Eric R. Switzer

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Dated: Dec. 10, 2013.

Employment and education

Astrophysicist, NASA GSFC, Observational Cosmology Laboratory, 2013-

Senior Research Associate, CITA, University of Toronto, 2011-2013.
Postdoctoral Fellow, Kavli Institute for Cosmological Physics, University of Chicago, 2008-2011.
Ph.D. Physics, Princeton University, 2008.
B.A. Physics (with honors), University of Chicago, 2003.
US citizen.

Past and present research areas: instrumentation and data analysis for cosmic microwave background (CMB) experiments, cosmological helium recombination and reionization, mapping diffuse 21 cm emission at $z \sim 1$. Dissertation adviser: Lyman Page. Title: *Small-scale anisotropies of the cosmic microwave background: Experimental and theoretical perspectives*.

Honors and awards

CITA Senior Research Associate, 2011-2013.
Compton Lecture Series, "The Physics of Energy Devices," University of Chicago, fall 2009. →
KICP Postdoctoral Fellowship, University of Chicago, 2008-2011.
Centennial Fellowship, Princeton University Graduate School, 2003-2008.
Joseph Henry Merit Prize, Princeton University Graduate School, 2003.
Member of Phi Beta Kappa, University of Chicago.
DESY-Zeuthen Summer Student Research Fellowship, 2002.

Refereed Publications

1. S. Das, T. Louis, M. R. Nolta, ACT Collaboration, "The Atacama Cosmology Telescope: Temperature and Gravitational Lensing Power Spectrum Measurements from Three Seasons of Data," JCAP **4** 14, (2014). →

2. D. Marsden, M. Gralla, T. A. Marriage, **E. R. Switzer**, B. Partridge, M. Massardi, G. Morales, ACT Collaboration, "The Atacama Cosmology Telescope: Dusty Star-Forming Galaxies and Active Galactic Nuclei in the Southern Survey," *MNRAS* **439**(2) 1556 (2014). →

3. L. M. Mocanu, T. M. Crawford, J. D. Vieira, SPT Collaboration, "Extragalactic millimeter-wave point source catalog, number counts and statistics from 771 square degrees of the SPT-SZ Survey," *ApJ* **779**(1) 61 (2013). →

4. J. L. Sievers, R. A. Hlozek, M. R. Nolta, ACT Collaboration, "The Atacama Cosmology Telescope: cosmological parameters from three seasons of data," *JCAP* **10**(60), (2013). →

5. M. Hasselfield, K. Moodley, ACT Collaboration, "The Atacama Cosmology Telescope: Beam Measurements and the Microwave Brightness Temperatures of Uranus and Saturn," *ApJS* **209**(1) 17 (2013). →

6. M. Hasselfield, M. Hilton, T. A. Marriage, ACT Collaboration, "The Atacama Cosmology Telescope: Sunyaev-Zel'dovich selected galaxy clusters at 148 GHz from three seasons of data," *JCAP* **7**(8), (2013). →
7. J. Dunkley, E. Calabrese, J. Sievers, ACT Collaboration, "The Atacama Cosmology Telescope: likelihood for small-scale CMB data," *JCAP* **7**(25), (2013). →
8. **E. R. Switzer**, K. W. Masui, K. Bandura, L.-M. Calin, T.-C. Chang, X.-L. Chen, Y.-C. Li, Y.-W. Liao, A. Natarajan, U.-L. Pen, J. B. Peterson, J. R. Shaw, T. C. Voytek, "Determination of $z \sim 0.8$ neutral hydrogen fluctuations using the 21 cm intensity mapping auto-correlation," *MNRASL* 10.1093/slt074 (2013). →
9. E. Calabrese, R. Hlozek, ACT Collaboration, "Cosmological parameters from pre-Planck cosmic microwave background measurements", *PRD* **87**(10), 103012 (2013). →
10. J. Chluba, **E. R. Switzer**, D. Nagai, K. Nelson, "Sunyaev-Zeldovich signal processing and temperature-velocity moment method for individual clusters," *MNRAS* **430**(4) 3054 (2013). →
11. N. Sehgal, ACT Collaboration, "The Atacama Cosmology Telescope: Relation between Galaxy Cluster Optical Richness and Sunyaev-Zel'dovich Effect," *ApJ* **767**(1) 38 (2013). →
12. F. Menanteau, C. Sifón, ACT Collaboration, "The Atacama Cosmology Telescope: Physical Properties of Sunyaev-Zel'dovich Effect Clusters on the Celestial Equator," *ApJ* **765**(1) 67, (2013). →
13. M. Farhang, J. R. Bond, J. Chluba, **E. R. Switzer**, "Constraints on Perturbations to the Recombination History from Measurements of the Cosmic Microwave Background Damping Tail," *ApJ* **764**(2) 137 (2013). →
14. K. W. Masui, **E. R. Switzer**, N. Banavar, K. Bandura, C. Blake, L.-M. Calin, T.-C. Chang, X. Chen, Y.-C. Li, Y.-W. Liao, A. Natarajan, U.-L. Pen, J. B. Peterson, J. R. Shaw, T. C. Voytek, "Measurement of 21 cm brightness fluctuations at $z \sim 0.8$ in cross-correlation," *ApJL* **763**(1) L20 (2013). →
15. R. Dünner, M. Hasselfield, T. A. Marriage, J. Sievers, ACT Collaboration, "The Atacama Cosmology Telescope: Data Characterization and Mapmaking," *ApJ* **762**(1) 10 (2013). →
16. M. J. Wilson, B. D. Sherwin, J. C. Hill, ACT Collaboration, "Atacama Cosmology Telescope: A measurement of the thermal Sunyaev-Zel'dovich effect using the skewness of the CMB temperature distribution," *PRD* **86**(12) 122005 (2012). →
17. B. D. Sherwin, S. Das, A. Hajian, ACT Collaboration, "The Atacama Cosmology Telescope: Cross-Correlation of CMB Lensing and Quasars," *PRD* **86**(8) 083006 (2012). →
18. N. Hand, ACT Collaboration, "Detection of Galaxy Cluster Motions with the Kinematic Sunyaev-Zel'dovich Effect," *PRL* **109**(4) 041101 (2012). →
19. J. Chluba, J. Fung, **E. R. Switzer**, "Radiative transfer effects during primordial helium recombination," *MNRAS* **423**(4) 3227 (2012). →
20. E. D. Reese, T. Mroczkowski, F. Menanteau, M. Hilton, J. Sievers, ACT Collaboration, "The Atacama Cosmology Telescope: High-Resolution Sunyaev-Zel'dovich Array Observations of ACT SZE-selected Clusters from the Equatorial Strip" *ApJ* **751**(1) 12 (2012). →
21. R. Hlozek, J. Dunkley, ACT Collaboration, "The Atacama Cosmology Telescope: a measurement of the primordial power spectrum," *ApJ* **749**(1) 90 (2012). →
22. A. Hajian, M. P. Viero, ACT Collaboration, "Correlations in the (Sub)millimeter background from ACTxBLAST," *ApJ* **744**(1) 40 (2012). →

23. A. Hajian, ACT Collaboration, "The Atacama Cosmology Telescope: Calibration with WMAP Using Cross-Correlations," *ApJ* **740** 86 (2011). →

24. J. Dunkley, R. Hlozek, J. Sievers, ACT Collaboration, "The Atacama Cosmology Telescope: Cosmological Parameters from the 2008 Power Spectrum," *ApJ* **739**(1) 52 (2011). →

25. T. A. Marriage, ACT Collaboration, "The Atacama Cosmology Telescope: Sunyaev-Zel'dovich-Selected Galaxy Clusters at 148 GHz in the 2008 Survey," *ApJ* **737**(2) 61 (2011). →

26. B. Sherwin, J. Dunkley, S. Das, ACT Collaboration, "Evidence for Dark Energy from the Cosmic Microwave Background Alone Using the Atacama Cosmology Telescope Lensing Measurements," *PRL* **107**(2) 021302 (2011). →

27. S. Das, B. Sherwin, ACT Collaboration, "Detection of the Power Spectrum of Cosmic Microwave Background Lensing by the Atacama Cosmology Telescope," *PRL* **107**(2) 021301 (2011). →

28. N. Hand, ACT Collaboration, "The Atacama Cosmology Telescope: Detection of Sunyaev-Zel'Dovich Decrement in Groups and Clusters Associated with Luminous Red Galaxies," *ApJ* **736**(1) 39 (2011). →

29. D. S. Abbot, **E. R. Switzer**, "The Steppenwolf: A Proposal for a Habitable Planet in Interstellar Space," *ApJL* **735**(2) L27 (2011). →

30. D. S. Swetz, ACT Collaboration, "Overview of the Atacama Cosmology Telescope: Receiver, Instrumentation, and Telescope Systems," *ApJS* **194**(2) 41 (2011). →

31. N. Sehgal, H. Trac, ACT Collaboration, "The Atacama Cosmology Telescope: Cosmology from Galaxy Clusters Detected via the Sunyaev-Zel'dovich Effect," *ApJ* **732**(1) 44 (2011). →

32. T. A. Marriage, J. B. Juin, Y.-T. Lin, D. Marsden, M. R. Nolta, B. Partridge, ACT Collaboration, "Atacama Cosmology Telescope: Extragalactic Sources at 148 GHz in the 2008 Survey," *ApJ* **731**(2) 100 (2011). →

33. S. Das, T. A. Marriage, ACT Collaboration, "The Atacama Cosmology Telescope: A Measurement of the Cosmic Microwave Background Power Spectrum at 148 and 218 GHz from the 2008 Southern Survey," *ApJ* **729**(1) 62-78 (2011). →

34. A. D. Hincks, ACT Collaboration, "The Atacama Cosmology Telescope (ACT): Beam Profiles and First SZ Cluster Maps," *ApJS* **191**(2) 423-438 (2010). →

35. F. Menanteau, J. Gonzlez, J. B. Juin, T. A. Marriage, E. D. Reese, ACT Collaboration, "The Atacama Cosmology Telescope: Physical Properties and Purity of a Galaxy Cluster Sample Selected via the Sunyaev-Zel'dovich Effect," *ApJ* **723**(2) 1523-1541 (2010). →

36. M. McQuinn, **E. R. Switzer**, "The He I 584 Å Forest as a Diagnostic of Helium Reionization," MNRAS **408**(3) 1945-1955 (2010). →

37. J. W. Fowler, ACT Collaboration, "The Atacama Cosmology Telescope: A Measurement of the $600 < \ell < 8000$ Cosmic Microwave Background Power Spectrum at 148 GHz," *ApJ* **722**(2) 1148-1161 (2010). →

38. N. R. Hall, R. Keisler, L. Knox, C. L. Reichardt, SPT Collaboration, "Angular Power Spectra of the Millimeter Wavelength Background Light from Dusty Star-forming Galaxies with the South Pole Telescope," *ApJ* **718**(2) 632-646 (2010). →

39. T. M. Crawford, **E. R. Switzer**, W. L. Holzapfel, C. L. Reichardt, D. P. Marrone, J. D. Vieira, "A Method for Individual Source Brightness Estimation in Single- and Multi-band Data," *ApJ* **718**(1) 513-521 (2010). →

40. J. D. Vieira, T. M. Crawford, **E. R. Switzer**, SPT Collaboration, "Extragalactic Millimeter-wave Sources in South Pole Telescope Survey Data: Source Counts, Catalog, and Statistics for an 87 Square-degree Field," *ApJ* **719**(1) 763-783 (2010). →

41. M. McQuinn, **E. R. Switzer**, "Redshifted intergalactic $^3\mathrm{He}+$ 8.7 GHz hyperfine absorption," *PRD* **80**(6) 063010 (2009). →

42. **E. R. Switzer**, "Small-scale anisotropies of the cosmic microwave background: Experimental and theoretical perspectives," *Princeton Ph.D. Thesis* (2008). →

43. **E. R. Switzer**, C. M. Hirata, "Primordial helium recombination III: Thomson scattering, isotope shifts, and cumulative results," *PRD* **77**(8) 083008 (2008). →

44. C. M. Hirata, **E. R. Switzer**, "Primordial helium recombination II: two-photon processes," *PRD* **77**(8) 083007 (2008). →

45. **E. R. Switzer**, C. M. Hirata, "Primordial helium recombination I: feedback, line transfer, and continuum opacity," *PRD* **77**(8) 083006 (2008). →

46. J. W. Fowler, M. D. Niemack, S. R. Dicker, ACT Collaboration, "Optical design of the Atacama Cosmology Telescope and the Millimeter Bolometric Array Camera," *Applied Optics* **46**(17) 3444-3454 (2007). →

47. **E. R. Switzer**, C. M. Hirata, "Ionizing radiation from hydrogen recombination strongly suppresses the lithium scattering signature in the CMB," *PRD* **72**(8) 083002 (2005). →

48. K. Abazajian, **E. R. Switzer**, S. Dodelson, K. Heitmann, S. Habib, "Nonlinear cosmological matter power spectrum with massive neutrinos: The halo model," *PRD* **71**(4) 043507 (2005). →

49. J. A. Switzer, C.-J. Hung, L.-Y. Huang, **E. R. Switzer**, T. D. Golden, and E. W. Bohannan, "Electrochemical Self-Assembly of Copper/Cuprous Oxide Layered Nanostructures," *J. Am. Chem. Soc.* **120** 3530-3531 (1998). →

Submitted Publications

1. **E. R. Switzer**, A. Liu, "Erasing the variable: Empirical foreground discovery for global 21 cm spectrum experiments", astro-ph/1404.7561 (2014). →

2. D. T. Chuss, J. R. Eimer, D. J. Fixsen, J. Hinderks, A. J. Kogut, J. Lazear, P. Mirel, **E. R. Switzer**, G. M. Voellmer, E. J. Wollack, "Variable-delay Polarization Modulators for Cryogenic Millimeter-wave Applications", astro-ph/1403.1652 (2014). →

3. N. Hand, A. Leauthaud, S. Das, B. D. Sherwin, ACT Collaboration, "First Measurement of the Cross-Correlation of CMB Lensing and Galaxy Lensing", astro-ph/1311.6200 (2013). →

4. M. B. Gralla, D. Crichton, T. A. Marriage, W. Mo, ACT Collaboration, "A Measurement of the Millimeter Emission and the Sunyaev-Zel'dovich Effect Associated with Low-Frequency Radio Sources", astro-ph/1310.8281 (2013). →

Proceedings, Reports

1. E. R. Switzer, T. M. Crawford, C. L. Reichardt, "Bayesian flux reconstruction in one and two bands," Statistical Challenges in Modern Astronomy V, Feigelson and Babu (Eds.), Springer 2012. →
2. E. S. Battistelli, ACT collaboration, "Automated SQUID tuning procedure for kilo-pixel arrays of TES bolometers on the Atacama Cosmology Telescope," *Proc. SPIE*, **7020** 702028-702028-12 (2008). →
3. A. D. Hincks, ACT collaboration, "The effects of the mechanical performance and alignment of the Atacama Cosmology Telescope on the sensitivity of microwave observations," *Proc. SPIE*, **7020** 70201P-70201P-10 (2008). →
4. D. S. Swetz, ACT collaboration, "Instrument design and characterization of the Millimeter Bolometer Array Camera on the Atacama Cosmology Telescope," *Proc. SPIE*, **7020** 702008-702008-12 (2008). →
5. **E. R. Switzer**, ACT collaboration, "Systems and control software for the Atacama Cosmology Telescope," *Proc. SPIE*, **7019** 70192L-70192L-12 (2008). →
6. R. J. Thornton, ACT collaboration, "Opto-mechanical design and performance of a compact three-frequency camera for the MBAC receiver on the Atacama Cosmology Telescope," *Proc. SPIE*, **7020** 70201R-70201R-10 (2008). →
7. Y. Zhao, ACT collaboration, "Characterization of Transition Edge Sensors for the Millimeter Bolometer Array Camera on the Atacama Cosmology Telescope," *Proc. SPIE*, **7020**, 70200O-70200O-11 (2008). →
8. M. Niemack, ACT collaboration, "A kilopixel array of TES bolometers for ACT: development, testing, and first light," *J. Low Temp. Phys.*, **151**(3-4) 690-696 (2008). →
9. E. R. Switzer, "Physics AI Guide: Princeton University," *Guide for graduate assistant instructorships*, Sept. 2006.
10. E. R. Switzer, "Graduate Student Life – Home on the Range," *Princeton physics departmental newsletter*, Sept. 2006.
11. A. Kosowsky, the ACT collaboration, "The Atacama Cosmology Telescope: A progress report," *New Astronomy Reviews* **50**(11-12) 969-976 (2006); Switzer: *preliminary beam maps appearing therein*. →
12. M. Niemack, the ACT collaboration, "Measuring two-millimeter radiation with a prototype multiplexed TES receiver for ACT," *Proc. SPIE* **6275** 62750C (2006).
13. "Numerical radiative transport for recombination physics," *Princeton advanced project under C. M. Hirata*, Apr. 2005.
14. "Variance estimates in the SDSS spectrographic data," *Sloan Digital Sky Survey internal report*, Sep. 2004.
15. **E. R. Switzer**, K. Abazajian, S. Dodelson, S. Habib, and K. Heitmann, "Massive neutrinos and the halo model of large scale structure," *Nuc. Phys. B, Proceedings from Neutrino 2004* **143**, 571 (2005). →
16. E. R. Switzer, "OPAL/LEP II measurements of τ polarization at ≈ 206 GeV," *Undergraduate thesis under Mark Oreglia, University of Chicago* (2003).
17. E. R. Switzer, "Measurements of electron energy deposition in the HERMES silicon recoil detector," *DESY HERMES Recoil Group internal report*, Aug. 2002.

Teaching, Service and Outreach

2012–2013	Advised one undergraduate (academic year), two (summer).
May 2012	Organizer of GBT 21 cm intensity mapping analysis workshop, CITA.
Mar. 2011	Interviews in popular press for "The Steppenwolf: A proposal for a habitable planet in interstellar space."
Mar. 2010	Early-stage textbook review, Cambridge University Press.
2009–2010 year	KICP Friday seminar committee.
Oct. 2009 – Dec. 2009	"The Physics of Energy Devices," Compton Lecture Series, University of Chicago (10 public lectures).
May 2009 issue	Interview: George Musser, "Spectral Sensation," *Scientific American*.
2008–2010	Founder and organizer of the energy technology student group within the University of Chicago physics department.
2007–	Referee: *The Astrophysical Journal*, MNRAS, JOAA.
May 2006 – Sep. 2006	Developed physics teaching guide for the McGraw Center for Teaching and Learning at Princeton.
Sep. 2005 – Dec. 2005	Introductory Integrated Engineering/Math/Physics, Problem session (Teaching Assistantship), Princeton.
Feb. 2005 – May 2005	Introductory Engineering Physics, Supplemental problem sessions (Teaching Assistantship), Princeton.
Sep. 2004 – May 2005	Introductory General Physics, Labs (Teaching Assistantship), Princeton.

Invited Talks

1. "Measuring mm/sub-mm curls and circles across the sky with the Primordial Inflation Polarization Explorer (PIPER)," *Science and Exploration Directorate Director's Seminar (GSFC)*, Nov. 2013.
2. "Results from the Green Bank Telescope 21 cm intensity survey," *Observations and Theoretical Challenges in Primordial Cosmology (KITP)*, Apr. 2013.
3. "Results from the Green Bank Telescope 21 cm intensity survey: Methods," *Innovative Techniques in 21 cm Analysis (Ohio)*, Apr. 2013.
4. "A history of the universe through its atoms," *NASA GSFC, cosmology division seminar*, Jan. 2013.
5. "A history of the universe through its atoms," *CMU, physics colloquium*, Jan. 2013.
6. "21 cm Intensity Mapping with the Green Bank Telescope," *UPenn, astrophysics seminar*, Dec. 2012.
7. "21 cm Intensity Mapping with the Green Bank Telescope," *University of Waterloo, astrophysics seminar*, Jan. 2012.
8. "Bayesian flux reconstruction in one and two bands," *Statistical Challenges in Modern Astronomy V (Penn State University)*, June 2011. $\rightarrow$
9. "Removing foregrounds and characterizing residuals in $z \sim 1$ 21 cm surveys," *21-cm Cosmology: Advanced data analysis (CITA)*, June 2011.
10. "Some Aspects of Cosmological Helium," *CITA, astrophysics seminar*, Jan. 2011. $\rightarrow$
11. "Some Aspects of Cosmological Helium," *Fermilab Center for Particle Astrophysics, seminar*, Dec. 2010. $\rightarrow$

12. "Statistics of the source population observed at millimeter wavelengths by the South Pole Telescope," *Berkeley, astrophysics seminar*, Mar. 2010. →
13. "A physicist's outlook on energy," *Environmental Protection Agency Region 5 office, seminar*, Feb. 2010. →
14. "The Physics of Energy Devices," Compton Lectures, University of Chicago, Fall 2009: →
    Lecture 1: Introduction and motors
    Lecture 2: Motors and generators
    Lecture 3: Power transmission
    Lecture 4: Power from the wind
    Lecture 5: Basic thermodynamics
    Lecture 6: Heat engines and transportation
    Lecture 7: Nuclear fission
    Lecture 8: Solar energy
    Lecture 9: Special guest lecture – Dorian Abbot
    Lecture 10: Summary; future
15. "Wandering in the hyperfine forest," *KICP seminar, University of Chicago*, Apr. 2009.
16. "Prospects for observing the spectral distortion from recombination," *The Physics of Cosmological Recombination (MPA),* July 2008.
17. "Cosmological helium recombination," *The Physics of Cosmological Recombination (MPA),* July 2008.
18. "Small-scale CMB Anisotropies and the Atacama Cosmology Telescope: Perspectives and Progress," *Berkeley, cosmology group seminar*, Oct. 2007.
19. "Small-scale CMB Anisotropies and the Atacama Cosmology Telescope: Perspectives and Progress," *KICP, seminar*, Oct. 2007.

Talks, Posters

1. "BICEP2: detection of B-mode polarization at degree angular scales", *presentation for GSFC Fermi group*, Mar. 2014.
2. "The Primordial Inflation Polarization ExploreR: Science from Circular Polarization Measurements", *AAS 223*, Jan. 2014.
3. "21 cm Intensity Mapping with the Green Bank Telescope," *Workshop on Recent Developments in Astronuclear and Astroparticle Physics (ICTP)*, Nov. 2012.
4. "21 cm Intensity Mapping with the Green Bank Telescope," *Cosmology on the Beach, Cancun*, Jan. 2012.
5. "21 cm Intensity Mapping with the Green Bank Telescope," *G2000, University of Toronto*, Nov. 2011.
6. "Prospects for cosmology at $z \sim 1$ with 21 cm radiation," *KICP Postdoctoral Symposium*, Mar. 2011.
7. "Statistics of the source population observed at millimeter wavelengths by the South Pole Telescope," *KICP Postdoctoral Symposium*, Feb. 2010.
8. "Radiative transport through the hyperfine transitions," *KICP, theory group talk*, Dec. 2009. →

9. Several informal presentations for the energy technology study group, University of Chicago, 2009. →
10. “Small-Scale Anisotropies of the CMB: Experimental and Theoretical Perspectives,” *Ph.D. Final Public Oral, Princeton*, Oct. 2008.
11. “Millimeter-wave emission of the planets,” *Princeton Gravity Group*, Feb., 2008.
12. “Cosmological helium recombination,” *Princeton Gravity Group*, Feb., 2007.
13. “Corrections to cosmological recombination,” *Princeton Gravity Group*, Apr. 2006.
14. “Weren’t we done with recombination?” *Princeton Gravity Group*, Mar. 2005.