

YUN-TING CHENG

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US Legal Permanent Resident (Green Card holder), Taiwan Citizenship

PROFESSIONAL EXPERIENCE

California Institute of Technology/Jet Propulsion Laboratory Research Scientist	Jan 2024 – present
Jet Propulsion Laboratory/California Institute of Technology Postdoctoral Researcher	Oct 2021 – Jan 2024

EDUCATION

California Institute of Technology Ph.D. in Physics (Advisor: Prof. Jamie Bock) Thesis: Cosmology and Astrophysics with Intensity Mapping	Jun 2021
M.S. in Physics	Jun 2019
National Taiwan University B.S. in Physics	Jun 2014

RESEARCH INTERESTS

- Development of analysis algorithms in galaxy surveys
- Characterization of observational systematics of large-scale structure surveys
- Photometric redshift inference and validation
- Optimal extraction of spectral-line intensity mapping signals
- Study of the extragalactic background

RESEARCH EXPERIENCE

California Institute of Technology / Jet Propulsion Laboratory <i>Research Scientist</i>	Pasadena, CA Jan 2024 – present
<ul style="list-style-type: none">• SPHEREx Mission<ul style="list-style-type: none">– Characterizing the photometric redshift estimation and systematics– Optimizing the multi-tracer analysis for SPHEREx cosmology science– Modeling the extragalactic background and line intensity mapping signal for SPHEREx• Photometric Redshift with Clustering Statistics (collaborators: E. Huff, K. Markovic, I. Szapudi)<ul style="list-style-type: none">– Developing a novel photometric redshift technique with clustering information	
Postdoctoral Researcher (Advisor: Dr. Olivier Doré)	Oct 2021 – Jan 2024
<ul style="list-style-type: none">• 3D Light Cones Cosmology (collaborators: B. Wandelt, O. Doré, T.-C. Chang)<ul style="list-style-type: none">– Developing a Bayesian data-driven technique to optimally constrain cosmology with spectral imaging data• Galactic Extinction Modeling (collaborators: B. Hensley, O. Doré, T.-C. Chang)<ul style="list-style-type: none">– Building Galactic dust extinction model from multi-tracer datasets• Extragalactic Radio Dipole (collaborators: A. Lidz, T.-C. Chang)<ul style="list-style-type: none">– Modeling the cosmic dipole signal from extragalactic radio sources• Intra-halo Light Signal in the Extragalactic Background (collaborator: J. J. Bock)<ul style="list-style-type: none">– Modeling non-linear clustering and intra-halo light in the near-infrared background	
Graduate Research Assistant (Advisor: Prof. Jamie Bock)	Sep 2015 – Jun 2021
<ul style="list-style-type: none">• Line Intensity Mapping<ul style="list-style-type: none">– Developing analysis algorithms to tackle line confusion in line intensity mapping surveys– Establishing formalism of optimal mapping strategies for large-scale structure surveys– Modeling galaxy-intensity mapping cross-correlation for SPHEREx• CIBER (Cosmic Infrared Background Experiment)<ul style="list-style-type: none">– Building CIBER analysis pipeline and characterizing observational systematic effects– Studying intra-halo light with stacking analysis on CIBER images• TIME (Tomographic Ionized Carbon Intensity Mapping Experiment)<ul style="list-style-type: none">– Simulating signal and foregrounds for TIME analysis pipeline– Developing foreground mitigation techniques– Analyzing TIME instrument data– Participating in instrument deployment at the ARO 12m telescope	

Academia Sinica of Astronomy and Astrophysics (ASIAA)**Research Assistant** (Advisor: Tzu-Ching Chang)

- Developing foreground mitigation techniques for line intensity mapping

Summer Student (Advisors: Sheng-Yuan Liu, Yu-Nung Su, I-Ta Hsieh)

- Modeling the starless core with radiative transfer

Taipei, Taiwan

May 2014 – Jul 2015

Jul 2013 – Aug 2013

GRANTS

- **NASA Astrophysics Data Analysis Program (ADAP)** 2025 – 2027
Title: Detecting Baryonic Acoustic Oscillations in the WISE galaxy sample
Role: Co-I (PI: Katarina Markovic, JPL)
- **NASA Astrophysics Data Analysis Program (ADAP)** 2025 – 2027
Title: Cosmology with Juno: Extracting the Cosmic Microwave Background Dipole at Low Frequencies and the Nature of the Diffuse Radio Background
Role: Co-I (PI: Tzu-Ching Chang, JPL)

TECHNICAL SKILLS

- **Statistical Tools:** Bayesian statistics, Markov Chain Monte Carlo, Fisher analysis, sparse reconstruction, convex optimization, Machine Learning
- **Programming Languages:** Python (JAX, Astropy, emcee, Pandas, scikit-learn, TensorFlow, Keras, seaborn), SQL, IDL, Matlab, C++, Fortran, LaTeX
- **Instrumentation:** SOLIDWORKS, trained in machine shop techniques

STUDENT MENTORING

- Jean Choppin de Janvry, Paris-Saclay University, Caltech Visiting Master Student Sep 2024 – Mar 2025
Topic: Photometric Redshift for SPHEREx
- Gemma (Zhaoyu) Huai, Caltech Physics Graduate Student Jun 2024 – present
Topic: SPHEREx Cosmology
- Jui-Kuan Chan, National Taiwan University, Caltech SURF Program Jun 2024 – present
Topic: SPHEREx Photometric Redshift With SOM
- Kailai Wang, Cornell University, JPL SURF Program Jun 2023 – Aug 2023
Topic: Bayesian Multi-line Intensity Mapping
- Abby Williams, NYU/Caltech, Caltech Post-baccalaureate Student Jun 2023 – present
Topic: Small-scale Nonlinear Effects in Cross Correlations

SERVICE AND OUTREACH

- The Chinese University of Hong Kong Study Tour Program, Lecturer Jul 2025
- Caltech Cosmology Journal Club, Co-organizer Sep 2022 – present
- 237th AAS Meeting, Oral Session Chair Jan 2021
- Gabrielino High School, CA, Physics In-Class Activities Leader Jan 2020 – Sep 2022
- 233rd AAS Meeting, Poster Judge Jan 2019
- Journal referee: *Astrophysical Journal (ApJ)*, *Astrophysical Journal Letters (ApJL)*, *Journal of Cosmology and Astroparticle Physics (JCAP)*, *Monthly Notices of the Royal Astronomical Society (MNRAS)*

AWARDS AND HONORS

- Balzan Cosmological Studies Travel Award Oct 2022
- Taiwan-Caltech Ministry of Education Fellowship Sep 2015 – Aug 2019
- Dean's Award of College of Science, National Taiwan University Jun 2014

REFERENCES

- **James J. (Jamie) Bock**
Professor, California Institute of Technology/Jet Propulsion Laboratory
jjb@astro.caltech.edu
- **Tzu-Ching Chang**
Research Scientist, Jet Propulsion Laboratory/California Institute of Technology
tzu-ching.chang@jpl.nasa.gov/tzu@caltech.edu
- **Olivier P. Doré**
Research Scientist, Jet Propulsion Laboratory/California Institute of Technology
olivier.p.dore@jpl.nasa.gov/odore@caltech.edu
- **Abigail T. Crites**
Assistant Professor, Cornell University
atc72@cornell.edu
- **Benjamin D. Wandelt**
Professor, Johns Hopkins University
wandelt@jhu.edu

PRESENTATIONS

Invited Conference Talks and Lectures

- Cosmology on the Steep Rise Workshop Sexten, Italy, Feb, 2025
- A new era with Line Intensity Mapping Workshop Heidelberg, Germany, Dec, 2024
- Line Intensity Mapping Workshop MPA, Garching, Germany, Apr, 2023

Invited Institution Colloquia and Seminars

- ASIAA Colloquium ASIAA, Taiwan, Dec, 2024
- University of Bonn/MPIfRA Colloquium Bonn, Germany, Dec 2024
- KIPAC Seminar Stanford, CA, Nov, 2024
- ASIAA Seminar ASIAA, Taiwan, Oct, 2023
- LAM Cafe Club LAM, Marseille, France, Dec, 2022
- IAP Universe Seminar IAP, Paris, France, Nov, 2022
- NYU CCPP Seminar NYU, NY, Aug, 2022
- ICAP seminar (virtual) IAP, Paris, France, Jun, 2022
- ASIAA Seminar ([video](#)) ASIAA, Taiwan, May, 2022
- IRSIG Webminar (virtual), Oct, 2021
- ASIAA Seminar (virtual) ASIAA, Taiwan, Mar, 2021
- UChicago KICP Seminar (virtual) Chicago, IL, Jan, 2021
- Berkeley BCCP Seminar (virtual) Berkeley, CA, Dec, 2020
- CCA Flatiron Institute Cosmology Group Meeting (virtual) CCA, NY, Oct, 2020
- OSU CCAPP Seminar (virtual) OSU, OH, Oct, 2020
- JHU Cosmology/GW Journal Club (virtual) JHU, MD, Oct, 2020
- UPenn Astronomy Seminar (virtual) UPenn, PA, Sep, 2020
- CCA Flatiron Institute Lunch Talk (virtual) CCA, NY, Sep, 2020
- ASIAA Seminar ASIAA, Taiwan, Sep, 2018

Contributed Talks

- Line Intensity Mapping 2025 Annecy, France, Jun, 2025
- PRIMA and the Future of Far-Infrared Science Caltech, CA, May, 2025
- Roman Community Workshop ([video](#)) Caltech, CA, Jul, 2024
- Line Intensity Mapping 2024 Workshop ([video](#)) UIUC, IL, Jun, 2024
- Diffuse Cosmic Backgrounds and the Low Surface Brightness Universe Aspen, CO, Apr, 2024
- Caltech ObsCos Seminar Caltech, CA, Feb, 2024
- 243rd AAS Meeting New Orleans, LA, Jan, 2024
- JPL Postdoc Seminar JPL, Pasadena, CA, Nov, 2023
- Probing the Universe at High Resolution Conference ASIAA, Taiwan, Nov, 2023
- LAM CONCERTO Working Group Meeting LAM, Marseille, France, Dec, 2022
- Caltech ObsCos Seminar Caltech, CA, Oct, 2022
- Columbia Cosmology Group Seminar Columbia, NY, Aug, 2022
- Cosmology from Home ([video](#)) (virtual), Jun, 2022
- Cross Correlations with CHORD Workshop (virtual), Oct, 2021
- SUBLIME Workshop (virtual), Oct, 2021
- KICP Line Intensity Mapping Workshop (virtual) Chicago, IL, Jul, 2021
- Caltech ObsCos Seminar (virtual) Caltech, CA, Feb, 2021
- 237th AAS Meeting (virtual), Jan, 2021
- Caltech ObsCos Seminar (virtual) Caltech, CA, Sep, 2020
- CCAT-prime Science Working Group Meeting (virtual) Cornell, NY, Sep, 2020
- Caltech ObsCos Seminar Caltech, CA, Feb, 2020
- L2S2 : Lines in the Large Scale Structure Conference Marseille, France, Jul, 2019
- Caltech ObsCos Seminar Caltech, CA, Jun, 2019
- Caltech ObsCos Seminar Caltech, CA, May, 2019

- 233rd AAS Meeting
 - Taiwanese Theoretical Astrophysics Workshop
 - Caltech ObsCos Seminar
 - Cosmological Signals from Cosmic Dawn to the Present
 - Caltech ObsCos Seminar
 - Caltech ObsCos Seminar
 - Caltech ObsCos Seminar
 - Opportunities and Challenges in Intensity Mapping Workshop
 - ASROC Annual Meeting (Taiwanese Astronomical Society)
- Seattle, WA, Jan, 2019
 - ASIAA, Taiwan, Sep, 2018
 - Caltech, CA, Jun, 2018
 - Aspen, CO, Feb, 2018
 - Caltech, CA, Dec, 2017
 - Caltech, CA, Nov, 2016
 - Caltech, CA, Jun, 2016
 - KIPAC, CA, Mar, 2016
 - Ilan, Taiwan, May, 2015

PUBLICATIONS

See [ADS](#), [Google Scholar](#), and [INSPIRE](#) for the complete publication list

First-author (10 published / accepted; 1 under review)

1. *Feature Intensity Mapping: Polycyclic Aromatic Hydrocarbon Emission from All Galaxies Across Cosmic Time*
Y.-T. Cheng, B. S. Hensley, T. S.-Y. Lai, 2025, ApJ submitted, [ADS](#), [[arXiv:2506.13863](#)]
2. *Mapping Galactic Dust Emission and Extinction with HI, HII, and H₂*
Y.-T. Cheng, B. S. Hensley, T.-C. Chang, & O. Doré, 2025, ApJ, 985, 15, [ADS](#), [[arXiv:2411.12801](#)]
3. *Bayesian Multi-line Intensity Mapping*
Y.-T. Cheng, K. Wang, B. D. Wandelt, T.-C. Chang, & O. Doré, 2024, ApJ, 971, 159, [ADS](#), [[arXiv:2403.19740](#)]
4. *Is the Radio Source Dipole from NVSS Consistent with the CMB and Λ CDM?*
Y.-T. Cheng, T.-C. Chang, & A. Lidz, 2023, ApJ, 965, 32, [ADS](#), [[arXiv:2309.02490](#)]
5. *Data-driven Cosmology from Three-dimensional Light Cones*
Y.-T. Cheng, B. D. Wandelt, T.-C. Chang, & O. Doré, 2023, ApJ, 944, 151, [ADS](#), [[arXiv:2210.10052](#)]
6. *Near-infrared Extragalactic Background Light Fluctuations on Nonlinear Scales*
Y.-T. Cheng & J. J. Bock, 2022, ApJ, 940, 115, [ADS](#), [[arXiv:2207.13712](#)]
7. *Cosmic Near-Infrared Background Tomography with SPHEREx Using Galaxy Cross-Correlations*
Y.-T. Cheng & T.-C. Chang, 2022, ApJ, 925, 136, [ADS](#), [[arXiv:2109.10914](#)]
8. *Probing Intra-Halo Light with Galaxy Stacking in CIBER Images*
Y.-T. Cheng et al. (CIBER Collaboration), 2021, ApJ, 919, 69, [ADS](#), [[arXiv:2103.03882](#)]
9. *Phase-Space Spectral Line De-confusion in Intensity Mapping*
Y.-T. Cheng, T.-C. Chang, & J. J. Bock, 2020, ApJ, 901, 142, [ADS](#), [[arXiv:2005.05341](#)]
10. *Optimally Mapping Large-Scale Structures with Luminous Sources*
Y.-T. Cheng, R. de Putter, T.-C. Chang, & O. Doré, 2019, ApJ, 877, 86, [ADS](#), [[arXiv:1809.06384](#)]
11. *Spectral Line De-Confusion in an Intensity Mapping Survey*
Y.-T. Cheng, T.-C. Chang, J. J. Bock, C. M. Bradford, & A. R. Cooray, 2016, ApJ, 832, 165, [ADS](#), [[arXiv:1604.07833](#)]

Contributing author

1. *The SPHEREx Sky Simulator: Science Data Modeling for the First All-Sky Near-Infrared Spectral Survey*
B. P. Crill, et al., 2025, ApJ submitted, [ADS](#), [[arXiv:2505.24856](#)]
2. *The Potential of the SPHEREx Mission for Characterizing PAH 3.3 μ m Emission in Nearby Galaxies*
E. Zhang, A. L. Faisst, et al., 2025, ApJ submitted, [ADS](#), [[arXiv:2503.21876](#)]
3. *CIBER 4th flight fluctuation analysis: Measurements of near-IR auto- and cross-power spectra on arcminute to sub-degree scales*
R. M. Feder, et al., 2025, ApJ submitted, [ADS](#), [[arXiv:2501.17933](#)]
4. *CIBER 4th flight fluctuation analysis: Pseudo-power spectrum formalism, improved source masking and validation on mocks*
R. M. Feder, et al., 2025, ApJ submitted, [ADS](#), [[arXiv:2501.17932](#)]
5. *Inferred Measurements of the Zodiacal Light Absolute Intensity through Fraunhofer Absorption Line Spectroscopy with CIBER*
P. M. Korngut, et al., 2022, ApJ, 926, 133, [ADS](#), [[arXiv:2104.07104](#)]
6. *Probing Cosmic Reionization and Molecular Gas Growth with TIME*
G. Sun, T.-C. Chang, et al., 2021, ApJ, 915, 33, [ADS](#), [[arXiv:2012.09160](#)]
7. *Superresolution Reconstruction of Severely Undersampled Point-spread Functions Using Point-source Stacking and Deconvolution*
T. Symons, M. Zemcov, et al., 2021, ApJS, 252, 24, [ADS](#), [[arXiv:2102.01094](#)]
8. *Hafnium Films and Magnetic Shielding for TIME, A mm-Wavelength Spectrometer Array*
J. Hunacek, et al., 2018, JLTP, 193, 893, [ADS](#)

9. *A Foreground Masking Strategy for [C II] Intensity Mapping Experiments Using Galaxies Selected by Stellar Mass and Redshift*
G. Sun, L. Moncelsi, M. P. Viero, et al., 2018, ApJ, 856, 107, [ADS](#), [[arXiv:1601.10095](#)]
10. *Design and fabrication of TES detector modules for the TIME-Pilot [C II] Intensity Mapping Experiment*
J. Hunacek, et al., 2016, JLTP, 184, 733, [ADS](#)

White paper / review paper contributions

1. *PRIMA General Observer Science Book*
A. Moullet, et al., 2023, [ADS](#), [[arXiv:2310.20572](#)]
2. *Tomography of the Cosmic Dawn and Reionization Eras with Multiple Tracers*
T.-C. Chang, et al., 2019, Astro2020 White Paper, [ADS](#), [[arXiv:1903.11744](#)]
3. *Line-Intensity Mapping: 2017 Status Report*
E. D. Kovetz, M. P. Viero, et al., 2017, [ADS](#), [[arXiv:1709.09066](#)]

Conference proceedings

1. *A status update on TIME: a mm-wavelength spectrometer designed to probe the Epoch of Reionization*
A. Crites, et al., 2020, [SPIE](#), [114530G](#)
2. *Detector modules and spectrometers for the TIME-Pilot [CII] intensity mapping experiment*
J. Hunacek, et al., 2016, [SPIE](#), [99140L](#)