

Tony Mroczkowski, Ph.D.

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Research Interests

Observational cosmology and large scale structure — X-ray, radio, and Sunyaev-Zeldovich effect (SZE) observations of the astrophysics of galaxy clusters — Radio, millimeter, and submillimeter-wave instrumentation — Design of the Atacama Large Aperture Submm Telescope ([AtLAST](#)).

Positions Held

Associate Astronomer/(Sub-)mm Instrument Scientist, European Southern Observatory <i>Indefinite appointment (equivalent to tenured ESO faculty) as of Feb 2021.</i>	2016–now
National Research Council (NRC) Fellow, Naval Research Lab (NRL)	2013–2016
Einstein Postdoctoral Fellow (2nd & 3rd years), Jet Propulsion Lab (JPL)	2011–2013
Einstein Postdoctoral Fellow (1st year), University of Pennsylvania (U Penn)	2010–2011
Postdoctoral Research Assistant, University of Pennsylvania	2008–2010

Education

Columbia University, Graduate School of Arts and Sciences
Advisor: Amber Miller
Ph.D. in Astronomy, conferred 20 May 2009 (defended Sept. 2008)
Dissertation: *The Sunyaev-Zel'dovich Array: Constraining a new pressure profile for fitting SZE observations of galaxy clusters*
Thesis Committee: Greg Bryan, Zoltan Haiman, Amber Miller, Frits Paerels, & Caleb Scharf
M.Phil. and M.A. in Astronomy, 19 May 2004

Cooper Union, Nerken School of Engineering
Advisor: Toby Cumberbatch
B.S. in Engineering, with an Electrical Engineering thesis, **2001**

Cornell University, College of Arts and Sciences
Physics Department, transferred to the Cooper Union in 1998

Research Experience

Associate Astronomer/Sub-mm Instrument Scientist
European Southern Observatory
Feb 2016–present
Line Manager: Eric Emsellem

- Project Scientist for ALMA Band 2, the ALMA project now in Phase I that will deliver receiver cartridges covering 67-116 GHz on sky [39, 26].
- Contact scientist responsible for overseeing several ALMA development studies and projects from ESO, which heads the European ALMA region.
- As an associate astronomer at ESO, I conduct a vigorous scientific research program alongside my functional duties roughly 50% of the time.

National Research Council Fellow
U.S. Naval Research Laboratory
Aug 2013–Jan 2016
Advisor: Tracy Clarke

- Led the analysis of *Chandra* X-ray spectroscopic and imaging data on radio-selected clusters.
- Key member of the NRL team commissioning the VLA Ionospheric and Transient Experiment (VLITE), a low frequency instrument on the Very Large Array (VLA).
- Obtained some of the first SZ images with the Goddard IRAM Superconducting Millimeter Observer (GISMO) on the IRAM 30-m telescope. See [73].
- Collaborator in the Stratospheric Kinetic Inductance Polarimeter (SKIP), a proposed balloon-borne mission to measure inflationary modes through CMB polarization. The proposal was not accepted.

Einstein Fellow (2nd-3rd Year)

NASA Jet Propulsion Laboratory

July 2011–July 2013

Advisor: Jonas Zmuidzinas

- Improved designs and geometric layout of the kinetic inductance detectors (KIDs) for the [MAKO](#) project on the Caltech Submillimeter Observatory ([CSO](#)).
- Active role in analysis and observations with [Bolocam](#) and [MUSIC](#) using the CSO. In particular, my role with the Bolocam 1 & 2 mm data led to the first measurement of the kinetic SZE on resolved, subcluster scales when I recognized the anomalous SZE signal we saw had to be due to the cluster’s line of sight peculiar velocity (see Mroczkowski et al. 2012 [[83](#)] and Sayers et al. 2013 [[79](#)]).

Postdoctoral Scholar / 1st Year Einstein Fellow

University of Pennsylvania

Aug 2008–July 2011

Advisor: Mark Devlin

- Led much of the cryogenic and electronics re-design and testing of [BLAST-Pol](#), the polarization rebuild/upgrade to the Balloon-borne Large Aperture Submillimeter Telescope ([BLAST](#)).
- Led new observations and analysis with the Multiplexed SQUID-TES Array at Ninety Gigahertz ([MUSTANG](#)), an 8×8 element bolometric array for the Green Bank Telescope ([GBT](#)) built to observe at a 3.3 mm wavelength. At 9” resolution, MUSTANG was the highest resolution instrument to image the Sunyaev-Zeldovich effect to date.
- Coauthored the science cases for the NSF proposals to fund observations performed with MUSTANG-1 and MUSTANG-1.5. I continue as co-Investigator on the successful proposals to build and fund operations with [MUSTANG-2](#).

Thesis Project: the Sunyaev-Zeldovich Array

Columbia University

Jan 2003 – Aug 2008

Advisor: Amber Miller

- Active role in the design, cryogenic testing, characterization, and integration of the receivers and backend electronics for the Sunyaev-Zeldovich Array (SZA; see [[101](#)]). The SZA became part of the Combined Array for Research in Millimeter-wave Astronomy (CARMA) in 2008.
- Early lead role in commissioning and observations with the SZA. The effort to get the instrument running included debugging, data quality assessment, as well as development, design, and fabrication of many components used in the SZA.
- Tested and developed improved models for parameter extraction from interferometric observations of the SZE using Monte Carlo Markov Chain (MCMC) fitting techniques. These models included the first application of the generalized NFW profile (Nagai et al. 2007) to SZE-measured pressure profiles (see Mroczkowski et al. 2009; [[100](#)]). The generalized NFW profile was adopted soon after as the Arnaud et al. 2010 “universal pressure profile”, and is still the standard in the analysis of SZ and X-ray pressure profiles.

Teaching and Mentoring Experience

Mentoring Roles at ESO

2017-present

- Primary advisor (along with Gergö Popping) to Joshiwa van Marrewijk, who is working on studies of galaxy clusters and the impact of environment on their member galaxies using ALMA and ACT observations of the SZ effect(s).
- Co-advisor with Eugene Churazov to Luca Di Mascolo at the Max Planck Institute for Astrophysics (MPA). Together with Eugene, I guided Luca throughout his PhD on ALMA/ACA joint-likelihood visibility-space model fitting (i.e. in the native Fourier domain). These are perhaps the most advanced tools for the analysis of interferometric SZ observations in existence. Luca graduated in spring 2020, and is now working as a postdoc in Trieste with a prestigious cluster cosmology group including Stefano Borgani, Elena Rasia, and Alex Saro.
- Advisor to visiting student Jean-Paul Breuer from Masaryk University in Brno, Czechia (home advisor: Norbert Werner). Under my joint supervision, he successfully completed his first paper [[21](#)], though this one year visit was interrupted by the onset of the COVID-19 pandemic.

- Main advisor to Pablo Gómez Toribio, an ESO Summer Student in 2020 coming from the Universitat Politècnica de Catalunya, in Barcelona. We have submitted for publication a paper [13] on the outcomes from this project, which addresses the effect of climate change and geography on water vapor in the Atacama Desert.

Mentoring Roles as a Postdoc 2009-2013

Role in mentoring several undergraduates and graduate students at U. Penn and Caltech, including Elio Angilè, Nicole Czakon, Phil Korngut, Alex Young, and Ashley Reichardt.

Graduate Teaching Assistant, Columbia University 2001-2003

Laboratory classes for *Earth, Moon, and Planets* and *Beyond the Solar System*, which are introductory undergraduate astronomy courses for non-majors.

Machine Shop Teaching Assistant, the Cooper Union, 1999-2001

Hands-on machine shop class for engineering undergraduates.

Press Releases and Highlights

Green Bank Observatory press release on MUSTANG-2 imaging of the SZ cavities in MS0735.6+7421 in [2] Dec 2022

NRAO image release on low-frequency VLA imaging of the the Perseus cluster[16] Nov 2020

Joint press release from the **Green Bank Observatory**, **European Space Agency**, and **Subaru** optical telescope on a merging cluster from the CAMIRA survey[14]. Nov 2020

Astronomy sets new records with revolutionary telescope (AtLAST) May 2020

UKRI press release on AtLAST Apr 2020

Our SZ measurement of the shock in the Bullet Cluster[32] was a highlight on the **ALMA Science Portal** and was an **A&A highlighted paper**. Oct 2019

1st SZ observation with GISMO from the IRAM 30-m Telescope Mar 2015

Collaborations, Professional Societies, and Community Service

Member of the Atacama Cosmology Telescope (**ACT**) collaboration

Member of the coordination committee and head of the telescope design work package for the Atacama Large Aperture Submm Telescope (**AtLAST**)

Member of CMB-S4, MaDCoWS, and MUSTANG-2 collaborations

Member of the European Astronomical Society (EAS) 2021

NASA endorsed member of the Athena Study Science Team (ASST) Mar 2015

SWG 1.2: the Astrophysics of Galaxy Groups and Clusters

Member of the International Astronomical Union (IAU) Sept 2015

Refereed several publications in e.g. A&A, ApJ, and MNRAS

Served on the review committees for NASA APRA, NSF, *Chandra*, CARMA, and ALMA observing proposals.

Served on several review committees for ALMA and AtLAST design reviews.

Awarded Proposals

INFRADEV-01-2019-2020 Horizons 2020 Design Study *Towards an Atacama Large Aperture Submillimeter Telescope (AtLAST)*. See also [15]. I am a co-leader in the steering committee for this study, and leader of the Telescope Design work package.

NSF AST 1309032 (as co-I): *High Resolution Observations of the Sunyaev-Zeldovich Effect in Clusters of Galaxies at 90 GHz Using the GBT*

NSF AST 1007905 (as co-I): *High Resolution Observations of the Sunyaev-Zeldovich Effect in Clusters of Galaxies and High-z Galaxies at 90 GHz Using the GBT*

Erik Reese and I wrote the successful science cases for the above three year NSF AST proposals, which

have funded MUSTANG & MUSTANG-1.5 observations.

Observing proposals as PI: many GBT/MUSTANG*, many IRAM 30-meter (GISMO, NIKA, NIKA2), several CARMA, several APEX, several ALMA, one XMM-Newton**, one JCMT, and one CSO proposal.

*Awarded support under the NRAO Student Observer Support (SOS) program.

**Awarded support under the NASA Astrophysics Data Analysis Program (ADAP).

Observing proposals as co-I: many GBT/MUSTANG, a few IRAM 30-meter (GISMO, NIKA, NIKA2), CARMA, APEX, ALMA, XMM-Newton, Chandra, VLA, VLT, and JCMT proposals

Conference Organization and Invited Talks

Member of the Science Organizing Committee (SOC) for mm Universe 2023 Workshop on mm astronomy at IRAM in Grenoble	June 2023
Invited participant at Mapping the invisible Universe: Workshop on single-dish sub-mm astronomy at the Lorentz Center in Leiden	Aug/Sept 2022
SOC and proposal team member of IAU-GA FM#6: Dynamics of the ICM: Radio and X-ray Observations and Theory	Aug 2022
Colloquium (invited, online) at the University of Oslo	Jan 2022
Chair, ALMA Front End Receiver Development Workshop (ALMA-FED 2021)	Sept 2021
Invited Talk at EAS2021-S3 session on Galaxy clusters and AGNs	June 2021
Co-Chair of the Galaxy Cluster Formation Workshop II (GCF2021) at ESO	June 2021
Invited Talk at Academia Sinica (ASIAA)	Jan 2020
Invited Talk, NASA Cosmic Origins Far-IR Science Interest Group (IR SIG)	Nov 2020
Invited Talk, ALMA Jet and Disk Study Group	Oct 2020
Invited Talk, University of Barcelona Cosmology Group	July 2020
Invited Joint Talk on AtLAST to the INAF community	May 2020
Invited (remote) seminar, Institut de Ciències de l'Espai (ICE/CSIC-IEEC)	Apr 2020
LOC of B-modes from Space (Bmode2019)	Dec 2019
co-Organizer and SOC member of the ALMA Development Workshop 2019	June 2019
Invited co-Chair for the International Workshop on Submillimeter Astronomy Workshop at the Purple Mountain Observatory	Feb 2019
SOC member for CMB in HD at the Simons Foundation Workshop on the Low-noise, High-Resolution Frontier for CMB measurements	Dec 2018
Invited seminar at l'Osservatorio Astronomico di Trieste	Oct 2018
Member of the SOC for ICM 2018: MPA/ESO Workshop on the Intra-Cluster Medium	Oct 2018
co-Chair of AtLAST2018 Part II: Science Workshop	Sept 2018
Invited Talk for the Caltech Observational Cosmology Group	Mar 2018
SOC member for Snowcluster 2018	Mar 2018
co-Chair of AtLAST2018 Part I: Technical Aspects	Jan 2018
Invited Talk at the ISSI Bern workshop Clusters of Galaxies: Physics & Cosmology	Nov 2017
co-Chair of Galaxy Cluster Formation Workshop (GCF2017) at ESO	July 2017
SOC member for Getting Ready for ALMA Band 5 workshop held at ESO	Feb 2017
Organizer of the ALMA Developers' and ALMA Bands 2/2+3 Workshops at Chalmers University	May 2016
Co-Organizer of Galaxy Cluster Discussion Group (GCDG) at ESO	2016 – 2019

Invited Special Seminar at Academia Sinica (ASIAA)	Aug 2015
SOC member for Snowcluster 2015	Mar 2015
Organizer of the astronomy talks at the Naval Research Lab	2013–2016
SOC member for Snowcluster 2013	Mar 2013
Invited Talk at NASA Goddard Space Flight Center	Oct 2014
Invited Talk at Max Planck Institute for Astrophysics (MPA)	July 2014
Invited Talk at Institut de Ciències de l’Espai (ICE)	July 2014
Colloquium (invited) at Academia Sinica (ASIAA)	Feb 2013
Special Session on High-resolution SZE, AAS 220th Meeting Co-organizer with Brian Mason (NRAO)	June 2012
Invited Talk at Institut de Ciències de l’Espai (ICE)	May 2012
ALMA Community Day at U. Penn Co-organizer with Kim Scott (U. Penn/NRAO)	Mar 2011
Colloquium (invited) at Michigan State University	Oct 2010
Invited Talk at the 3 rd Biennial Leopoldina Conference: Dark Energy <i>Using the Sunyaev-Zeldovich Array in Detailed Studies of Galaxy Clusters</i>	Oct 2008

Personal References

Dr. Eugene Churazov, Staff Scientist
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Prof. Craig Sarazin, W. H. Vanderbilt Professor
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1 Publications with a high degree of involvement

- [1] Melanie Kaasinen, Joshiwa van Marrewijk, Gergö Popping, Michele Ginolfi, Luca Di Mascolo, Tony **Mroczkowski**, et al. To See or Not to See a $z \sim 13$ Galaxy? That is the Question. *arXiv e-prints*, page arXiv:2210.03754, February 2023. [arXiv:2210.03754](https://arxiv.org/abs/2210.03754), [doi:10.1051/0004-6361/202245093](https://doi.org/10.1051/0004-6361/202245093).
- [2] John Orłowski-Scherer, Saianeesh K. Haridas, Luca Di Mascolo, Karen Perez Sarmiento, Charles E. Romero, Simon Dicker, et al. GBT/MUSTANG-2 9” resolution imaging of the SZ effect in MS0735.6+7421. Confirmation of the SZ cavities through direct imaging. *A&A*, 667:L6, November 2022. [arXiv:2207.07100](https://arxiv.org/abs/2207.07100), [doi:10.1051/0004-6361/202244547](https://doi.org/10.1051/0004-6361/202244547).
- [3] John Carpenter, Crystal Brogan, Daisuke Iono, and Tony **Mroczkowski**. The ALMA2030 Wideband Sensitivity Upgrade. *ALMA Memo Series*, 621:arXiv:2211.00195, October 2022. URL: <http://library.nrao.edu/public/memos/alma/main/memo621.pdf>, [arXiv:2211.00195](https://arxiv.org/abs/2211.00195).
- [4] Tony **Mroczkowski**, Megan Donahue, Joshiwa van Marrewijk, Tracy E. Clarke, Aaron Hoffer,

- Huib Intema, et al. The strongest cool core in REXCESS: Missing X-ray cavities in RXC J2014.8-2430. *A&A*, 665:A48, September 2022. [arXiv:2207.13359](https://arxiv.org/abs/2207.13359), [doi:10.1051/0004-6361/202243718](https://doi.org/10.1051/0004-6361/202243718).
- [5] E. Osinga, R. J. van Weeren, F. Andrade-Santos, L. Rudnick, A. Bonafede, T. Clarke, et al. The detection of cluster magnetic fields via radio source depolarisation. *A&A*, 665:A71, September 2022. [arXiv:2207.09717](https://arxiv.org/abs/2207.09717), [doi:10.1051/0004-6361/202243526](https://doi.org/10.1051/0004-6361/202243526).
- [6] Joanna Ramasawmy, Pamela D. Klaassen, Claudia Cicone, Tony K. **Mroczkowski**, Chian-Chou Chen, Thomas Cornish, et al. The Atacama Large Aperture Submillimetre Telescope: key science drivers. In Jonas Zmuidzinas and Jian-Rong Gao, editors, *Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy XI*, volume 12190 of *Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series*, page 1219007, August 2022. [arXiv:2207.03914](https://arxiv.org/abs/2207.03914), [doi:10.1117/12.2627505](https://doi.org/10.1117/12.2627505).
- [7] Veronica Biffi, John A. ZuHone, Tony **Mroczkowski**, Esra Bulbul, and William Forman. The velocity structure of the intracluster medium during a major merger: Simulated microcalorimeter observations. *A&A*, 663:A76, July 2022. [arXiv:2201.12370](https://arxiv.org/abs/2201.12370), [doi:10.1051/0004-6361/202142764](https://doi.org/10.1051/0004-6361/202142764).
- [8] Adam D. Hincks, Federico Radiconi, Charles Romero, Mathew S. Madhavacheril, Tony **Mroczkowski**, Jason E. Austermann, 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. *MNRAS*, 510(3):3335–3355, March 2022. [arXiv:2107.04611](https://arxiv.org/abs/2107.04611), [doi:10.1093/mnras/stab3391](https://doi.org/10.1093/mnras/stab3391).
- [9] T. **Mroczkowski**, A. Stroe, and S. M. Chasiotis-Klingner. Report on the ESO/Center for Astrophysics — Harvard & Smithsonian Workshop “Galaxy Cluster Formation II (GCF2021)”. *The Messenger*, 185:39–41, December 2021. [doi:10.18727/0722-6691/5253](https://doi.org/10.18727/0722-6691/5253).
- [10] Hugo G. Messias, Evanthia Hatziminaoglou, Pascale Hibon, Tony **Mroczkowski**, Israel Matute, Mark Lacy, et al. An ACA 1 mm survey of HzRGs in the ELAIS-S1: survey description and first results. *MNRAS*, 508(4):5259–5278, December 2021. [arXiv:2105.09895](https://arxiv.org/abs/2105.09895), [doi:10.1093/mnras/stab1462](https://doi.org/10.1093/mnras/stab1462).
- [11] John Orłowski-Scherer, Luca Di Mascolo, Tanay Bhandarkar, Alex Manduca, Tony **Mroczkowski**, Stefania Amodeo, et al. *A&A*, 653:A135, September 2021. [arXiv:2105.00068](https://arxiv.org/abs/2105.00068), [doi:10.1051/0004-6361/202141200](https://doi.org/10.1051/0004-6361/202141200).
- [12] Luca Di Mascolo, Tony **Mroczkowski**, Yvette Perrott, Lawrence Rudnick, M. James Jee, Kim HyeonHan, et al. Multiwavelength view of SPT-CL J2106-5844. The radio galaxies and the thermal and relativistic plasmas in a massive galaxy cluster merger at $z \simeq 1.13$. *A&A*, 650:A153, June 2021. [arXiv:2101.02216](https://arxiv.org/abs/2101.02216), [doi:10.1051/0004-6361/202040260](https://doi.org/10.1051/0004-6361/202040260).
- [13] Pablo Gómez Toribio, Tony **Mroczkowski**, Anna Cabré, and Carlos De Breuck. Two decades of km-resolution satellite- and ground-based measurements of the precipitable water vapor in the Atacama Desert. *arXiv e-prints*, page arXiv:2103.03917, March 2021. [arXiv:2103.03917](https://arxiv.org/abs/2103.03917).
- [14] Nobuhiro Okabe, Simon Dicker, Dominique Eckert, Tony **Mroczkowski**, Fabio Gastaldello, Yen-Ting Lin, et al. Active gas features in three HSC-SSP CAMIRA clusters revealed by high angular resolution analysis of MUSTANG-2 SZE and XXL X-ray observations. *MNRAS*, 501(2):1701–1732, February 2021. [arXiv:1911.09236](https://arxiv.org/abs/1911.09236), [doi:10.1093/mnras/staa2330](https://doi.org/10.1093/mnras/staa2330).
- [15] Pamela D. Klaassen, Tony K. **Mroczkowski**, Claudia Cicone, Evanthia Hatziminaoglou, Sabrina Sartori, Carlos De Breuck, et al. The Atacama Large Aperture Submillimeter Telescope (AtLAST). In *Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series*, volume 11445 of *Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series*, page 114452F, December 2020. [arXiv:2011.07974](https://arxiv.org/abs/2011.07974), [doi:10.1117/12.2561315](https://doi.org/10.1117/12.2561315).
- [16] M. Gendron-Marsolais, J. Hlavacek-Larrondo, R. J. van Weeren, L. Rudnick, T. E. Clarke, B. Sebastian, et al. High-resolution VLA low radio frequency observations of the Perseus cluster: radio lobes, mini-halo, and bent-jet radio galaxies. *MNRAS*, 499(4):5791–5805, November 2020. [arXiv:2005.12298](https://arxiv.org/abs/2005.12298), [doi:10.1093/mnras/staa2003](https://doi.org/10.1093/mnras/staa2003).
- [17] Simon R. Dicker, Charles E. Romero, Luca Di Mascolo, Tony **Mroczkowski**, Jonathan Sievers, Emily Moravec, et al. The Massive and Distant Clusters of WISE Survey. X. Initial Results from a Sunyaev-Zeldovich Effect Study of Massive Galaxy Clusters at $z > 1$ Using MUSTANG2 on the

- GBT. *ApJ*, 902(2):144, October 2020. [arXiv:2006.06703](https://arxiv.org/abs/2006.06703), [doi:10.3847/1538-4357/abb673](https://doi.org/10.3847/1538-4357/abb673).
- [18] Emily Moravec, Anthony H. Gonzalez, Simon Dicker, Stacey Alberts, Mark Brodwin, Tracy E. Clarke, et al. The Massive and Distant Clusters of WISE Survey. IX. High Radio Activity in a Merging Cluster. *ApJ*, 898(2):145, August 2020. [arXiv:2006.15155](https://arxiv.org/abs/2006.15155), [doi:10.3847/1538-4357/aba0b2](https://doi.org/10.3847/1538-4357/aba0b2).
- [19] A. Ginsburg, L. D. Anderson, S. Dicker, C. Romero, B. Svoboda, M. Devlin, et al. VizieR Online Data Catalog: MUSTANG-2 Galactic Plane survey at 3mm (MGPS90) (Ginsburg+, 2020). *VizieR Online Data Catalog*, page J/ApJS/248/24, July 2020.
- [20] Luca Di Mascolo, Tony **Mroczkowski**, Eugene Churazov, Emily Moravec, Mark Brodwin, Anthony Gonzalez, et al. The Massive and Distant Clusters of WISE Survey. SZ effect Verification with the Atacama Compact Array - Localization and Cluster Analysis. *A&A*, 638:A70, June 2020. [arXiv:2004.06728](https://arxiv.org/abs/2004.06728), [doi:10.1051/0004-6361/202037818](https://doi.org/10.1051/0004-6361/202037818).
- [21] J. P. Breuer, N. Werner, F. Mernier, T. **Mroczkowski**, A. Simionescu, T. E. Clarke, et al. The mergers in Abell 2256: displaced gas and its connection to the radio-emitting plasma. *MNRAS*, 495(4):5014–5026, June 2020. [arXiv:2005.10263](https://arxiv.org/abs/2005.10263), [doi:10.1093/mnras/staa1492](https://doi.org/10.1093/mnras/staa1492).
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- [23] Brian Mason, Simon Dicker, Sarah Sadavoy, Sara Stanchfield, Tony **Mroczkowski**, Charles Romero, et al. Confirmation of Enhanced Long-wavelength Dust Emission in OMC 2/3. *ApJ*, 893(1):13, April 2020. [arXiv:1905.05221](https://arxiv.org/abs/1905.05221), [doi:10.3847/1538-4357/ab734a](https://doi.org/10.3847/1538-4357/ab734a).
- [24] C. Xie, R. J. van Weeren, L. Lovisari, F. Andrade-Santos, A. Botteon, M. Brügger, et al. The discovery of radio halos in the frontier fields clusters Abell S1063 and Abell 370. *A&A*, 636:A3, April 2020. [arXiv:2001.04725](https://arxiv.org/abs/2001.04725), [doi:10.1051/0004-6361/201936953](https://doi.org/10.1051/0004-6361/201936953).
- [25] Charles E. Romero, Jonathan Sievers, Vittorio Ghirardini, Simon Dicker, Simona Giacintucci, Tony **Mroczkowski**, et al. Pressure Profiles and Mass Estimates Using High-resolution Sunyaev-Zel'dovich Effect Observations of Zwicky 3146 with MUSTANG-2. *ApJ*, 891(1):90, March 2020. [arXiv:1908.09200](https://arxiv.org/abs/1908.09200), [doi:10.3847/1538-4357/ab6d70](https://doi.org/10.3847/1538-4357/ab6d70).
- [26] P. Yagoubov, T. **Mroczkowski**, V. Belitsky, D. Cuadrado-Calle, F. Cuttaia, G. A. Fuller, et al. Wideband 67-116 GHz receiver development for ALMA Band 2. *A&A*, 634:A46, Feb 2020. [arXiv:1912.10841](https://arxiv.org/abs/1912.10841), [doi:10.1051/0004-6361/201936777](https://doi.org/10.1051/0004-6361/201936777).
- [27] Surajit Paul, Sameer Salunkhe, Satish Sonkamble, Prateek Gupta, Tony **Mroczkowski**, and Somak Raychaudhury. Radio relic and the diffuse emission trail discovered in low-mass galaxy cluster Abell 1697. *A&A*, 633:A59, Jan 2020. [arXiv:1911.00531](https://arxiv.org/abs/1911.00531), [doi:10.1051/0004-6361/201936593](https://doi.org/10.1051/0004-6361/201936593).
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