John D. Garrett

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PROFILE

* I am a Submillimeter Array (SMA) Fellow at the Harvard & Smithsonian Center for Astrophysics. My research is focused on advanced submillimeter-wave receivers for radio astronomy. Specifically, I am developing a new multibeam receiver for the SMA at 345 GHz.
* I have a strong technical background in:
  - **Superconducting detectors**: modeling superconductors and quantum tunneling effects, testing superconducting devices in cryogenic systems
  - **Electrical engineering**: RF design, electromagnetic simulations, low-noise testing
  - **Software**: building complex simulation software, analyzing experimental data
* I have published my research in top academic journals, including 7 first author papers. These papers combined have +250 citations.

Employment History

Submillimeter Array (SMA) Fellow, Center for Astrophysics | Harvard & Smithsonian 2019 – pres.

* Developing a new multibeam receiver for the SMA based on SIS mixers at 345 GHz
* Contributing to the wideband SMA (wSMA) upgrade (extending the instantaneous bandwidth)

Postdoctoral research assisant, Department of Physics (Astrophysics), University of Oxford 2018 – 2019

* Developed a new 900 GHz SIS receiver system, a model to simulate distributed SIS frequency multipliers, and a 1×4 focal plane array at 230 GHz

Education

DOCTORATE

DPhil Astrophysics, University of Oxford, Oxford, UK 2014 – 2018

* Supervisor: Prof. Ghassan Yassin
* Thesis: *A 230 GHz Focal Plane Array Using a Wide IF Bandwidth SIS Receiver*
  - Developed a wide bandwidth SIS mixer and a 1×4 focal plane array
  - Built a software package to simulate SIS mixer operation/performance (online: QMix)
  - Observed star formation in intermediate redshift galaxies using the IRAM 30 m telescope

MASTERS

MSc Electrical Engineering, University of Calgary, Calgary, Canada 2012 – 2014

* Supervisor: Prof. Elise Fear
* Thesis: *Average Dielectric Property Analysis of Non-Uniform Structures*
  - Developed a new technique to estimate the average dielectric properties of complex and non-uniform structures using microwave transmission measurements
  - Developed a new tissue mimicking material to test biomedical imaging systems

BACHELORS

BSc Electrical Engineering, University of Alberta, Edmonton, Canada 2008 – 2012

* Capstone project: *Nanowire Metamaterials for Biosensing Applications*

Publications

Journal Papers

A. Traini, B.-K. Tan, J. Garrett, *et al.* , "The Influence of LO Power Heating of the Tunnel Junction on the Performance of THz SIS Mixers," *IEEE Trans. THz Sci. Technol.*, accepted.

J. Garrett, *et al.*, "A Non-Linear Transmission Line Model for Simulating Distributed SIS Frequency Multipliers," *IEEE Trans. THz Sci. Technol.*, vol. 10, no. 3, pp. 246–255, May 2020.

J. Garrett, *et al.*, "Simulating the Behavior of a 230 GHz SIS Mixer Using Multi-Tone Spectral Domain Analysis," *IEEE Trans. THz Sci. Technol.*, vol. 9, no. 9, pp. 540–548, Nov. 2019.

J. Garrett, A. Pollak, G. Yassin, and M. Henry, "A Compact and Easy to Fabricate *E*-plane Waveguide Bend," *IEEE Microw. Wireless Compon. Lett.*, vol. 29, no. 8, pp. 529–531, Aug. 2019.

J. Garrett, and G. Yassin, "QMix: A Python package for simulating the quasiparticle tunneling currents in SIS junctions," *J. Open Source Softw.*, vol. 4, no. 35, pp. 1231, Mar. 2019.

I. Cortzen, J. Garrett, *et al.*, "PAHs as tracers of the molecular gas in star-forming galaxies," *Mon. Notices Royal Astron. Soc.*, vol. 482, no. 2, pp. 1618–1633, Oct. 2018.

J. Garrett, and E. Fear, "A New Breast Phantom with a Durable Skin Layer for Microwave Breast Imaging," *IEEE Trans. Antennas Propag.*, vol. 63, no. 4, pp. 1693–1700, Jan. 2015.

J. Garrett, and E. Fear, "Average Dielectric Property Analysis of Complex Breast Tissue with Microwave Transmission Measurements," *Sensors,* vol. 15, no. 1, pp. 1199–1216, Jan. 2015.

J. Garrett, and E. Fear, "Stable and Flexible Materials to Mimic the Dielectric Properties of Human Soft Tissues," *IEEE Antennas Wireless Propag. Lett.*, vol. 13, pp. 599–602, Mar. 2014.

J. Bourqui, J. Garrett, and E. Fear, "Measurement and Analysis of Microwave Frequency Signals Transmitted Through the Breast," *Int. J. Biomed. Imag.*, vol. 2012, pp. 562563, Dec. 2012.

Selected Conference Proceedings

J. Garrett, P. Grimes, and E. Tong, "Preliminary Design of a Multibeam Receiver for the SMA," in *31st Int. Sym. Space THz Tech.*, Tempe, AZ, 2020.

J. Garrett, F. Boussaha, C. Chaumont, B.-K. Tan, and G. Yassin, "Multi-tone Spectral Domain Analysis of a 230 GHz SIS Device," in *30th Int. Sym. Space THz Tech.*, Göteborg, Sweden, 2019.

J. Garrett, J. Leech, F. Boussaha, C. Chaumont, B. Ellison, and G. Yassin, "A 1×4 Focal Plane Array Using 230 GHz SIS Mixers," in *29th Int. Sym. Space THz Tech.*, Los Angeles, CA, 2018.

J. Garrett, H. Rashid, V. Desmaris, V. Belitsky, and G. Yassin, "Spectral Domain Simulation of SIS Frequency Multiplication," in *28th Int. Sym. Space THz Tech.*, Cologne, Germany, 2017.

J. Garrett, F. Boussaha, C. Chaumont, B.-K. Tan, and G. Yassin, "A 230 GHz Finline SIS Receiver with Wide IF Bandwidth," in *27th Int. Sym. Space THz Tech.*, Nanjing, China, 2016.

J. Garrett, B.-K. Tan, F. Boussaha, C. Chaumont, and G. Yassin, "A 220 GHz Finline Mixer with Ultra-Wide Instantaneous BW," in *26th Int. Sym. Space THz Tech.*, Cambridge, MA, 2015.

J. Garrett, and E. Fear, "Average Property Estimation Validation with Realistic Breast Models," in *8th Eur. Conf. Antennas Propag.*, The Hague, Netherlands, 2014, pp. 1279–1280.

J. Garrett, and E. Fear, "A Time- and Temperature-Stable Complex Breast Phantom for Microwave Breast Imaging," in *IEEE Antennas Propag. Sym.*, Lake Buena Vista, FL, 2013.

J. Garrett, J. Bourqui, and E. Fear, "Average Property Estimation of Breast Tissue," in *IEEE Antennas Propag. Sym.*, Chicago, IL, 2012.

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