Zhilei Xu, Ph.D.

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RESEARCH INTERESTS

- *Cosmic Microwave Background, High-redshift 21 cm, Cosmic Inflation, Cosmic Reionization* **Cosmology**
- *Neutrino Physics, Axion Dark Matter* **Particle Physics**
- *Mirowave/radio Engineering, Cryogenics, Instrumentation Calibration* **Instrumentation**

EMPLOYMENT

- **Massachusetts Institute of Technology** **Boston, MA**
  Postdoctoral Associate *2020 – now*
  Primary Project: Hydrogen Epoch of Reionization Array (HERA)
- **University of Pennsylvania** **Philadelphia, PA**
  Postdoctoral Researcher *2017 – 2020*
  Primary Project: Simons Observatory

EDUCATION

- **Johns Hopkins University** **Baltimore, MD**
  Ph.D. in Physics *2011 – 2017*
  Thesis: Integration and Testing of CLASS at 40 GHz
- **University of Science and Technology of China** **Hefei, China**
  B.S. in Astronomy (Astrophysics) *2007 – 2011*
  With the highest honor (Guo Moruo Scholarship)

RESEARCH EXPERIENCE

- **Hydrogen Epoch of Reionization Array (HERA)** *2020 – now*
  - Developed the direct optimal mapping (DOM) algorithm for mapping interferometric visibilities with robust statistics
  - Characterized low-frequency radio sky with HERA data
  - Measuring the image-based power spectrum during and prior to cosmic reionization with the DOM algorithm
  - Characterizing the array primary beam with sky sources
- **Simons Observatory (SO)** *2017 – now*
  - Led the design, manufacture, integration, and validation of the 2.5m-diameter 100-mK cryogenic receiver—SO Large Aperture Telescope Receiver (LATR)
  - Led the development of Metamaterial Microwave Absorbers (MMAs) for SO, CMB-S4, FYST, and CLASS; work reported in *New York Times* (link)
  - Leading the SO calibration pipeline and strategy, focusing on system efficiency, pointing calibration, beam measurements, and polarization response, etc.
- **CMB-Stage 4 (CMB-S4)** *2017 – now*
  - Working in the Large Aperture Telescope (LAT) group on the receiver design
  - Developing cryogenic absorbers in the Small Aperture Telescope (SAT) working group
- **Atacama Cosmology Telescope (ACT) & Dark Energy Survey (DES)** *2017 – 2019*
  - Cross-correlating the CMB thermal Sunyaev-Zel'dovich y-map with galaxy catalogs in DES to study galaxy cluster evolution and feedback
- **Cosmology Large Angular Scale Surveyor (CLASS)** *2011 – now*
  - Developed mount structures and cold optical components along with their characterization devices
  - Led the integration, testing, and field deployment of the 40 GHz telescope
  - Led the initial calibration analysis for the 40 GHz telescope
  - Advising calibration analysis for following telescopes and observations

MEMBERSHIPS

- **Professional Societies**
  - International Astronomical Union (IAU)
  - American Astronomical Society (AAS)
  - Society of Photo-Optical Instrumentation Engineers (SPIE)
- **Research Collaborations**
  - Hydrogen Epoch of Reionization Array (HERA)
  - CMB-Stage 4 (CMB-S4)
  - Atacama Cosmology Telescope (ACT)
  - Simons Observatory (SO)
  - Cosmology Large Angular Scale Surveyor (CLASS)

PROFESSIONAL SERVICE

- Reviewer for SPT-SLIM Cryostat Design *July 2022*
- Reviewer for NASA Proposals *September 2021 - October 2021*
- CMB-S4 Workshop, session organizer *August 2021*
- CMB-S4 Collaboration Meeting, session chair *March 2021*
- AAS 237th Meeting, session chair, *Radio and mm Instrumentation and Surveys* *January 2021*
- CMB-S4 Collaboration Meeting, SOC Member *December 2020 – March 2021*
- CMB-S4 Governing Board Member *July 2020 – July 2021*
  Personnel decision and bylaw writing of a 500-member international collaboration
- Co-chair of the Simons Observatory (SO) Talks Committee *March 2020 – July 2022*
  Public talk and presentation administration of a 400-member international collaboration
- Reviewer for *JCAP, Nature, ApJ*, and *Universe* *January 2019 – now*
- AAS 231st Meeting, session chair, *Cosmology I* *January 2018*
- AAS 231st Meeting, session chair, *Instrumentation: Ground-based and Airborne II* *January 2018*

TEACHING EXPERIENCE

- **HERA CHAMP Camp** **Philadelphia, PA**
  Instructor for Mapping Interferometric Data *June 2022*
- **Johns Hopkins University** **Baltimore, MD**
  Instructor & Teaching Assistant for General Physics and Physics Lab *September 2011 – December 2011*
- **University of Science and Technology of China** **Hefei, China**
  Teaching Assistant for Observational Astronomy *September 2010 – December 2010*

RESEARCH MENTORSHIP

- **14 Undergraduate Students**
  F. Boone, M. Chan, J. Chavarry, B. Digia, H. France, S. Haridas, D. Li, L. Lowry, N. Mehrle, A. Nottingham, D. Parekh, D. Valle, N. Wilson, Z. Zhang
- **17 Graduate Students**
  T. Bhandarkar, S. Bhimani, G. Chesmore, J. Clancy, J. Couto, K. Dachlythra, A. Kofman, Y. Li, I. Lowry, H. Nakata, J. Orlowski-Scherer, K. Osumi, B. Pradenas, E. Rath, T. Terasaki, Y. Wang, K. Zheng, N. Zhu

PRESS COVERAGE

- These Materials Could Make Science Fiction a Reality — *New York Times, April 2021*
- Metamaterial Tiles Boost Sensitivity of Large Telescopes — *OSA, Penn Today, Physics World, January 2021*
- 'At the whim of the world' — *Penn Today, June 2020*
- How do we know the universe's age? — *All About Space, November 2019*
- In Search of Signals from the Early Universe — *Penn Today, physics.org, August 2019*

TALKS

- Beam Mode Conference (invited) — *September 2023*
- University of Nevada Las Vegas, Astronomy Colloquium (invited) — *March 2023*
- University of Washington, DUSC Seminar (invited) — *February 2023*
- Ohio State University, Physics Colloquium (invited) — *February 2023*
- Ohio State University, CCAPP Seminar (invited) — *December 2022*
- University of Chicago, KICP Seminar (invited) — *November 2022*
- Caltech Observational Cosmology Seminar (invited) — *October 2022*
- Global 21 cm Workshop — *October 2022*
- Stanford Cosmology Seminar (invited) — *October 2022*
- HERA Annual Meeting — *October 2022*
- Harvard CfA Receiver Lab Lunch Talk (invited) — *October 2022*
- Florida State University Astrophysics Seminar (invited) — *September 2022*
- UIUC Astrophysics/Gravity/Cosmology Seminar (invited) — *September 2022*
- Lawrence-Berkeley National Laboratory INPA Seminar (invited) — *September 2022*
- CMB-S4 Summer Meeting — *August 2022*
- McGill CMB × EoR Workshop (invited) — *July 2022*
- Simons Observatory Collaboration Meeting — *July 2022*
- Cosmology from Home — *July 2022*
- AliCPT Collaboration Seminar (invited) — *June 2022*
- Fermilab New Perspectives Conference — *June 2022*
- Fermilab Cosmic Physics Center (CPC) Seminar (invited) — *June 2022*
- Brown University CFPU seminar (invited) — *April 2022*
- Argonne National Laboratory HEP Seminar (invited) — *January 2022*
- Mount Diablo Astronomical Society (Invited Public Talk) — *August 2021*
- CMB-S4 SAT Working Group — *August 2021*
- CMB-S4 Summer Workshop — *August 2021*
- Simons Observatory Collaboration Meeting (2 talks) — *July 2021*
- Tufts Astronomy Seminar (invited) — *April 2021*

- Green Bank Observatory Science Lunch Talk (invited) *April 2021*
- CMB-S4 Collaboration Meeting *March 2021*
- MIT Kavli Institute Journal Club *March 2021*
- 237th AAS Meeting *January 2021*
- Yale Nuclear Particle Astrophysics (NPA) Seminar (invited) *December 2020*
- 2020 SPIE Conference *December 2020*
- NSF Virtual Tour *December 2020*
- Simons Observatory Collaboration Meeting (2 talks) *June 2020*
- CMB-S4 Collaboration Meeting *October 2019*
- Simons Observatory Collaboration Meeting (2 talks) *July 2019*
- Dark Energy Survey (DES) Collaboration Meeting *June 2019*
- Tsinghua Astronomy Seminar *January 2019*
- USTC Astronomy Seminar *January 2019*
- Institute of High Energy Physics Seminar *January 2019*
- University of Pennsylvania Astro Seminar *October 2018*
- Simons Observatory Collaboration Meeting *June 2018*
- 231st AAS Meeting *January 2018*
- Harvard Astro Seminar (invited) *February 2017*
- University of Pennsylvania Astro Seminar (invited) *January 2017*
- Johns Hopkins University CAS Seminar *March 2016*
- Penn State Workshop on Astrophysics and Cosmology, PSU *March 2015*
- Johns Hopkins University Fourier Optics Project *May 2013*
- Johns Hopkins University Extragalactic Astronomy Presentation *November 2011*

MEETINGS

- *5th Global 21 cm Workshop, LBNL* *October, 2022*
- *HERA Annual Meeting, UC-Berkeley* *October, 2022*
- *CMB-S4 Summer Meeting, Chicago* *August, 2022*
- *Simons Observatory Collaboration Meeting, San Diego* *July, 2022*
- *Cosmology from Home, virtual* *July, 2022*
- *New Perspectives, Fermilab* *June, 2022*
- *Astronomical Software Workshop, CCA* *May, 2022*
- *CMB-S4 Workshop, virtual* *August, 2021*
- *Simons Observatory Collaboration Meeting, virtual* *July, 2021*
- *CMB-S4 Collaboration Meeting, virtual* *March, 2021*
- *247th AAS Meeting, virtual* *January, 2021*
- *SPIE Astronomical Telescopes + Instrumentation, virtual* *December, 2020*

- *CMB-S4 Workshop, virtual* *August, 2020*
- *HERA Annual Meeting, virtual* *July, 2020*
- *Simons Observatory Collaboration Meeting, virtual* *June, 2020*
- *CMB-S4 Workshop, virtual* *March, 2020*
- *CMB-S4 Workshop, UCSD* *October, 2019*
- *CLASS Collaboration Meeting, JHU* *September, 2019*
- *Simons Observatory Collaboration Meeting, UC-Berkeley* *July, 2019*
- *ACT Collaboration Meeting, Princeton* *March, 2019*
- *CMB-S4 Workshop, Princeton* *September, 2018*
- *Simons Observatory Collaboration Meeting, UPenn* *June, 2018*
- *SPIE Astronomical Telescopes + Instrumentation, Austin* *June, 2018*
- *AAS 231st Meeting, Washington D.C.* *January, 2018*
- *CLASS Quarter-5 Collaboration Meeting, JHU* *December, 2017*
- *CLASS Quarter-4 Collaboration Meeting, JHU* *September, 2017*
- *CMB-S4 Workshop, Harvard* *August, 2017*
- *CLASS Quarter-3 Collaboration Meeting, JHU* *June, 2017*
- *Simons Observatory Collaboration Meeting, UCSD* *June, 2017*
- *CLASS Quarter-2 Collaboration Meeting, JHU* *March, 2017*
- *CLASS Quarter-1 Collaboration Meeting, JHU* *December, 2016*
- *Neighborhood Workshop on Astrophysics and Cosmology, PSU* *March, 2015*

PUBLICATIONS

119 papers; **4101** citations; **27** H-index

Publications as a Lead Author

[1] **Z. Xu** et al. "Direct Optimal Mapping Image Power Spectrum and its Window Functions". In: *arXiv e-prints*, arXiv:2311.10711 (Nov. 2023), arXiv:2311.10711. arXiv: 2311.10711 [astro-ph.IM].

[2] **Z. Xu** et al. "Direct Optimal Mapping for 21 cm Cosmology: A Demonstration with the Hydrogen Epoch of Reionization Array". In: ApJ 938.2, 128 (Oct. 2022), p. 128. DOI: 10.3847/1538-4357/ac9053. arXiv: 2204.06021 [astro-ph.CO].

[3] **Z. Xu** et al. "The Simons Observatory: The Large Aperture Telescope (LAT)". In: *Research Notes of the AAS* 5.4 (Apr. 2021), p. 100. DOI: 10.3847/2515-5172/abf9ab. URL: https://doi.org/10.3847/2515-5172/abf9ab.

[4] **Z. Xu** et al. "The Simons Observatory: metamaterial microwave absorber and its cryogenic applications". In: *Appl. Opt.* ***(Editor's Pick)*** 60.4 (Feb. 2021), pp. 864–874. DOI: 10.1364/AO.411711. URL: http://ao.osa.org/abstract.cfm?URI=ao-60-4-864.

[5] **Z. Xu** et al. "The Simons Observatory: the Large Aperture Telescope Receiver (LATR) integration and validation results". In: *Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series*. Vol. 11453. Dec. 2020, p. 1145315. DOI: 10.1117/12.2576151. arXiv: 2012.07862 [astro-ph.IM].

[6] **Z. Xu** et al. "Two-year Cosmology Large Angular Scale Surveyor (CLASS) Observations: 40 GHz Telescope Pointing, Beam Profile, Window Function, and Polarization Performance". In: *The Astrophysical Journal* 891.2 (Mar. 2020), p. 134. DOI: 10.3847/1538-4357/ab76c2. URL: https://doi.org/10.3847%2F1538-4357%2Fab76c2.

[7] R. Datta et al. "Cosmology Large Angular Scale Surveyor (CLASS): pointing stability and beam measurements at 90, 150, and 220 GHz". In: *Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy XI*. Ed. by J. Zmuidzinas and J.-R. Gao. Vol. 12190. Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series. Aug. 2022, 121902S. DOI: 10.1117/12.2630649. arXiv: 2208.05022 [astro-ph.IM].

[8] N. Zhu et al. "The Simons Observatory Large Aperture Telescope Receiver". In: ApJS 256.1, 23 (Sept. 2021), p. 23. DOI: 10.3847/1538-4365/ac0db7. arXiv: 2103.02747 [astro-ph.IM].

[9] S. Pandey et al. "Constraints on the redshift evolution of astrophysical feedback with Sunyaev-Zel'dovich effect cross-correlations". In: *Phys. Rev. D* 100 (6 Sept. 2019), p. 063519. DOI: 10.1103/PhysRevD.100.063519. URL: https://link.aps.org/doi/10.1103/PhysRevD.100.063519.

[10] J. W. Appel et al. "On-sky Performance of the CLASS Q-band Telescope". In: *The Astrophysical Journal* 876.2 (May 2019), p. 126. DOI: 10.3847/1538-4357/ab1652. URL: https://doi.org/10.3847%2F1538-4357%2Fab1652.

[11] G. Coppi et al. "Cooldown strategies and transient thermal simulations for the Simons Observatory". In: *Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series*. Vol. 10708. July 2018, p. 1070827. DOI: 10.1117/12.2312679.

[12] N. Zhu et al. "Simons Observatory large aperture telescope receiver design overview". In: *Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series*. Vol. 10708. July 2018, p. 1070829. DOI: 10.1117/12.2312871.

[13] J. L. Orlowski-Scherer et al. "Simons Observatory large aperture receiver simulation overview". In: *Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series*. Vol. 10708. July 2018, p. 107083X. DOI: 10.1117/12.2312868.

Publications as a Contributing Author

[14] S. Dahal et al. "Microwave Observations of Venus with CLASS". In: *Planetary Science Journal* 4.8, 154 (Aug. 2023), p. 154. DOI: 10.3847/PSJ/acee76. arXiv: 2304.07367 [astro-ph.EP].

[15] C. Núñez et al. "On-Sky Performance of New 90 GHz Detectors for the Cosmology Large Angular Scale Surveyor (CLASS)". In: *IEEE Transactions on Applied Superconductivity* 33.5, 3262497 (Aug. 2023), p. 3262497. DOI: 10.1109/TASC.2023.3262497.

[16] R. Shi et al. "Testing Cosmic Microwave Background Anomalies in E-mode Polarization with Current and Future Data". In: ApJ 945.1, 79 (Mar. 2023), p. 79. DOI: 10.3847/1538-4357/acb339. arXiv: 2206.05920 [astro-ph.CO].

[17] G. E. Chesmore et al. "Simons Observatory: characterizing the Large Aperture Telescope Receiver with radio holography". In: Appl. Opt. 61.34 (Dec. 2022), p. 10309. DOI: 10.1364/AO.470138. arXiv: 2207.07040 [astro-ph.IM].

[18] J. W. Appel et al. "Calibration of Transition-edge Sensor (TES) Bolometer Arrays with Application to CLASS". In: ApJS 262.2, 52 (Oct. 2022), p. 52. DOI: 10.3847/1538-4365/ac8cf2. arXiv: 2205.06901 [astro-ph.IM].

[19] Z. B. Huber et al. "The Simons Observatory: Magnetic Shielding Measurements for the Universal Multiplexing Module". In: *Journal of Low Temperature Physics* (Sept. 2022). DOI: 10.1007/s10909-022-02875-w. arXiv: 2111.11495 [astro-ph.IM].

[20] J. Cleary et al. "Long-timescale stability in CMB observations at multiple frequencies using front-end polarization modulation". In: *Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy XI*. Ed. by J. Zmuidzinas and J.-R. Gao. Vol. 12190. Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series. Aug. 2022, 121902Q. DOI: 10.1117/12.2629723. arXiv: 2208.04996 [astro-ph.IM].

[21] J. E. Moore et al. "Development and performance of universal readout harness for the Simons Observatory". In: *Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy XI*. Ed. by J. Zmuidzinas and J.-R. Gao. Vol. 12190. Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series. Aug. 2022, p. 1219025. DOI: 10.1117/12.2630527. arXiv: 2207.13737 [astro-ph.IM].

[22] J. R. Eimer et al. "Construction of a large diameter reflective half-wave plate modulator for millimeter wave applications". In: *Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy XI*. Ed. by J. Zmuidzinas and J.-R. Gao. Vol. 12190. Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series. Aug. 2022, 121901N. DOI: 10.1117/12.2630637. arXiv: 2208.05005 [astro-ph.IM].

[23] C. Nunez et al. "Design and characterization of new 90 GHz detectors for the Cosmology Large Angular Scale Surveyor (CLASS)". In: *Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy XI*. Ed. by J. Zmuidzinas and J.-R. Gao. Vol. 12190. Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series. Aug. 2022, 121901J. DOI: 10.1117/12.2630081. arXiv: 2208.05006 [astro-ph.IM].

[24] T. Bhandarkar et al. "The Simons Observatory: development and validation of the large aperture telescope receiver". In: *Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy XI*. Ed. by J. Zmuidzinas and J.-R. Gao. Vol. 12190. Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series. Aug. 2022, p. 1219012. DOI: 10.1117/12.2629557. arXiv: 2207.14212 [astro-ph.IM].

[25] E. M. Vavagiakis et al. "CCAT-prime: design of the Mod-Cam receiver and 280 GHz MKID instrument module". In: *Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy XI*. Ed. by J. Zmuidzinas and J.-R. Gao. Vol. 12190. Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series. Aug. 2022, p. 1219004. DOI: 10.1117/12.2630115. arXiv: 2208.05468 [astro-ph.IM].

[26] E. Healy et al. "The Simons Observatory 220 and 280 GHz Focal-Plane Module: Design and Initial Characterization". In: *Journal of Low Temperature Physics* (July 2022). DOI: 10.1007/s10909-022-02788-8. arXiv: 2201.04507 [astro-ph.IM].

[27] M. Lokken et al. "Superclustering with the Atacama Cosmology Telescope and Dark Energy Survey. I. Evidence for Thermal Energy Anisotropy Using Oriented Stacking". In: ApJ 933.2, 134 (July 2022), p. 134. DOI: 10.3847/1538-4357/ac7043. arXiv: 2107.05523 [astro-ph.CO].

[28] J. C. Hill et al. "Atacama Cosmology Telescope: Constraints on prerecombination early dark energy". In: Phys. Rev. D 105.12, 123536 (June 2022), p. 123536. DOI: 10.1103/PhysRevD.105.123536. arXiv: 2109.04451 [astro-ph.CO].

[29] S. Pandey et al. "Cross-correlation of Dark Energy Survey Year 3 lensing data with ACT and P l a n c k thermal Sunyaev-Zel'dovich effect observations. II. Modeling and constraints on halo pressure profiles". In: Phys. Rev. D 105.12, 123526 (June 2022), p. 123526. DOI: 10.1103/PhysRevD.105.123526. arXiv: 2108.01601 [astro-ph.CO].

[30] M. Gatti et al. "Cross-correlation of Dark Energy Survey Year 3 lensing data with ACT and Planck thermal Sunyaev-Zel'dovich effect observations. I. Measurements, systematics tests, and feedback model constraints". In: Phys. Rev. D 105.12, 123525 (June 2022), p. 123525. DOI: 10.1103/PhysRevD.105.123525. arXiv: 2108.01600 [astro-ph.CO].

[31] M. Lungu et al. "The Atacama Cosmology Telescope: measurement and analysis of 1D beams for DR4". In: J. Cosmology Astropart. Phys. 2022.5, 044 (May 2022), p. 044. DOI: 10.1088/1475-7516/2022/05/044. arXiv: 2112.12226 [astro-ph.IM].

[32] K. D. Crowley et al. "The Simons Observatory: A large-diameter truss for a refracting telescope cooled to 1 K". In: *Review of Scientific Instruments* 93.5 (2022), p. 055106. DOI: 10.1063/5.0093857. eprint: https://doi.org/10.1063/5.0093857. URL: https://doi.org/10.1063/5.0093857.

[33] B. S. Hensley et al. "The Simons Observatory: Galactic Science Goals and Forecasts". In: ApJ 929.2, 166 (Apr. 2022), p. 166. DOI: 10.3847/1538-4357/ac5e36. arXiv: 2111.02425 [astro-ph.GA].

[34] I. Lowe et al. "A Study of 90 GHz Dust Emissivity on Molecular Cloud and Filament Scales". In: ApJ 929.1, 102 (Apr. 2022), p. 102. DOI: 10.3847/1538-4357/ac5d4f. arXiv: 2105.13432 [astro-ph.GA].

[35] K. Abazajian et al. "CMB-S4: Forecasting Constraints on Primordial Gravitational Waves". In: ApJ 926.1, 54 (Feb. 2022), p. 54. DOI: 10.3847/1538-4357/ac1596. arXiv: 2008.12619 [astro-ph.CO].

[36] S. Dahal et al. "Four-year Cosmology Large Angular Scale Surveyor (CLASS) Observations: On-sky Receiver Performance at 40, 90, 150, and 220 GHz Frequency Bands". In: ApJ 926.1, 33 (Feb. 2022), p. 33. DOI: 10.3847/1538-4357/ac397c. arXiv: 2107.08022 [astro-ph.IM].

[37] T. W. Morris et al. "The Atacama Cosmology Telescope: Modeling bulk atmospheric motion". In: Phys. Rev. D 105.4, 042004 (Feb. 2022), p. 042004. DOI: 10.1103/PhysRevD.105.042004. arXiv: 2111.01319 [astro-ph.IM].

[38] T. Namikawa et al. "Simons Observatory: Constraining inflationary gravitational waves with multitracer B -mode delensing". In: Phys. Rev. D 105.2, 023511 (Jan. 2022), p. 023511. DOI: 10.1103/PhysRevD.105.023511. arXiv: 2110.09730 [astro-ph.CO].

[39] S. R. Dicker et al. "Observations of compact sources in galaxy clusters using MUSTANG2". In: MNRAS 508.2 (Dec. 2021), pp. 2600–2612. DOI: 10.1093/mnras/stab2679. arXiv: 2107.06725 [astro-ph.CO].

[40] S. Adhikari et al. “Probing Galaxy Evolution in Massive Clusters Using ACT and DES: Splashback as a Cosmic Clock”. In: ApJ 923.1, 37 (Dec. 2021), p. 37. DOI: 10.3847/1538-4357/ac0bbc. arXiv: 2008.11663 [astro-ph.GA].

[41] K. Harrington et al. “Two Year Cosmology Large Angular Scale Surveyor (CLASS) Observations: Long Timescale Stability Achieved with a Front-end Variable-delay Polarization Modulator at 40 GHz”. In: ApJ 922.2, 212 (Dec. 2021), p. 212. DOI: 10.3847/1538-4357/ac2235. arXiv: 2101.00034 [astro-ph.IM].

[42] Y. Li et al. “Constraining Cosmic Microwave Background Temperature Evolution With Sunyaev-Zel’Dovich Galaxy Clusters from the Atacama Cosmology Telescope”. In: ApJ 922.2, 136 (Dec. 2021), p. 136. DOI: 10.3847/1538-4357/ac26b6. arXiv: 2106.12467 [astro-ph.CO].

[43] A. D. Hincks et al. “A high-resolution view of the filament of gas between Abell 399 and Abell 401 from the Atacama Cosmology Telescope and MUSTANG-2”. In: MNRAS (Nov. 2021). DOI: 10.1093/mnras/stab3391. arXiv: 2107.04611 [astro-ph.CO].

[44] H. McCarrick et al. “The Simons Observatory Microwave SQUID Multiplexing Detector Module Design”. In: ApJ 922.1, 38 (Nov. 2021), p. 38. DOI: 10.3847/1538-4357/ac2232. arXiv: 2106.14797 [astro-ph.IM].

[45] G. E. Chesmore et al. “Simons Observatory HoloSim-ML: machine learning applied to the efficient analysis of radio holography measurements of complex optical systems”. In: Appl. Opt. 60.29 (Oct. 2021), p. 9029. DOI: 10.1364/AO.435007. arXiv: 2107.04138 [astro-ph.IM].

[46] Y. Guan et al. “The Atacama Cosmology Telescope: Microwave Intensity and Polarization Maps of the Galactic Center”. In: ApJ 920.1, 6 (Oct. 2021), p. 6. DOI: 10.3847/1538-4357/ac133f. arXiv: 2105.05267 [astro-ph.GA].

[47] J. Orlowski-Scherer et al. “Atacama Cosmology Telescope measurements of a large sample of candidates from the Massive and Distant Clusters of WISE Survey. Sunyaev-Zeldovich effect confirmation of MaDCoWS candidates using ACT”. In: A&A 653, A135 (Sept. 2021), A135. DOI: 10.1051/0004-6361/202141200. arXiv: 2105.00068 [astro-ph.GA].

[48] E. M. Vavagiakis et al. “The Atacama Cosmology Telescope: Probing the baryon content of SDSS DR15 galaxies with the thermal and kinematic Sunyaev-Zel’dovich effects”. In: Phys. Rev. D 104.4, 043503 (Aug. 2021), p. 043503. DOI: 10.1103/PhysRevD.104.043503. arXiv: 2101.08373 [astro-ph.CO].

[49] V. Calafut et al. “The Atacama Cosmology Telescope: Detection of the pairwise kinematic Sunyaev-Zel’dovich effect with SDSS DR15 galaxies”. In: Phys. Rev. D 104.4, 043502 (Aug. 2021), p. 043502. DOI: 10.1103/PhysRevD.104.043502. arXiv: 2101.08374 [astro-ph.CO].

[50] Y. Li et al. “In Situ Performance of the Low Frequency Array for Advanced ACTPol”. In: *IEEE Transactions on Applied Superconductivity* 31.5, 3063334 (Aug. 2021), p. 3063334. DOI: 10.1109/TASC.2021.3063334. arXiv: 2101.02658 [astro-ph.IM].

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