Duncan Joseph Watts

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Research Interests:

Cosmology
Cosmic Microwave Background Physics
Inflation
Galactic Foregrounds
Nonlinear optimization
Monte Carlo Markov Chain methods
Distributed computing (`slurm`, `PBS`)
Multivariate statistics

Education:

Johns Hopkins University
2012–2018, Ph.D. Physics and Astronomy
Advisor: Tobias A. Marriage
Thesis: Methods and Projections for Joint Foreground and Cosmological Parameter Estimation for the CLASS Experiment
2012–2014, M.A. Physics and Astronomy

Harvard University
2008–2012, A.B. Departmental Honors, Physics and Astronomy
Advisor: Douglas P. Finkbeiner
Thesis: An Investigation of Gamma-Rays in the Galactic Center

Teaching and Outreach

Fall 2012, Teaching Assistant, Introductory Physics Recitation and Laboratory
Fall 2016, Teaching Assistant/Lecturer, Graduate Cosmology
2012–2018, Volunteer, JHU Physics and Astronomy Graduate Student Public Outreach Group
2013–2016, Maryland Space Grant Observatory Fellowship

Collaborations:

2013–, The Cosmology Large Angular Scale Surveyor (CLASS) Collaboration

Conference Presentations and Talks

1. CMB-S4 Workshop, *Projected Constraints on Optical Depth to Reionization and Neutrino Mass from the CLASS Experiment*, August 2017
2. Great Lakes Cosmology Workshop, *Measuring CMB B-mode Polarization with Galactic Foregrounds on a Cut Sky*, June 2016
3. AAS Winter Meeting *Galactic foreground cleaning in support of a primordial CMB B-mode measurement*, January 2014

Workshops and Meetings

1. CMB-S4 Workshop, August 2017
2. SciCoder: Astroinformatics for Astronomers, July 2014

SELECTED PUBLICATIONS:

1. **Watts, D. J.**, G. A. Addison, C. L. Bennett, and J. L. Weiland . Beyond optical depth: Future determination of ionization history from the CMB. *arXiv e-prints*, page arXiv:1910.00590, Oct 2019
2. **Watts, Duncan J.**, Bingjie Wang, Aamir Ali, John W. Appel, Charles L. Bennett, David T. Chuss, Sumit Dahal, Joseph R. Eimer, Thomas Essinger-Hileman, Kathleen Harrington, Gary Hinshaw, Jeffrey Iuliano, Tobias A. Marriage, Nathan J. Miller, Ivan L. Padilla, Lucas Parker, Matthew Petroff, Karwan Rostem, Edward J. Wollack, and Zhilei Xu. A Projected Estimate of the Reionization Optical Depth Using the CLASS Experiment's Sample Variance Limited E-mode Measurement. ApJ, 863(2):121, Aug 2018
3. **Watts, D. J.**, D. Larson, T. A. Marriage, M. H. Abitbol, J. W. Appel, C. L. Bennett, D. T. Chuss, J. R. Eimer, T. Essinger-Hileman, N. J. Miller, K. Rostem, and E. J. Wollack. Measuring the Largest Angular Scale CMB B-mode Polarization with Galactic Foregrounds on a Cut Sky. ApJ, 814:103, December 2015
4. E. R. Switzer and **Watts, D. J.** Robust likelihoods for inflationary gravitational waves from maps of cosmic microwave background polarization. Phys. Rev. D, 94(6):063526, September 2016
5. J. L. Weiland, K. Osumi, G. E. Addison, C. L. Bennett, **Watts, D. J.**, M. Halpern, and G. Hinshaw. Effect of Template Uncertainties on the WMAP and Planck Measures of the Optical Depth Due To Reionization. *ArXiv e-prints*, January 2018
6. G. E. Addison, **Watts, D. J.**, C. L. Bennett, M. Halpern, G. Hinshaw, and J. L. Weiland. Elucidating ΛCDM: Impact of Baryon Acoustic Oscillation Measurements on the Hubble Constant Discrepancy. ApJ, 853:119, February 2018
7. G. E. Addison, Y. Huang, **Watts, D. J.**, C. L. Bennett, M. Halpern, G. Hinshaw, and J. L. Weiland. Quantifying Discordance in the 2015 Planck CMB Spectrum. ApJ, 818:132, February 2016

ALL PUBLICATIONS:

6. D. T. Chuss, A. Ali, M. Amiri, J. Appel, C. L. Bennett, F. Colazo, K. L. Denis, R. Dünner, T. Essinger-Hileman, J. Eimer, P. Fluxa, D. Gothe, M. Halpern, K. Harrington, G. Hilton, G. Hinshaw, J. Hubmayr, J. Iuliano, T. A. Marriage, N. Miller, S. H. Moseley, G. Mumby, M. Petroff, C. Reintsema, K. Rostem, K. U-Yen, **Watts, D.**, E. Wagner, E. J. Wollack, Z. Xu, and L. Zeng. Cosmology Large Angular Scale Surveyor (CLASS) Focal Plane Development. *Journal of Low Temperature Physics*, 184:759–764, August 2016
7. K. Harrington, T. Marriage, A. Ali, J. W. Appel, C. L. Bennett, F. Boone, M. Brewer, M. Chan, D. T. Chuss, F. Colazo, S. Dahal, K. Denis, R. Dünner, J. Eimer, T. Essinger-Hileman, P. Fluxa, M. Halpern, G. Hilton, G. F. Hinshaw, J. Hubmayr, J. Iuliano, J. Karakla, J. McMahon, N. T. Miller, S. H. Moseley, G. Palma, L. Parker, M. Petroff, B. Pradenas, K. Rostem, M. Sagliocca, D. Valle, **Watts, D.**, E. Wollack, Z. Xu, and L. Zeng. The Cosmology Large Angular Scale Surveyor. In *Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy VIII*, volume 9914 of Proc. SPIE, page 99141K, July 2016
8. N. J. Miller, D. T. Chuss, T. A. Marriage, E. J. Wollack, J. W. Appel, C. L. Bennett, J. Eimer, T. Essinger-Hileman, D. J. Fixsen, K. Harrington, S. H. Moseley, K. Rostem, E. R. Switzer, and **Watts, D. J.** Recovery of Large Angular Scale CMB Polarization for Instruments Employing Variable-delay Polarization Modulators. ApJ, 818:151, February 2016
9. J. W. Appel, A. Ali, M. Amiri, D. Araujo, C. L. Bennet, F. Boone, M. Chan, H.-M. Cho, D. T. Chuss, F. Colazo, E. Crowe, K. Denis, R. Dünner, J. Eimer, T. Essinger-Hileman, D. Gothe, M. Halpern, K. Harrington, G. Hilton, G. F. Hinshaw, C. Huang, K. Irwin, G. Jones, J. Karakula, A. J. Kogut, D. Larson, M. Limon, L. Lowry, T. Marriage, N. Mehrle, A. D. Miller, N. Miller, S. H. Moseley, G. Novak, C. Reintsema, K. Rostem, T. Stevenson, D. Towner, K. U-Yen, E. Wagner, **Watts, D.**, E. Wollack, Z. Xu, and L. Zeng. The cosmology large angular scale surveyor (CLASS): 38-GHz detector array of bolometric polarimeters. In *Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy VII*, volume 9153 of Proc. SPIE, page 91531J, July 2014
10. T. Essinger-Hileman, A. Ali, M. Amiri, J. W. Appel, D. Araujo, C. L. Bennett, F. Boone, M. Chan, H.-M. Cho, D. T. Chuss, F. Colazo, E. Crowe, K. Denis, R. Dünner, J. Eimer, D. Gothe, M. Halpern, K. Harrington, G. C. Hilton, G. F. Hinshaw, C. Huang, K. Irwin, G. Jones, J. Karakla, A. J. Kogut, D. Larson, M. Limon, L. Lowry, T. Marriage, N. Mehrle, A. D. Miller, N. Miller, S. H. Moseley, G. Novak, C. Reintsema, K. Rostem, T. Stevenson, D. Towner, K. U-Yen, E. Wagner, **Watts, D.**, E. J. Wollack, Z. Xu, and L. Zeng. CLASS: the cosmology large angular scale surveyor. In *Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy VII*, volume 9153 of Proc. SPIE, page 91531I, July 2014