Nikko J. Cleri

Eberly Postdoctoral Fellow The Pennsylvania State University

Summary

Research: Galaxy Evolution, High-Redshift Galaxies, Emission-Line Galaxies, Population III Stars, Active

Galactic Nuclei, Black Hole Seeds, Star Formation, Dust Attenuation

Techniques: UV/Optical/Near-IR Spectroscopy, Photoionization Modeling

Proposals: JWST, HST, Gemini: >500 hours (PI+Co-I) and >300k USD (PI) awarded

Collaborations: CEERS, NGDEEP, RUBIES, CAPERS, POPPIES

Publications: 4 first author, 4 significant author, 60 coauthor, 3019 citations, h-index 28

Presentations: 17 research, 10 outreach and professional development

Academic and Professional Appointments

2024-	Eberly Postdoctoral Fellow	Penn State
2021-24	Graduate Student (Advisor: Prof. Casey Papovich)	Texas A&M
2019-21	Graduate Student (Advisor: Prof. Jonathan Trump)	UConn
2017-20	Research Assistant (Advisor: Prof. Gerald Dunne)	UConn
2018	NSF REU Student (Advisor: Prof. Louis Strigari)	Texas A&M

Education

Ph.D. Astronomy	Texas A&M University	2021 - 2024
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Advisor: Casey Papovich

Thesis: Spectroscopic Studies of Stars and Black Holes Across Cosmic Time

M.S. Physics University of Connecticut 2019 - 2021

Advisor: Jonathan R. Trump

Thesis: CLEAR: Paschen-β Star Formation Rates and Dust Attenuation in Low Redshift Galaxies

B.S. Physics | *Mathematics Minor* University of Connecticut 2015 - 2019

Advisor: Gerald V. Dunne

Undergraduate Research: Resurgent trans-series for generalized Hastings-McLeod solutions

Awarded Proposals and Grants

Principal Investigator		2
2024	JWST-AR-5558: A Census of Optical Diagnostics of Ionizing Sources Across Cosmic Time	~\$174k
2021	HST-AR-16609: Peering Through the Dust: Paschen-beta Indicators of Star Formation and Dust Attenuation	∼\$136k
Co-Investiga	ator	7

2024	JWST-GO-5718: A Spectroscopic Census of Faint, Broad-Line AGN at z>5 (PI: D. Kocevski)	20.49 hours
2024	JWST-GO-5943: What really are the Physical Properties of Galaxies in the Epoch of Reionization? (PI: C. Papovich)	61.83 hours
2024	JWST-GO-5407: <i>MEOW: The MIRI Early Obscured-AGN Wide Survey</i> (PI: G. Leung)	73.95 hours
2024	JWST-GO-5507: Deep Spectroscopy of Galaxies at z=4-14: Uncovering Drivers of Early Galaxy Formation and Black Hole Growth (PI: T. Hutchison)	23.29 hours
2024	JWST-GO-6368: The CANDELS-Area Prism Epoch of Reionization Survey (CAPERS) (PI: M. Dickinson)	293.21 hours
2023	JWST-GO-3703: Breaking the $z=10$ barrier with MIRI: redshift confirmation and detection of rest-frame optical emission lines (PI: J. Zavala)	24.33 hours
2023	GS-2023A-Q-136: Optical Spectroscopy of JWST ERO Galaxies (PI: B. Backhaus)	20 hours

Honors and Awards

2022	Texas Space Grant Consortium Graduate Fellow - \$5K	Texas A&M
2018	NSF REU - \$5K	Texas A&M
2016	Dean's List - College of Liberal Arts and Sciences	UConn
2015-19	Governor's Scholarship - \$8.5K/yr	UConn
2015	Community Service Scholarship - \$1K	UConn

Teaching Experience

Teaching Assistant/Course Assistant

2019-21	PHYS 1501: Physics for Engineers I	UConn
2021	PHYS 1025: Introduction to Astronomy	UConn

Service

Physics & Astronomy Community

Referee - Astronomy & Astrophysics (A&A)

Referee - Astrophysical Journal (ApJ)

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2024-	Climate and Diversity Committee	Penn State
2023-24	Graduate Representative - Astronomy	Texas A&M
2022-24	Organizer - Astronomy Journal Club	Texas A&M

Mentoring

2022-24	Coordinator - Mentoring and Advising Graduates in an Inclusive Community (MAGIC)	Texas A&M
2022-24	Mentor - Mentoring and Advising Graduates in an Inclusive Community (MAGIC)	Texas A&M
2017-18	Mentor - UConn Undergraduate Peer Mentoring	UConn

Outreach

2022	Volunteer - Gateway to Graduate School	Texas A&M
2022-24	Demonstrator - Physics and Engineering Festival	Texas A&M
2022	High School Research Reviewer - Lumiere	Texas A&M
2021-24	Presenter - Astronomy on Tap BCS 'In the News'	Texas A&M
2021-22	Treasurer - Astronomy on Tap BCS	Texas A&M
2021-22	Pen-Pal - Letters to a Pre-Scientist	Texas A&M
2018	Volunteer - Mitchell Institute Star Party Group	Texas A&M

Collaborations and Survey Membership

Co-I	CAPERS: The CANDELS-Area Prism Epoch of Reionization Survey	JWST
Member	POPPIES: The Public Observation Pure Parallel Infrared Emission-Line Survey	JWST
Member	RUBIES: Red Unknowns: Bright Infrared Extragalactic Survey	JWST
Member	NGDEEP: The Next Generation Deep Exploratory Public Survey	JWST
Member	CEERS: The Cosmic Evolution Early Release Science Survey	JWST
Member	CLEAR: The CANDELS Ly α Emission at Reionization Survey	HST

Technical Skills and Programming Languages

Programming Fluent: Python, LaTeX

Familiar: SQL, Julia, C, C++, R, IDL, perl, Mathematica, MATLAB, HTML, CSS

Software Fluent: Cloudy, PyNeb

Familiar: grizli, DS9, IRAF, sbatch, slurm

Website Architect

Personal Website: njcleri.github.io

TAMU Astronomy (co-author): tamu-astro.github.io/

Mentoring and Advising Graduates in an Inclusive Community (MAGIC) (co-author): tx.ag/tamumagic

Publications

Lead/Co-Lead Author

- 4. Cleri, N. J., Olivier, G. M., Hutchison T. A., et al. 2023, Using [Ne V]/[Ne III] to Understand the Nature of Extreme-Ionization Galaxies, ApJ, 953, 10
- 3. Cleri, N. J., Yang, G., Papovich, C, et al. 2023, CLEAR: High-Ionization [Ne V] λ 3426 Emission-line Galaxies at 1.4 < z < 2.3, ApJ, 948, 112
- 2. **Cleri, N. J.**, Trump, J. R., Backhaus, B. E., et al. 2022, *CLEAR: Paschen-β Star Formation Rates and Dust Attenuation of Low Redshift Galaxies*, ApJ, 929, 3
- 1. **Cleri, N. J.**, Dunne, G. V., 2020, *Resurgent trans-series for generalized Hastings-McLeod solutions*, Journal of Physics A: Mathematical General, 53, 355203

Significant Author

- Larson, R.L., Finkelstein, S.L., Kocevski, D.D., Hutchison, T.A., Trump, J.R., Arrabal Haro, P., Bromm, V., Cleri, N.J., et al. 2023, A CEERS Discovery of an Accreting Supermassive Black Hole 570 Myr after the Big Bang: Identifying a Progenitor of Massive z > 6 Quasars, ApJL, 953, L29
- 3. Backhaus, B.E., Bridge J.S., Trump, J.R., Cleri, N.J., et al. 2023, CLEAR: Detecting Low-Luminosity Active Galactic Nuclei at 0.6 < z < 1.3 via Spatially Resolved Hubble Space Telescope Grism Emission Line Ratios, ApJ, 943, 37
- 2. Prescott, M.K.M., Finlator, K.M., Cleri, N.J., et al. 2022, *Using Multiple Emission Line Ratios to Constrain the Slope of the Dust Attenuation Law*, ApJ, 928, 71
- 1. Backhaus, B.E., Trump, J.R., Cleri, N.J., et al. 2022, CLEAR: Emission Line Ratios at Cosmic High Noon, ApJ, 926, 161

Co-Author: Refereed

- 39. Llerena, M., et al. 2024, Physical properties of extreme emission-line galaxies at $z\sim 4-9$ from the JWST CEERS survey, A&A, 691, A59
- 38. Davis, K., et al. 2024, A Census from JWST of Extreme Emission-line Galaxies Spanning the Epoch of Reionization in CEERS, ApJ, 974, 42
- 37. Chworowsky, K., et al. 2024, Evidence for a Shallow Evolution in the Volume Densities of Massive Galaxies at $z=4\ to\ 8$ from CEERS, AJ, 168, 113
- 36. Hu, W., et al. 2024, Characterizing the Average Interstellar Medium Conditions of Galaxies at $z \sim 5.6$ -9 with UV and Optical Nebular Lines, ApJ, 971, 21
- 35. Ronayne, K., et al. 2024, CEERS: 7.7 μm PAH Star Formation Rate Calibration with JWST MIRI, ApJ, 970, 61
- 34. Wang, B., et al. 2024, RUBIES: Evolved Stellar Populations with Extended Formation Histories at $z\sim7-8$ in Candidate Massive Galaxies Identified with JWST/NIRSpec, ApJL, 969, L13
- 33. Finkelstein, S.L., et al. 2024, The Complete CEERS Early Universe Galaxy Sample: A Surprisingly Slow Evolution of the Space Density of Bright Galaxies at $z \sim 8.5-14.5$, ApJL, 969, L2
- 32. Pirzkal, K., et al. 2024, The Next Generation Deep Extragalactic Exploratory Public Near-Infrared Slitless Survey Epoch 1 (NGDEEP-NISS1): Extra-Galactic Star-formation and Active Galactic Nuclei at 0.5 < z < 3.6, ApJ, 969, 90
- 31. Jung, I., et al. 2024, CEERS: Diversity of Lyman-Alpha Emitters during the Epoch of Reionization, ApJ, 967, 73
- 30. Mascia, S. et al. 2024 New insight on the nature of cosmic reionizers from the CEERS survey A&A, 685, A3

- 29. Morales, A.M., et al. 2024, Rest-Frame UV Colors for Faint Galaxies at $z\sim 9-16$ with the JWST NGDEEP Survey, ApJL, 964, L24
- 28. Cheng, Y., et al. 2024, Exploring the Gas-Phase Metallicity Gradients of Star-forming Galaxies at Cosmic Noon, ApJ, 964, 94
- 27. Shen, L., et al. 2024, NGDEEP Epoch 1: Spatially Resolved H α Observations of Disk and Bulge Growth in Star-Forming Galaxies at $z \sim 0.6$ -2.2 from JWST NIRISS Slitless Spectroscopy, ApJL, 963, L49
- 26. Barro, G., et al. 2023, Extremely Red Galaxies at z = 5-9 with MIRI and NIRSpec: Dusty Galaxies or Obscured Active Galactic Nuclei?, ApJ, 963, 128
- 25. Backhaus, B.E., et al. 2023, CEERS Key Paper. VIII. Emission-line Ratios from NIRSpec and NIRCam Wide-Field Slitless Spectroscopy at z > 2, ApJ, 962, 195
- 24. Kirkpatrick, A., et al. 2023, CEERS Key Paper VII: JWST/MIRI Reveals a Faint Population of Galaxies at Cosmic Noon Unseen by Spitzer, ApJL, 959, L7
- 23. Calabró, A, et al. 2023, Near-infrared emission line diagnostics for AGN from the local Universe to redshift 3, A&A, 679, A80
- 22. Fujimoto, S., et al. 2023, ALMA FIR View of Ultra High-redshift Galaxy Candidates at $z \sim 11$ -17: Blue Monsters or Low-z Red Interlopers?, ApJ, 955, 130
- 21. Kocevski, D.D., et al. 2023, Hidden Little Monsters: Spectroscopic Identification of Low-Mass, Broad-Line AGN at z>5 with CEERS, ApJL, 954, L4
- 20. Arrabal Haro, P., et al. 2023, Spectroscopic confirmation of CEERS NIRCam-selected galaxies at $z \simeq 8-10$, ApJL, 951, L22
- 19. Estrada-Carpenter, V., et al. 2023, *CLEAR: The Morphological Evolution of Galaxies in the Green Valley*, ApJ, 951, 115
- 18. Yang, G., et al. 2023, CEERS Key Paper VI: JWST/MIRI Uncovers a Large Population of Obscured AGN at High Redshifts, ApJL, 950, L5
- 17. Papovich, C., et al. 2023, CEERS Key Paper IV: Galaxies at 4 < z < 9 are Bluer than They Appear Characterizing Galaxy Stellar Populations from Rest-Frame ~ 1 micron Imaging, ApJL, 949, L18
- 16. Simons, R.C., et al. 2023, CLEAR: Survey Overview, Data Analysis and Products, ApJS, 266, 13
- 15. Constantin, L. et al. 2023, Expectations of the size evolution of massive galaxies at $3 \le z \le 6$ from the TNG50 simulation: the CEERS/JWST view, ApJ, 946, 71
- 14. Perez-Gonzalez, P.G.. et al. 2022, CEERS Key Paper V: A triality on the nature of HST-dark galaxies, ApJL, 946, L16
- 13. Kocevski, D.D., et al. 2023, CEERS Key Paper II: The Resolved Host Properties of AGN at 3 < z < 5 with JWST, ApJL, 946, L14
- 12. Finkelstein, S.L.. et al. 2023, CEERS Key Paper I: An Early Look into the First 500 Myr of Galaxy Formation with JWST, ApJL, 946, L13
- 11. Guo, Y. et al. 2023, First Look at z > 1 Bars in the Rest-Frame Near-Infrared with JWST Early CEERS Imaging, ApJL, 945, L10
- 10. Trump, J.R. et al. 2023, *The Physical Conditions of Emission-Line Galaxies at Cosmic Dawn from JWST/NIRSpec Spectroscopy in the SMACS 0723 Early Release Observations*, ApJ, 945, 35
- 9. García-Argumánez, A. et al. 2023, Probing the earliest phases in the formation of massive galaxies with simulated HST+JWST imaging data from Illustris, ApJ, 944, 3
- 8. Zavala, J. et al. 2023, Dusty starbursts masquerading as ultra high redshift galaxies in JWST observations, ApJL, 943, L9

- 7. Rose, C. et al. 2023, *Identifying Galaxy Mergers in Simulated CEERS NIRCam Images using Random Forests*, ApJ, 942, 54
- 6. Finkelstein, S.L. et al. 2022, A Long Time Ago in a Galaxy Far, Far Away: A Candidate $z \sim 14$ Galaxy in Early JWST CEERS Imaging, ApJL, 940, L55
- 5. Papovich, C. et al. 2022, CLEAR: The Ionization and Chemical-Enrichment Properties of Galaxies at 1.1 < z < 2.3 ApJ, 937, 22
- 4. Matharu, J. et al. 2022, CLEAR: The Evolution of Spatially Resolved Star Formation in Galaxies between $0.5 \le z \le 1.7$ using $H\alpha$ Emission Line Maps, ApJ, 937, 16
- 3. Jung, I. et al. 2022, CLEAR: Boosted Ly α Transmission of the Intergalactic Medium in UV bright Galaxies, ApJ, 933, 87
- 2. Simons, R. C. et al. 2021, CLEAR: The Gas-Phase Metallicity Gradients of Star-Forming Galaxies at 0.6 < z < 2.6, ApJ, 923, 203
- 1. Estrada-Carpenter, V. et al. 2020, CLEAR II: Evidence for Early Formation of the Most Compact Quiescent Galaxies at High Redshift, ApJ, 880, 2

Co-Author: Submitted

- 21. Burgarella, D., et al. 2024 CEERS: Forging the First Dust Transition from Stellar to ISM Grain Growth in the Early Universe, arXiv e-prints, arXiv:2410.23959
- 20. Shen, L., et al. 2024 NGDEEP: The Star Formation and Ionization Properties of Galaxies at 1.7 < z < 3.4, arXiv e-prints, arXiv:2410.23349
- 19. Bisigello, L., et al. 2024 *Spectroscopic confirmation of a dust-obscured, metal-rich dwarf galaxy at z*∼*5*, arXiv e-prints, arXiv:2410.10954
- 18. Cooper, O.R., et al. 2024 RUBIES: JWST/NIRSpec resolves evolutionary phases of dusty star-forming galaxies at $z \sim 2$, arXiv e-prints, arXiv:2410.08387
- 17. Brooks, M., et al. 2024 Here There Be (Dusty) Monsters: High Redshift AGN are Dustier Than Their Hosts, arXiv e-prints, arXiv:2410.07340
- 16. Brooks, M., et al. 2024 Here There Be (Dusty) Monsters: High Redshift AGN are Dustier Than Their Hosts, arXiv e-prints, arXiv:2410.07340
- 15. Gupta, A.R., et al. 2024 Emission-Line Ratios and Ionization Conditions of CEERS Star-Forming Galaxies with JWST/NIRSpec, arXiv e-prints, arXiv:2410.03784
- 14. Taylor, A.J., et al. 2024 Broad-Line AGN at 3.5 < z < 6: The Black Hole Mass Function and a Connection with Little Red Dots, arXiv:2409.06772
- 13. de Graaff, A., et al. 2024, *RUBIES: a complete census of the bright and red distant Universe with JWST/NIRSpec*, arXiv e-prints, arXiv:2409.05948
- 12. Weibel, A., et al. 2024, RUBIES Reveals a Massive Quiescent Galaxy at z=7.3, arXiv e-prints, arXiv:2409.03829
- 11. Katz, H., et al. 2024, 21 Balmer Jump Street: The Nebular Continuum at High Redshift and Implications for the Bright Galaxy Problem, UV Continuum Slopes, and Early Stellar Populations, arXiv e-prints, arXiv:2408.03189
- 10. Rose, C., et al. 2024, CEERS Key Paper. IX. Identifying Galaxy Mergers in CEERS NIRCam Images Using Random Forests and Convolutional Neural Networks, arXiv e-prints, arXiv:2407.21279
- 9. Seille, L.-M., et al. 2024, *Physical properties of strong 1 < z < 3 Balmer and Paschen lines emitters observed with JWST*, arXiv e-prints, arXiv:2404.09659
- 8. de Graaff, A., et al. 2024, *Efficient formation of a massive quiescent galaxy at redshift 4.9*, arXiv e-prints, arXiv:2404.05683

- 7. Kocevski, D.D., et al. 2024, The Rise of Faint, Red AGN at z > 4: A Sample of Little Red Dots in the JWST Extragalactic Legacy Fields, arXiv e-prints, arXiv:2404.03576
- 6. Zavala, J., et al. 2024, Detection of ionized hydrogen and oxygen from a very luminous and young galaxy 13.4 billion years ago, arXiv e-prints, arXiv:2403.10491
- 5. Wang, B., et al. 2024a, RUBIES: JWST/NIRSpec Confirmation of an Infrared-luminous, Broad-line Little Red Dot with an Ionized Outflow, arXiv e-prints, arXiv:2403.02304
- 4. Calabró, A., et al. 2024, *The evolution of the SFR and* Σ_{SFR} *of galaxies in cosmic morning (*4 < z < 10), arXiv e-prints, arXiv:2402.17829
- 3. Napolitano, L., et al. 2024, 'Peering into cosmic reionization: the Ly α visibility evolution from galaxies at z=4.5-8.5 with JWST, arXiv e-prints, arXiv:2402.11220
- 2. Cole, J.W., et al. 2023, CEERS: Increasing Scatter along the Star-Forming Main Sequence Indicates Early Galaxies Form in Bursts, arXiv e-prints, arXiv:2312.10152
- 1. Jung, I, et al. 2022, New z>7 Lyman-alpha Emitters in EGS: Evidence of an Extended Ionized Structure at $z\sim7.7$, arXiv e-prints, arXiv:2212.09850

Presentations

Research Presentations

17.	Talk: High-Redshift Diagnostics of Star Formation and Active Galactic Nuclei, The Pennsylvania State University, State College, Pennsylvania, USA	17 September 2024
16.	Talk: <i>High-Redshift Diagnostics of Ionizing Sources</i> , University of Wisconsin, Madison, Wisconsin, USA	17 July 2024
15.	Discussion Chair: <i>Active Galactic Nuclei and Little Red Dots</i> , San Lorenzo de El Escorial, Spain	13 May 2024
14.	Talk: Diagnostics of Ionizing Sources at High-z using Models and Observations, San Lorenzo de El Escorial, Spain	13 May 2024
13.	Talk: Diagnostics of AGN, Black Hole Seeds, and Population III Stars with JWST at the AAS 243rd Meeting, New Orleans, Louisiana, USA	10 January 2024
12.	Poster: Emission Line Ratio Diagnostics of AGN, Black Hole Seeds and Population III Stars with JWST at the First Year of JWST Science Conference, Space Telescope Science Institute, Baltimore, Maryland, USA	11 September 2023
11.	Talk: <i>Diagnostics of Exotic Ionizing Sources with JWST</i> at Texas A&M Astrosymposium, College Station, Texas, USA	17 August 2023
10.	Talk: Diagnostics of Exotic Ionizing Sources Across Cosmic Time - High-Ionization Emission-Line Ratios: Ne53 at University of Texas, Austin, Texas, USA	10 May 2023
9.	Poster: High-Ionization [Ne V] Emission-Line Galaxies at Cosmic Noon and the Epoch of Reionization at AAS 241st Meeting, Seattle, Washington, USA	12 January 2023
8.	Talk: Using [Ne V] to Constrain the Sources of Highly-Energetic Photoionization Across Cosmic Time: Exploring the "Mystery of Neon" with HST and JWST at Texas A&M University, College Station, Texas, USA	2 December 2022
7.	Talk: Extreme High-Ionization Emission-Line Galaxies at Cosmic Noon and the Epoch of Reionization: Exploring the "Mystery of Neon" with HST and JWST at Texas A&M University, College Station, Texas, USA	18 August 2022
6.	Talk: The Evolution of Spectroscopy from HST to JWST: Implications for the Epoch of Reionization at Texas A&M University, College Station, Texas, USA	22 July 2022
5.	Poster: HST Grism Observations of Paschen-Line Star-Formation and Dust Attenuation: A Precursor to the JWST Era at AAS 240th Meeting, Pasadena, California, USA	14 June 2022
4.	Talk: Paschen- β Star Formation Rates and Dust Attenuation with HST and JWST at Texas A&M Astrosymposium, College Station, Texas, USA	27 August 2021
3.	Poster: CLEAR: Paschen- β Star Formation Rates and Dust Attenuation in Low Redshift Galaxies at AAS 237th Meeting, Virtual	13 January 2021
2.	Poster: Modeling 8B Solar Neutrino Detection with CE ν NS at AAS 233rd Meeting, Seattle, Washington, USA	9 January 2019
1.	Poster: Modeling 8B Solar Neutrino Detection with $CE\nu NS$ at TAMU Undergraduate Research Poster Session, College Station, Texas, USA	1 August 2018
Outr	each Presentations	

2.	Talk: The Origin of the Elements: Chemistry Across Cosmic Time at Astronomy on Tap State College, State College, Pennsylvania, USA	19 September 2024
1.	Talk: Beyond the Telescope: Unraveling Mysteries with AI in Astronomy at Astronomy on Tap B/CS, Bryan, Texas, USA	24 April 2024
Professional Development Presentations		
8.	Panel: GLASS Postdoc Panel at Texas A&M University, College Station, Texas, USA	8 March 2024
7.	Talk: How to Be A Referee at Texas A&M University, College Station, Texas, USA	10 November 2023
6.	Panel: How to Get Into Grad School at Texas A&M University, College Station, Texas, USA	28 July 2023
5.	Talk: Data Visualization in Astronomy: More Important than the Science Itself? at Texas A&M University, College Station, Texas, USA	11 November 2022
4.	Panel: How to Get Into Grad School at Texas A&M University, College Station, Texas, USA	29 July 2022
3.	Data Visualization in Astronomy: More Important than the Science Itself? at Texas A&M University, College Station, Texas, USA	2 June 2022
2.	Workshop: <i>Matplotlib: The Champion of Plotting in Python</i> at Texas A&M University, College Station, Texas, USA	2 June 2022
1.	Workshop: pandas: Your Best Friend for Data Analysis in Python at Texas A&M University, College Station, Texas, USA	1 June 2022

References

Postdoctoral Advisor Prof. Joel Leja Penn State

The Pennsylvania State University Department of Astronomy and Astrophysics Davey Laboratory, State College, PA, 16802 joel.leja@psu.edu

PhD Advisor Prof. Casey J. Papovich Texas A&M

Texas A&M University Mitchell Institute for Fundamental Physics and Astronomy 4242 TAMU, College Station, TX 77843-4242 papovich@tamu.edu

M.S. Advisor Prof. Jonathan R. Trump UConn

University of Connecticut Department of Physics 196 Auditorium Road, Unit 3046, Storrs, CT, 06269-3046 jonathan.trump@uconn.edu

PhD Mentor Prof. Robert C. Kennicutt Texas A&M

Texas A&M University Mitchell Institute for Fundamental Physics and Astronomy 4242 TAMU, College Station, TX 77843-4242 rck@tamu.edu