

# YUN-TING CHENG

US Legal Permanent Resident (Green Card holder), Taiwan Citizenship  
Jet Propulsion Laboratory / California Institute of Technology  
M.C. 367-17, 1200 E California Blvd, Pasadena, CA 91125

<https://yuntingcheng.github.io/>  
[yun-ting.cheng@jpl.nasa.gov](mailto:yun-ting.cheng@jpl.nasa.gov)  
[yucheng3@caltech.edu](mailto:yucheng3@caltech.edu)

---

## PROFESSIONAL EXPERIENCE

### Jet Propulsion Laboratory/California Institute of Technology

Postdoctoral Researcher (Advisor: Dr. Olivier Doré)

October 2021 - present

---

## EDUCATION

### California Institute of Technology

Ph.D. in Physics (Advisor: Prof. Jamie Bock)

June 2021

Thesis: [Cosmology and Astrophysics with Intensity Mapping](#)

M.S. in Physics

June 2019

### National Taiwan University

B.S. in Physics

June 2014

---

## RESEARCH INTERESTS

analysis algorithms for cosmological surveys, observational cosmology, intensity mapping, large-scale structure, extragalactic background light, intra-halo light

---

## RESEARCH EXPERIENCE

### Jet Propulsion Laboratory / California Institute of Technology

Pasadena, CA

*Postdoctoral Researcher* (Advisor: Dr. Olivier Doré)

October 2021 - Present

- **Data-driven Cosmology from 3D Light Cones**

(collaborators: Benjamin Wandelt, Olivier Doré, Tzu-Ching Chang)

- Developing a data-driven method to constrain cosmology with spectral imaging data

- **Galactic Extinction Modeling**

(collaborators: Brandon Hensley, Olivier Doré, Tzu-Ching Chang)

- Building Galactic dust extinction model from multi-wavelength datasets

- **Extragalactic Radio Dipole**

(collaborators: Adam Lidz, Tzu-Ching Chang)

- Modeling the radio dipole from extragalactic sources

- **Intra-halo Light Signal in the Extragalactic Background**

(collaborators: Jamie Bock)

- Modeling the non-linear clustering and the intra-halo light in the near-infrared background

*Graduate Research Assistant* (Advisor: Prof. Jamie Bock)

September 2015 - June 2021

- **Intensity Mapping**

- Developing analysis algorithms to solve the line blending problem in line intensity mapping

- Establishing the formalism of optimal mapping strategy for large-scale structure survey

- Modeling galaxy-intensity mapping cross correlation for SPHEREx

- **CIBER** (Cosmic Infrared Background Experiment)

- Building CIBER analysis pipeline and characterizing noise and systematic effects

- Studying intra-halo light with stacking analysis on CIBER images

- **TIME** (Tomographic Ionized Carbon Intensity Mapping Experiment)

- Simulating the signal and foregrounds for TIME analysis pipeline

- Developing foreground mitigation techniques

- Analyzing TIME instrument data

- Helping with instrument deployment at the ARO 12m telescope

### Academia Sinica of Astronomy and Astrophysics (ASIAA)

Taipei, Taiwan

*Research Assistant* (Advisor: Tzu-Ching Chang)

May 2014 - July 2015

- Developing foreground mitigation technique for line intensity mapping

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

July 2013 - August 2013

- Modeling the starless core with radiative transfer

## TECHNICAL SKILLS

---

- Statistical Tools: Bayesian statistics, Markov Chain Monte Carlo, Fisher analysis, Sparse Reconstruction, convex optimization, Machine Learning (with experience in CNN and Machine Learning Explainability)
- Programming Languages: Python (Astropy, emcee, Pandas, scikit-learn, TensorFlow, Keras, seaborn), SQL, IDL, Matlab, C++, Fortran, Latex
- Instrumentation: SOLIDWORKS, machine shop trained

## PRESENTATIONS

---

- **(invited overview talk)** Line Intensity Mapping Workshop MPA, Garching, Germany, Apr, 2023
- LAM Cafe Club LAM, Marseille, France, Dec, 2022
- LAM CONCERTO Working Group Meeting LAM, Marseille, France, Dec, 2022
- IAP Universe Seminar IAP, Paris, France, Nov, 2022
- Caltech ObsCos Seminar Caltech, CA, Oct, 2022
- Columbia Cosmology Group Seminar Columbia, NY, Aug, 2022
- NYU CCPP Seminar NYU, NY, Aug, 2022
- ICAP seminar (virtual) IAP, Paris, France, Jun, 2022
- Cosmology from Home (virtual), Jun, 2022
- ASIAA Seminar ASIAA, Taiwan, May, 2022
- Cross Correlations with CHORD Workshop (virtual), Oct, 2021
- SUBLIME Workshop (virtual), Oct, 2021
- IRSIG Webminar (virtual), Oct, 2021
- KICP Line Intensity Mapping Workshop (virtual) Chicago, IL, Jul, 2021
- ASIAA Seminar (virtual) ASIAA, Taiwan, Mar, 2021
- Caltech ObsCos Seminar (virtual) Caltech, CA, Feb, 2021
- UChicago KICP Seminar (virtual) Chicago, IL, Jan, 2021
- 237th AAS Meeting (virtual), 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
- Johns Hopkins U Cosmology/GW Journal Club (virtual) JHU, MD, Oct, 2020
- UPenn Astronomy Seminar (virtual) UPenn, PA, Sep, 2020
- Caltech ObsCos Seminar (virtual) Caltech, CA, Sep, 2020
- CCAT-prime Science Working Group Meeting (virtual) Cornell, NY, Sep, 2020
- CCA Flatiron Institute Lunch Talk (virtual) CCA, 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 Seattle, WA, Jan, 2019
- Taiwanese Theoretical Astrophysics Workshop ASIAA, Taiwan, Sep, 2018
- ASIAA Seminar ASIAA, Taiwan, Sep, 2018
- Caltech ObsCos Seminar Caltech, CA, Jun, 2018
- Cosmological Signals from Cosmic Dawn to the Present Aspen, CO, Feb, 2018
- Caltech ObsCos Seminar Caltech, CA, Dec, 2017
- Caltech ObsCos Seminar Caltech, CA, Nov, 2016
- Caltech ObsCos Seminar Caltech, CA, Jun, 2016
- Opportunities and Challenges in Intensity Mapping Workshop KIPAC, CA, Mar, 2016
- ASROC Annual Meeting (Taiwanese Astronomical Society) Ilan, Taiwan, May, 2015

## 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

## STUDENT ADVISING

---

Kailai Wang (Cornell University), JPL Summer Undergraduate Research Fellowship Topic: Multi-line Inference in Line Intensity Mapping	Jun 2023 - Present
Abby Williams (NYU/Caltech), Caltech Post Baccalaureate Student Topic: Small-scale Nonlinear Effects in Cross Correlations	Jun 2023 - Present

## SERVICE AND OUTREACH

---

Caltech Cosmology Journal Club co-organizer	Sep 2022 - present
237th AAS meeting oral session chair	Jan 2021
Leading physics in-class activities at Gabrielino High School, CA	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)

## 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, Institut d'Astrophysique de Paris/Center for Computational Astrophysics, Flatiron Institute  
bwandelt@iap.fr

## PUBLICATIONS

---

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

### First-author papers

- “*Is the Radio Source Dipole from NVSS Consistent with the CMB and  $\Lambda$ CDM?*”  
Y.-T. Cheng, T.-C. Chang, and Adam Lidz; 2023, *ApJ* submitted; arXiv:2309.02490
- “*Data-driven Cosmology from Three-dimensional Light Cones*”  
Y.-T. Cheng, B. D. Wandelt, T.-C. Chang, and O. Doré; 2023, *ApJ* 944, 151; arXiv:2210.10052
- “*Near-infrared Extragalactic Background Light Fluctuations on Nonlinear Scales*”  
Y.-T. Cheng, and J. J. Bock; 2022; *ApJ* 940, 115; arXiv:2207.13712
- “*Cosmic Near-Infrared Background Tomography with SPHEREx Using Galaxy Cross-Correlations*”  
Y.-T. Cheng, and T.-C. Chang; 2022, *ApJ* 925, 136; arXiv:2109.10914
- “*Probing Intra-Halo Light with Galaxy Stacking in CIBER Images*”  
Y.-T. Cheng, et al. (CIBER Collaboration); 2021, *ApJ*, 919, 69; arXiv:2103.03882
- “*Phase-Space Spectral Line De-confusion in Intensity Mapping*”  
Y.-T. Cheng, T.-C. Chang, and J. J. Bock; 2020, *ApJ*, 901, 142; arXiv:2005.05341
- “*Optimally Mapping Large-Scale Structures with Luminous Sources*”  
Y.-T. Cheng, R. de Putter, T.-C. Chang, and O. Doré; 2019, *ApJ*, 877, 86; arXiv:1809.06384
- “*Spectral Line De-Confusion in an Intensity Mapping Survey*”  
Y.-T. Cheng, T.-C. Chang, J. J. Bock, C. M. Bradford, and A. R. Cooray; 2016, *ApJ*, 832, 165; arXiv:1604.07833

### Co-author papers

- “*Inferred Measurements of the Zodiacal Light Absolute Intensity through Fraunhofer Absorption Line Spectroscopy with CIBER*”  
P. M. Korngut, et al., 2022, *ApJ*, 926, 133; arXiv:2104.07104
- “*Probing Cosmic Reionization and Molecular Gas Growth with TIME*”  
G. Sun, T.-C. Chang, et al., 2021, *ApJ*, 915, 33; arXiv:2012.09160
- “*Superresolution Reconstruction of Severely Undersampled Point-spread Functions Using Point-source Stacking and Deconvolution*”  
T. Symons, M. Zemcov, et al., 2021, *ApJS*, 252, 24; arXiv:2102.01094
- “*Hafnium Films and Magnetic Shielding for TIME, A mm-Wavelength Spectrometer Array*”  
J. Hunacek, et al., 2018, *JLTP*, 193, 893
- “*A Foreground Masking Strategy for [C II] Intensity Mapping Experiments Using Galaxies Selected by Stellar Mass and Redshift*”  
G. Sun, L. Monceli, M. P. Viero, et al., 2018, *ApJ*, 856, 107; arXiv:1601.10095
- “*Design and fabrication of tes detector modules for the time-pilot [cii] intensity mapping experiment*”  
J. Hunacek, et al., 2016, *JLTP*, 184, 733

### Non-refereed review papers / white papers

- “*Tomography of the Cosmic Dawn and Reionization Eras with Multiple Tracers*”  
T.-C. Chang, et al., 2019, Astro2020 White Paper, arXiv: 1903.11744
- “*Line-Intensity Mapping: 2017 Status Report*”  
E. D. Kovetz, M. P. Viero, et al., 2017, arXiv:1709.09066

### Conference proceedings

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