZn ferrite", *J. Mater. Sci.*, 26, 1890, 2015.
- Z. Chen, et al. "UHF tunable compact antennas on Co<sub>2</sub>Z hexaferrite substrate with 2.5/1 tunable frequency range", *Antennas and Propagation & USNC/URSI National Radio Science Meeting, IEEE International Symposium*, 2015
- Z. Zhou, et al. "Low-temperature spin spray deposited ferrite/piezoelectric thin film magnetoelectric heterostructures with strong magnetoelectric coupling", *J. Mater. Sci. Mater Electron*, Volume 25, Issue 3, 2014.
- T. Nan, et al. "Quantification of strain and charge co-mediated magnetoelectric coupling on ultra-thin Permalloy/PMN-PT interface", *Scientific Reports*, 4, 3688, 2014.

## Grant Writing Experience

---

- **NSF Nanosystems Engineering Research Center for Translational Applications of Nanoscale Multiferroic Systems (TANMS)**  
*NSF* 2014-2022 (Current)
- **Novel Implantable Smart Magnetolectric NanoRFIDs for Large-Scale Neural Magnetic Recording and Modulation**  
*NIH* 2018-2021 (Current)
- **CMOS Compatible Deposition of Multi-Ferroic Films for Tunable Microwave Applications**  
*Army SBIR* 2018-2020 (Current)
- **Ultrapact Magnetoelctric Antennas**  
*Army STTR* 2018-2020 (Current)
- **High Hesitivity Magnetic Materials for Magnetic Toroid and Flat Dipole Antennas**  
*Navy STTR* 2017-2020 (Current)
- **NCS-FO: Nanomagnetic Stimulation Capability for Neural Investigation and Control**  
*NSF* 2015-2019 (Current)
- **Low Cost Magnetic Sensor for Mine Neutralizer Identification and Charge Placement**  
*Navy STTR* 2017-2018 (Current)
- **A New Dual-Chamber Sputter Deposition & Magnetic Annealing System for Ultra-Compact Reconfigurable RF Magnetolectric Antennas**  
*AFOSR DURIP* 2017-2018 (Current)
- **Sensitive and Selective Chemical Sensor Using Molecularly-Imprinted Single Layer Graphene**  
*AFRL* 2015-2017 (Completed)
- **Nanofabricated Neural Probes with Ultra-Sensitive Integrated Compact RF Magnetolectric Sensors for Electro-Magneto-Brain Activity Mapping**  
*Keck Foundation* 2014-2017 (Completed)
- **Voltage Tunable Multiferroic Inductors**  
*AFRL/UES* 2014-2017 (Completed)
- **RF Multiferroic Materials**  
*DARPA* 2014-2017 (Completed)
- **Integrated Magnetics on PCB for Compact Antennas and RF/Microwave Components**  
*Rogers Corporation* 2014-2015 (Completed)

## Presentation

---

- **International Microwave Biomedical Conference (IMBioC) 2018, Philadelphia, PA, USA.**  
“NEMS Magnetolectric Antennas for Biomedical Application”
  - Best Student Paper Finalist
- **International Microwave Symposium (IMS) 2018, Philadelphia, PA, USA.**  
“Future Antenna Miniaturization Mechanism: Magnetolectric Antennas”
  - Three Minute Thesis (3MT®) Competition Finalist
- **Army Research Lab Leadership Visit 2018, Kostas Research Institute, Boston, MA, USA.**  
“Acoustically Actuated Ultra-Compact NEMS Magnetolectric Antennas”
- **TANMS Year 6 Renewal Review 2018, UCLA, CA, USA.**  
“NanoNeuroRFID: A Wireless, Self-powered, Sub-mm-size, and Addressable Implantable Device”  
“Tunable RF Band-Pass Filters Based on NEMS Magnetolectric Resonators”  
“Effect of Carbon Content on Thin Film Piezomagnetic Materials”

- "Magnetolectric Antenna Designs for Wide Bandwidth"*
- **Materials Research Society Symposium Fall 2017, Boston, MA, USA.**  
*"Acoustically Actuated Ultra-Compact NEMS Magnetolectric Antennas"*  
*"Integrated Magnetics and Multiferroics for Compact and Power Efficient Sensing, Power, RF, Microwave and mm-Wave Tunable Electronics"*
    - *Invited Speaker*
  - **62nd Annual Magnetism & Magnetic Materials Conference 2017, Pittsburgh, PA, USA.**  
*"Magnetostatic Surface Wave Tunable Bandpass Filter with Nonreciprocity"*  
*"Acoustically Actuated Ultra-Compact NEMS Magnetolectric Antennas"*
    - *The APS GMAG-sponsored Best Student Presentation Award Finalist*
  - **Comsol Conference 2017, Boston, MA, USA.**  
*"RF NEMS Magnetolectric Sensor Simulation and Demonstration"*
    - *Comsol Best Poster Award*
  - **Napa Microsystems Workshop 2017, Napa, CA, USA.**  
*"Acoustically Actuated Ultra-Compact NEMS Magnetolectric Antennas"*
  - **TANMS Industrial Advisory Board and NSF annual Meeting 2017, UCLA, CA, USA.**  
*"Acoustically Actuated Ultra-Compact NEMS Magnetolectric Antennas"*
  - **International Microwave Symposium (IMS) 2016, San Francisco, CA, USA**  
*"Tunable RF Multiferroic Bandpass Filters Based on NEMS Magnetolectric Resonators"*
  - **TANMS Multiferroic Strategy Meeting 2016, UCLA, CA, USA.**  
*"Acoustically Actuated Ultra-Compact NEMS Magnetolectric Antennas"*
  - **61th Annual Magnetism & Magnetic Materials Conference 2016, New Orleans, LA, USA.**  
*"Reconfigurable Integrated Self-Biased Ferrite Coupled Line Circulators"*  
*"Tunable RF Band-Pass Filters Based on NEMS Magnetolectric Resonators"*  
*"Circularly Polarized Antennas Realization by NiZn Ferrite Full Film Loading Substrates"*  
*"Band-Notched Ultra-wideband (UWB) Antenna Loaded with Ferrite"*  
*"Self-biased microwave ferromagnetic performance of patterned Ni<sub>80</sub>Fe<sub>20</sub> thin films"*  
*"Large electric field tunability on microwave ferromagnetic properties of Fe<sub>50.8</sub>Co<sub>24.0</sub>B<sub>25.2</sub>/PZN-PT multiferroic heterostructures"*
  - **Materials Research Society Symposium Fall 2015, Boston, MA, USA.**  
*"Integrated Non-Reciprocal Dual H- and E-Field Tunable Bandpass Filter with Ultra-Wideband Isolation"*
    - *Symposium Assistant and presenter*
  - **TANMS Multiferroic Strategy Meeting 2015, UCLA, CA, USA.**  
*"Integrated Multiferroics for Compact and Power Efficient Sensing, Memory, RF and Microwave Electronics"*
  - **International Microwave Symposium (IMS) 2015, Phoenix, AZ, USA.**  
*"Integrated Non-Reciprocal Dual H- and E-Field Tunable Bandpass Filter with Ultra-Wideband Isolation"*
  - **59th Annual Magnetism & Magnetic Materials Conference 2014, Honolulu, HI, USA.**  
*"Non-Reciprocal Integrated Tunable Bandpass Filter Based on Spin-Sprayed Ferrite"*

## Teaching and Leadership Experience

---

- **Teaching Assistant at Northeastern University (TRACE Rating 4.25/5)  
(Nominate as the annual Ph.D.-graduate-student Teaching awards)**
  - *Microwave Circuits and Networks*
    - ◇ Review lectures and Laboratory Touring
    - ◇ High Frequency Structure Simulator (HFSS) and Comsol Multiphysics demonstration
  - *Electronics 1 and Electronics Lab 1*
  - *Freshman Electrical Engineering Department Lab Experience (Wireless Power Transfer)*
- **Undergraduate Research Program (URP) at TANMS  
(Translational Applications of Nanoscale Multiferroic Systems Research Center)**

- *Guide the students and develop their fundamental knowledge of Multiferroic Systems*
- *Develop core entrepreneurial and research skills/experiences*
- **President of Taiwanese Graduate Student Association at Northeastern University**
  - *Lead the association and guide new coming Taiwanese graduate students*
  - *Organize all activities and study groups; cooperate with other university in Boston area*
- **Educational Robotics Instructor at Mathobotix**
  - *Teach Robotics to K-12 students using STEM subjects*
  - *Robotic project design and programming*
  - *Referee at OCRL/SMI Vex Robotics Competition*

## References

---

- **Dr. Nian Xiang Sun (Research Advisor)**
  - *Professor, Electrical and Computer Engineering Department, Northeastern University, Boston, MA 02115*
  - *Director, W.M. Keck Laboratory for Integrated Ferroics, Northeastern University*
  - *n.sun@northeastern.edu*
- **Dr. Gregory P. Carman**
  - *Distinguished Professor, Mechanical and Aerospace Engineering Department, UCLA, Los Angeles, CA 90095*
  - *Director, Translational Applications of Nanoscale Multiferroic Systems (TANMS)*
  - *carman@seas.ucla.edu*
- **Dr. David Cheng**
  - *Chair and Professor, Electrical Engineering Department, CSU Fullerton, Fullerton, CA 92831*
  - *Chairman, Institute of Electrical and Electronic Engineers Orange County Section*
  - *Coordinator, Institute of Electrical and Electronic Engineers Greater Los Angeles Council*
  - *President, Asian Faculty and Staff Association, CSU Fullerton*
  - *dcheng@fullerton.edu*