John D. Garrett

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PROFILE

* I am a postdoctoral research assistant in Astrophysics at the University of Oxford. My research is focused on advanced millimetre- and submillimetre-wave receivers for radio astronomy. For my DPhil thesis, I developed a wide bandwidth SIS mixer and a focal plane array at 230 GHz.
* I have a strong technical background in:
  - **Superconducting detectors**: SIS mixer theory, modelling quantum tunnelling effects, and testing SIS devices in cryogenic systems
  - **Electrical engineering**: RF design, electromagnetic simulations, and low-noise testing
  - **Software development**: building complex simulation software and analyzing experimental results from SIS mixers
* I have published my research in top academic journals, including 5 first author papers. These papers combined have 180 citations.

Work Experience

POSTDOC

Astrophysics, University of Oxford, Oxford, UK — Sep. 2018 – pres.

* Projects: Testing a new terahertz receiver system, simulating frequency multiplication in distributed SIS junctions, and developing a focal plane array at 230 GHz.
* Publishing the research from my DPhil.

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: Dr. 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
  - This can be used to provide *a priori* information to microwave imaging algorithms
* Graduate courses including letter grade: Antenna Design (A+), RFIC Design (A+), Analog IC Design (A), RF Microwave Passive Circuits (A+). GPA: 4.0 / 4.0

BACHELORS

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

* Capstone project: *Nanowire Metamaterials for Biosensing Applications*
* Graduated with distinction

Publications

Journal Papers

J. Garrett, H. Rashid, G. Yassin, V. Desmaris, A. Pavolotsky, and V. Belitsky, "A Non-Linear Transmission Line Model for Simulating Distributed SIS Frequency Multipliers," submitted for publication.

J. Garrett, B.-K. Tan, F. Boussaha, C. Chaumont, and G. Yassin, "Simulating the Behavior of a 230 GHz SIS Mixer Using Multi-Tone Spectral Domain Analysis," submitted for publication.

J. Garrett, A. Pollak, G. Yassin, and M. Henry, "A Compact and Easy to Fabricate *E*-plane Waveguide Bend," *IEEE Microwave and Wireless Components Letters*, vol. 29, no. 8, to be published.

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

I. Cortzen, J. Garrett, G. Magdis, D. Rigopoulou, F. Valentino, M. Pereira-Santaella, F. Combes, A. Alonso-Herrero, S. Toft, E. Daddi, D. Elbaz, C. Gomez-Guijarro, M. Stockmann, J. Huang, and C. Kramer, "PAHs as tracers of the molecular gas in star-forming galaxies," *Monthly Notices of the Royal Astronomical Society,* 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 Transactions on Antennas and Propagation,* 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 (MDPI),* 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 and Wireless Propagation Letters,* 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," *International Journal of Biomedical Imaging,* vol. 2012, Dec. 2012, Art. ID 562563.

Selected Conference Proceedings

J. Garrett, F. Boussaha, C. Chaumont, B.-K. Tan, and G. Yassin, "Multi-tone Spectral Domain Analysis of a 230 GHz SIS Device," in *Proceedings of the 30th International Symposium on Space Terahertz Technology (ISSTT)*, Gothenburg, 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 *Proceedings of the 29th International Symposium on Space Terahertz Technology (ISSTT)*, Los Angeles, CA, 2018, pp. 240–244.

J. Garrett, H. Rashid, V. Desmaris, V. Belitsky, and G. Yassin, "Spectral Domain Simulation of SIS Frequency Multiplication," in *Proceedings of the 28th International Symposium on Space Terahertz Technology (ISSTT)*, 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 *Proceedings of the 27th International Symposium on Space Terahertz Technology (ISSTT)*, Nanjing, China, 2016.

J. Garrett, B.-K. Tan, F. Boussaha, C. Chaumont, and G. Yassin, "A 220 GHz Finline Mixer with Ultra-Wide Instantaneous Bandwidth," in *Proceedings of the 26th International Symposium on Space Terahertz Technology (ISSTT)*, Cambridge, MA, 2015.

J. Leech, G. Yassin, B.-K. Tan, Y. Zhou, J. Garrett, and P. Grimes, "An SIS Mixer Based Focal-Plane Array at 230 GHz," in *Proceedings of the 26th International Symposium on Space Terahertz Technology (ISSTT)*, Cambridge, MA, 2015.

J. Garrett, and E. Fear, "Average Property Estimation Validation with Realistic Breast Models," in *Proceedings of the 8th European Conference on Antennas and Propagation (EuCAP)*, The Hague, Netherlands, 2014, pp. 1279–1280.

Scholarships and Awards

Scholarships

* Clarendon Fund Scholarship & New College Graduate Scholarship — 2014 – 2018
  - £13,863/year plus all university and college fees for 3.5 years
  - Awarded to top 1.8% of graduate applicants to Oxford
* Alberta Innovates Technology Futures (AITF) Scholarship — 2012 – 2014
  - Provincial award, $26,500/year for 2 years
* NSERC Undergraduate Student Research Award (USRA) — 2011
  - National award, $4,500/16 weeks

Selected Awards

* ALIS Sir James Lougheed Award of Distinction (Doctoral) — 2015
  - Provincial scholarship (1 of 8 yearly): $20,000
* IEEE Antennas and Propagation Pre-Doctoral Research Award — 2013
  - International award (1 of 6 yearly): $1,000 USD

Teaching

Teaching Assistant

* First Year Electromagnetics, University of Oxford — 2016 – 2018
  - Assisting weekly labs (24 hrs./term)
* Electromagnetic Waves and Applications, University of Calgary — 2013 – 2014
  - Planning material, grading, and delivering tutorials and labs (102 hrs./term)
* Electromagnetic Fields and Applications, University of Calgary — 2013
  - Assisting weekly tutorials, drop-in hours and grading (68 hrs./term)

Extracurricular

Volunteer

* Stargazing at Oxford (science outreach) — 2014 – 2018
* Sports Representative, New College MCR Committee — 2015
* Volunteer Ski Instructor, Canadian Association for Disabled Skiing — 2012 – 2013

Competitive Athletics

* New College Rugby Football Club — 2014 – 2018
* New College VIII's (rowing) — 2014 – 2015
* Calgary Rams Rugby Club — 2012 – 2014
* University of Calgary Triathlon Club — 2013
* University of Alberta Triathlon Club — 2010 – 2012