

Adrian C. Liu

CONTACT INFORMATION	UC Berkeley Dept. of Astronomy 501 Campbell Hall #3411 Berkeley, CA 94720-3411, USA	(609) 203-1398 acliu@berkeley.edu http://astro.berkeley.edu/~acliu
EMPLOYMENT	BCCP Postdoctoral Fellow , Berkeley, CA, USA Joint appointment between UC Berkeley Department of Astronomy and Berkeley Center for Cosmological Physics at the Lawrence Berkeley National Laboratory	September 2012 to present
	Research Affiliate , MIT, Cambridge, MA, USA	August 2012 to present
EDUCATION	Ph.D., Physics, Massachusetts Institute of Technology , Cambridge, MA, USA Advisor: Max Tegmark Completed M.I.T. Graduate Student Teaching Certificate Program	June 2012
	Bachelor of Arts, Physics, Princeton University , Princeton, NJ, USA Degree conferred <i>summa cum laude</i> Advisor: Paul Steinhardt	June 2006
HONORS AND AWARDS	Origins Project Postdoctoral Prize Lectureship , Arizona State University USD 10,000 cash prize and lecture series awarded annually “to an outstanding junior scholar chosen from all countries, from any field of study relevant to the Origins Project”	2015
	Hubble Fellowship , Space Telescope Science Institute	Beginning Sept. 2015
	Goodwin Teaching Medal , Massachusetts Institute of Technology Citation: “ <i>for performance of teaching duties conspicuously effective over and above ordinary excellence.</i> ” Awarded annually to a recipient drawn from any discipline.	2012
	Henry Kendall Teaching Award , MIT Department of Physics Award citation: “ <i>for his excellent contributions over several semesters to teaching quantum mechanics.</i> ” Awarded annually within the Department of Physics.	2011
	Buechner Teaching Prize , MIT, Department of Physics Award citation: “ <i>for outstandingly effective and engaging teaching as a recitation instructor.</i> ” Awarded annually to one recipient within the Department of Physics.	2009
	Allen G. Shenstone Prize in Physics , Princeton University	2006
	Kusaka Memorial Prize in Physics , Princeton University	2005
	Shapiro Prize for Academic Excellence , Princeton University	2004
	Manfred Pyka Memorial Prize in Physics , Princeton University	2003
TEACHING EXPERIENCE	Recitation Instructor , Massachusetts Institute of Technology 8.04, Quantum Physics I 8.022, Physics II (“Honors” Electromagnetism)	Fall 2010, Fall 2011, Spring 2012 Spring 2009
	Lecturer , Johns Hopkins University, Center for Talented Youth, Baltimore, MD, USA Fast-Paced Physics at Carlisle, PA and Los Angeles, CA sites	Summers 2007 to 2012

Teaching Assistant, Massachusetts Institute of Technology

8.04, Quantum Physics I

Spring 2010

8.902, Graduate Astrophysics II

Fall 2009

8.02, Physics II (Electromagnetism)

Spring 2008

GRANTS AND
SUPERCOMPUTING
TIME ALLOCATIONS

University of California Multicampus Research Programs Grant

\$288,477, Co-Investigator, *Cosmic Dawn Initiative*

2015-2016

National Energy Research Scientific Computing Center (NERSC) Time Allocations

1,800,000 hours, Principal Investigator, *Data Analysis and Forecasts for Current- and Next-Generation Hydrogen Cosmology Surveys* **2015**

900,000 hours, Principal Investigator, *Low-frequency Radio Data Analysis for Hydrogen Cosmology* **2014**

50,000 hours, Principal Investigator, *From theoretical promise to observational reality: optimal foreground mitigation in cosmological 21 cm power spectrum measurements* **2013**

PUBLICATIONS AS
ONE OF PRIMARY
AUTHORS

17. Parsons, A.R., **Liu, A.**, Ali, Z.S., Cheng, C. (2015), *Optimized Beam Sculpting with Generalized Fringe-Rate Filters*, submitted to ApJ, arXiv: 1503.05564
16. Ali, Z. S., Parsons, A.R., Zheng, H., Pober, J.C., **Liu, A.**, et al. (2015), *PAPER-64 Constraints on Reionization: The 21 cm Power Spectrum at $z = 8.4$* , submitted to ApJ, arXiv: 1502.06016
15. Presley, M.E. *, **Liu, A. ***, Parsons, A.R. (2015), *Measuring the cosmological 21 cm monopole with an interferometer*, submitted to ApJ, arXiv: 1501.01633
[*Served as primary research advisor for undergraduate student]
14. Dillon, J.S., Tegmark, M., **Liu, A.**, Ewall-Wice, A., Hewitt, J.N., et al. (2014), *Mapmaking for Precision 21 cm Cosmology*, Phys. Rev. D **91**, 023002
13. Switzer, E.R., **Liu, A.** (2014), *Erasing the variable: Empirical foreground discovery for global 21 cm spectrum experiments*, ApJ **793** 102
12. **Liu, A.**, Parsons, A.R., Trott, C.M. (2014), *The Epoch of Reionization Window: II. Statistical Methods for Foreground Wedge Reduction*, Phys. Rev. D **90**, 023019
11. **Liu, A.**, Parsons, A.R., Trott, C.M. (2014), *The Epoch of Reionization Window: I. Mathematical Formalism*, Phys. Rev. D **90**, 023018
[Phys. Rev. D Editors' Suggestion]
10. Parsons, A.R., **Liu, A.**, et al. (2014), *New Limits on 21cm EoR from PAPER-32 Consistent with an X-ray Heated IGM at $z = 7.7$* , ApJ **788** 106
9. Pober, J.C., **Liu, A.**, Dillon, J.S., et al. (2014), *What Next-Generation 21 cm Power Spectrum Measurements Can Teach Us About the Epoch of Reionization*, ApJ **782** 66
8. Dillon, J.S., **Liu, A.**, Williams, C.L., et al. (2014), *Overcoming Real-World Obstacles in 21 cm Power Spectrum Estimation: A Method Demonstration and Results from Early Murchison Widefield Array Data*, Phys. Rev. D **89**, 023002
[Co-first author]
7. **Liu, A.**, Pritchard, J., Tegmark, M., Loeb, A. (2013), *Global 21 cm signal experiments: a designer's guide*, Phys. Rev. D **87**, 043002
6. Dillon, J.S., **Liu, A.**, Tegmark, M. (2013), *A Fast Method for Power Spectrum and Foreground Analysis for 21 cm Cosmology*, Phys. Rev. D **87**, 043005
5. **Liu, A.**, Tegmark, M. (2011), *How well can we measure and understand foregrounds with 21 cm experiments?*, MNRAS **419** 3491
4. **Liu, A.**, Tegmark, M. (2011), *A method for 21 cm power spectrum estimation in the presence of foregrounds*, Phys. Rev. D **83**, 103006

3. **Liu, A.**, Tegmark, M., Morrison, S., Lutomirski, A., Zaldarriaga, M. (2010), *Precision calibration of radio interferometers using redundant baselines*, MNRAS **408** 1029
2. **Liu, A.**, Tegmark, M., Bowman, J., Hewitt, J., Zaldarriaga, M. (2009), *An improved method for 21 cm foreground removal*, MNRAS **398** 401
1. **Liu, A.**, Tegmark, M., Zaldarriaga, M. (2009), *Will point sources spoil 21 cm tomography?*, MNRAS **394** 1575

COLLABORATION
PUBLICATIONS

4. Pober, J.C., Ali, Z.S., ... **Liu, A.**, et al. [27 authors] (2015), *PAPER-64 Constraints On Reionization II: The Temperature Of The $z=8.4$ Intergalactic Medium*, ApJ submitted, arXiv: 1503.00045
3. Moore, D., Aguirre, J.A., ... **Liu, A.**, et al. [17 authors] (2015), *New Limits on Polarized Power Spectra at 126 and 164 MHz: Relevance to Epoch of Reionization Measurements*, ApJ submitted, arXiv: 1502.05072
2. Jacobs, D.C., Pober, J.C., ... **Liu, A.**, et al. [18 authors] (2014), *Multi-redshift limits on the 21cm power spectrum from PAPER*, ApJ accepted, arXiv: 1408.3389
1. Zheng, H., Tegmark, M., ... **Liu, A.**, et al. [37 authors] (2014), *MITEoR: A Scalable Interferometer for Precision 21 cm Cosmology*, MNRAS **445** 1084

CONFERENCE
PROCEEDINGS

1. Zheng, H., Tegmark, M., ... **Liu, A.**, et al. [36 authors] (2014), *Mapping our Universe in 3D with MITEoR*, 2013 IEEE International Symposium on Phased Array Systems & Technology

STUDENTS
MENTORED

Graduate students

Carina Cheng, UC Berkeley (co-advised with Aaron Parsons) **Summer 2014 to present**

Undergraduate researchers

Morgan Presley, Princeton/UC Berkeley summer researcher **Summer 2014 to present**

Michael Valdez, MIT **Spring 2011 to Winter 2011**

PROFESSIONAL
ACTIVITIES

Conference session co-organizer

2014

Wide-field Imaging and Power Spectrum Measurements, International Union of Radio Science- National Radio Science Meeting (URSI-NRSM)

Journal referee

The Astrophysical Journal, Monthly Notices of the Royal Astronomical Society, Physical Review Letters, Physical Review D, Progress in Electromagnetic Research/Journal of Electromagnetic Waves and Applications

PROFESSIONAL
TALKS

27. **MIT Astrophysics Colloquium (Feb 2015):** *Frontiers of Cosmology and Radio Astronomy*
26. **University of Chicago Astronomy & Astrophysics Colloquium (Jan 2015):** *Frontiers of Cosmology and Radio Astronomy*
25. **American Astronomical Society Meeting (Jan 2015):** *Using 21 cm Cosmology to Improve Cosmic Microwave Background Constraints*
24. **Tempe MWA Project Meeting (Dec 2014):** *Precision Statistics for Precision 21 cm Cosmology*
23. **UC Santa Barbara Astro Seminar (Oct 2014):** *From current-generation 21 cm cosmology to HERA*
22. **Imperial College London Astrophysics Seminar (July 2014):** *What's next in 21 cm cosmology?*
21. **Berkeley MWA Epoch of Reionization Workshop (June 2014):** *Subtleties in Power Spectrum Statistics*

20. **AAS Exascale Radio Astronomy (April 2014):** *Pushing the Scale and Redshift Frontiers: Next-Generation EoR Measurements*
19. **UC Santa Cruz Cosmology Seminar (March 2014):** *What's next in 21 cm cosmology?*
18. **Carnegie Mellon Astro Seminar (October 2013):** *What's next in 21 cm cosmology?*
17. **UC Davis Astro Seminar (October 2013):** *What's next in 21 cm cosmology?*
16. **Center for Astrophysics Institute for Theory and Computation Lunch (September 2013):** *Recent Results from PAPER and Next Steps in 21cm Cosmology with HERA.*
15. **Reionization in the Red Centre (July 2013):** *Foreground subtraction of foreground avoidance?*
14. **Ohio State 21 cm Workshop (April 2013):** *Global 21 cm experiments: a designer's guide.*
13. **American Astronomical Society Meeting (January 2013):** *Global 21 cm experiments: a designer's guide.*
12. **ARC Centre of Excellence For All-Sky Astrophysics (November 2012):** *Global 21 cm experiments: a designer's guide.*
11. **ARC Centre of Excellence For All-Sky Astrophysics (November 2012):** *The current state of global signal theory.*
10. **Canadian Institute for Theoretical Astrophysics Seminar (January 2012):** *Optimizing global 21 cm signal measurements with spectral and spatial information.*
9. **McGill University Astroparticle Seminar (January 2012):** *Optimizing global 21 cm signal measurements with spectral and spatial information.*
8. **Melbourne MWA Project Meeting (December 2011):** *Power spectrum estimation in theory and in practice.*
7. **Melbourne MWA Project Meeting (December 2011):** *Subtleties in Foreground Subtraction.*
6. **Berkeley Cosmology Group Seminar (Aug. 2011):** *From theoretical promise to observational reality: calibration and foreground subtraction in 21cm tomography.*
5. **21 cm Cosmology: Advanced Data Analysis Meeting, Candian Institute for Theoretical Astrophysics (June 2011):** *21 cm Foreground Modeling.*
4. **American Astronomical Society Meeting (May 2011):** *Real World Issues in 21 cm tomography.*
3. **Hydrogen Cosmology Workshop, Harvard-Smithsonian Center for Astrophysics (May 2011):** *Precision Subtraction for Precision Cosmology.*
2. **Science with Fast Radio Telescopes Workshop (Oct 2010):** *Automatic Omniscope Calibration Using Redundant Baselines.*
1. **Canberra MWA Project Meeting (January 2009):** *21cm Foreground Subtraction in the Image Plane and the uv Plane.*

POPULAR TALKS

4. **"Discover Physics!", MIT Freshman Pre-Orientation Program (Aug 2010, 2011):** *The Big, Expanding Universe.*
3. **"Discover Physics!", MIT Freshman Pre-Orientation Program (Aug 2010, 2011):** *How to Study Physics.*
2. **Office of Undergraduate Advising, MIT (Sep. 2009):** *How to Study Physics.*
1. **Choate Rosemary Hall (May 2007):** *Averaging You Out — Cosmology as the Study of the Universe on its Largest Scales.*

SERVICE TO THE
COMMUNITY

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|---|---------------------------------------|
| Postdoc representative
UC Berkeley Astronomy Department | 2013 to present |
| Graduate student representative
“Discover Physics!” Freshman Pre-orientation Program | 2010, 2011 |
| Astrophysics graduate student liaison
MIT Physics department admitted graduate student open house | 2010 |
| Astrophysics graduate student representative
MIT Physics Graduate Student Council | September 2008 to August 2010 |
| Co-organizer
Astrophysics graduate student weekly lunch | October 2006 to September 2008 |