Jake A. Connors

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Research Interests Radio Astronomy Instrumentation, Microwave Device Physics, Microwave Measurement and Design, Nanofabrication, Electronics, RF electronics, High energy particle physics, Detector physics

Education

Harvard University, Cambridge, MA

Ph.D., Physics, *Expected:* Spring 2018

- Thesis Topic: Modeling, Fabrication, and Measurement of Microwave Graphene FETs
- Advisors: Ray Blundell, Ph.D. and Paul Grimes, Ph.D.

M.S., Physics, May 2013

The Ohio State University, Columbus, OH

B.S., Physics, June 2011

- *Summa Cum Laude with Research Distinction*
- Thesis Topic: A Search For the Standard Model Higgs Boson Produced in Association with Top Quark Pairs at CDFII
- Advisors: Richard Hughes, Ph.D and Brian Winer, Ph.D

Research Experience

Graduate Research Assistant Sept 2015 to Present
Harvard-Smithsonian Center for Astrophysics (CfA)
Supervisor: Ray Blundell, Ph.D and Paul Grimes, Ph.D.

Graduate Research Assistant Sept 2013 to Sept 2015
Dept. of Astronomy,
Harvard University
Supervisor: John Kovac, Ph.D

Graduate Research Assistant August 2011 to Sept 2013
Dept. of Physics,
Harvard University
Supervisor: Melissa Franklin, Ph.D

Undergraduate Research Assistant Sept 2008 to June 2011
Dept. of Physics,
The Ohio State University
Supervisors: Richard Hughes, Ph.D and Brian Winer, Ph.D

Student Research Assistant June 2006 to Aug 2008
Superconductivity Group,
Propulsion Directorate,
United States Air Force Research Laboratory
Supervisors: Paul Barnes, Ph.D and George Levin, Ph.D.

Awards

Fellowships and Scholarships

- National Science Foundation Graduate Research Fellowship Sept. 2011
- National Barry M. Goldwater Scholar April 2010

Travel Awards

- Excellence in Detectors and Instrumentation Technologies School March 2013
  Tsukuba, Japan

Teaching Awards
- Harvard University Certificate of Distinction in Teaching — April 2017

Research Awards
- Fermilab Result of the Week — Sept. 2012

Student Awards —Harvard University, Dept. of Physics
- James Mills Pierce Fellowship — Sept. 2011

Student Awards — Ohio State University
- Physics Dept. Senior Alumni Award — 2011
- Physics Dept. Summer Research Grant — 2010
- Physics Dept. Smith Junior Award — 2010
- Arts and Sciences College Honors Research Scholarship — 2009
- Undergraduate Research Office Summer Fellowship — 2009
- Physics Dept. Smith Sophomore Award — 2009
- Physics Dept. Helen Cowan Book Award — 2008
- Tumbleson Honors Math Dept. Scholarship — 2008
- Maximus Scholarship — 2007
- Physics Dept. Valentino Academic Achievement Scholarship — 2007

Conference Contributions

- International Symposium on Space Terahertz Technology (ISSTT), Cologne, Germany — March 2017
  Talk Title: Measurement and design of a waveguide probe based WR3.4 optically controlled modulator
- International Symposium on Space Terahertz Technology (ISSTT), Cologne, Germany — March 2017
  Poster Title: Design and optimization of wideband micro-patterned quasi-optical matching structures
- American Physical Society Meeting, Pasadena, CA — April 2011
  Talk Title: Search for the standard model Higgs boson produced in association with top quarks at CDF
  Abstract ID: BAPS.2011.APR.B8.8
- Sigma Xi Annual Meeting, Woodlands, Texas — Nov. 2009
  Poster Title: A Search For Dark Matter Microhalos with the Fermi Gamma Ray Space Telescope

Teaching Experience

Teaching Fellow — Fall 2016
PHY 123/223 - Laboratory Electronics
with Masahiro Morii, Ph.D and Tom Hayes
Physics Department,
Harvard University

Teaching Fellow — Spring 2015
ASTR 191 - Astrophysics Laboratory
with John Kovac, Ph.D
Astronomy Department,
Harvard University

Teaching Fellow — Fall 2013
PHY 123/223 - Laboratory Electronics
with Masahiro Morii, Ph.D and Tom Hayes
Physics Department,
Harvard University

Refereed Journal Publications

1. *Effective Dielectric Constants of Micro-Patterned Materials*
   Jake A. Connors, C.-Y. E. Tong, Paul K. Grimes , Scott Paine
   In prep.

2. *BICEP2 / Keck Array IX: New Bounds on Anisotropies of CMB Polarization Rotation and Implications for Axion-Like Particles and Primordial Magnetic Fields*
   BICEP2/Keck Collaboration including **Jake Connors**
   arXiv:1705.02523, 2017

3. BICEP2/Keck Array VIII: Measurement of Gravitational Lensing from Large-scale B-mode Polarization
   BICEP2/Keck Collaboration including **Jake Connors**
   The Astrophysical Journal, 833, 228, 2016

4. *Initial Performance of Bicep3: A Degree Angular Scale 95 GHz Band Polarimeter*
   W. L. K. Wu et al. (BICEP3 Collaboration) including **Jake Connors**
   Journal of Low Temperature Physics, 184, 765-771, 2106

5. *BICEP2/Keck Array. VII. Matrix Based E/B Separation Applied to Bicep2 and the Keck Array*
   BICEP2 Collaboration including **Jake Connors**
   The Astrophysical Journal, 825, 66, 2016

6. *Improved Constraints on Cosmology and Foregrounds from BICEP2 and Keck Array Cosmic Microwave Background Data with Inclusion of 95 GHz Band*
   BICEP2 Collaboration including **Jake Connors**
   Physical Review Letters, 116, 031302, 2016

7. *BICEP2/Keck Array V: Measurements of B-mode Polarization at Degree Angular Scales and 150 GHz by the Keck Array*
   BICEP2/Keck Collaboration including **Jake Connors**
   The Astrophysical Journal, 811, 126, 2015

8. *Joint Analysis of BICEP2/Keck Array and Planck Data*
   BICEP2/Keck Collaboration including **Jake Connors**
   Physical Review Letters, 114, 101301, 2015

9. *Search for the Standard Model Higgs Boson Produced in Association with Top Quarks Using the Full CDF Data Set*
   T. Aaltonen et al. (CDF Collaboration) including **Jake Connors**
   Physical Review Letters, 108, 181802, 2012

10. *Stability and Normal Zone Propagation Speed in YBCO Coated Conductors With Increased Interfacial Resistance*
    George A. Levin, Paul N. Barnes, Jose P. Rodriguez, **Jake A. Connors**, John S. Bulmer
    IEEE Transactions on Applied Superconductivity, 19(3):2504–2507, 2009

11. *Emergence of dissipative structures in current-carrying superconducting wires*
    G. A. Levin, P. N. Barnes, J. P. Rodriguez, **J. A. Connors**, J. S. Bulmer
    Physical Review E, 79, 056224, 2009

Conference Proceedings

1. *Design and Optimization of Micro-patterned Quasi-optical Impedance Transformers*
   Jake A. Connors, C.-Y. E. Tong, Paul K. Grimes , Scott Paine
   Proceeding of the ISSTT, 2017

2. *Design and Measurement of a Waveguide Probe Based WR3.4 Optically Controlled Modulator*
   Jake A. Connors, C.-Y. E. Tong, Paul K. Grimes, A. Gebreyohannes, Lei Liu
   Proceedings of the ISSTT, 2017

3. *Optical characterization of the BICEP3 CMB polarimeter at the South Pole*
   K. S. Karkare et al. (BICEP3 Collaboration) including **Jake Connors**
   Proceedings of the SPIE, 9914, 991430, 2016

4. *BICEP3 focal plane design and detector performance*
   H. Hui et al. (BICEP3 Collaboration) including **Jake Connors**
   Proceedings of the SPIE, 9914, 99140T, 2016

5. *BICEP3 performance overview and planned Keck Array upgrade*
   J. A. Grayson et al. (BICEP3/Keck Collaboration) including **Jake Connors**
   Proceedings of the SPIE, 9914, 99140S, 2016

6. *Keck array and BICEP3: spectral characterization of 5000+ detectors*
   K. Karkare et al. (BICEP3 Collaboration) including **Jake Connors**
   Proceedings of the SPIE, 9153, 91533B, 2014

7. *BICEP3: a 95GHz refracting telescope for degree-scale CMB polarization*
   Z. Ahmed et al. (BICEP3 Collaboration) including **Jake Connors**
   Proceedings of the SPIE, 9153, 91531N, 2014

Hardware and Software Skills

Software:

- C++, ROOT, Pascal, Perl, Python, UNIX shell scripting, Mathematica, Matlab, LabView, GCode, VISA

Hardware:

- Nanofabrication: Electron-beam lithography (125kV and 30kV) and Photolithography, RIE, Silicon DRIE, Thin-Film Deposition, ALD, 2D materials, SEM, Ellipsometry, Profilometry
- Microwave and mm-Wave Engineering: Antenna design (Horn, Planar, Interferometric/ Phased Array) , Low Noise Amplifiers, Power Amplifiers, Mixers, Couplers, Filters, Impedance Transformers, PLL, Waveguide components, Quasi-optical Test Fixtures and Systems
- Electronics CAD: Ansys HFSS, FEKO, Genesys, Scikit-RF (python), Personal code for amplifier/mixer modeling and noise analysis, quasi-optical design
- Microwave and mm-Wave Measurement: Vector Network Analyzer (up to 350+GHz both in waveguide and quasioptically), Spectrum Analyzers, Synthesizers, Vector Voltmeters, Power Meters, Oscilloscope, Probe Station (and de-embedding)
- Low Freq. Electronics Design: DC Low Noise Amplifiers, High-Current Amplifiers, Filters, Lock-in Amplifiers, Phase Lock Loops, Oscillators, Regulators, ADC/DAC, Micro-controllers and PLD's
- NIR optical components: Laser Diodes, Fiber components, Modulators
- PCB Layout and Design: EagleCAD and Altium
- Mechanical Design and CAD: Solidworks, AutoCAD, Draftsight,
- Cryogenic and Vacuum Engineering: HV and UHV components, Pulse Tube Cryocoolers, Low-thermal conductance cabling and mechanical design
- Gaseous particle detectors, Scintillator Counters and Triggers, Photomultipliers, Gaseous Detectors, Micro-pattern Gas Detectors
- Machining (Manual and CNC Vertical Mill and Lathe) , Welding (MIG, TIG, Oxy-Acetylene), Soldering and Brazing