Fei Ge

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Education

University of California, Davis **September 2019 – Present**
Doctor of Philosophy in Physics *Davis, California, USA*

Xi'an Jiaotong University **September 2014 – June 2018**
Bachelor of Science in Physics (Honors Program) *Xi'an, Shaanxi, China*

Research Interests

Cosmology and fundamental physics: use cosmic microwave background (CMB) observations to study the cosmological model and explore new physics beyond standard model.

Data analysis: new data analysis method that is optimal for future low-noise CMB observations.

Experience

University of California, Davis **Janurary 2020 – Present**
Graduate Student Researcher *Davis, CA*

SPT-3G CMB Lensing Analysis

- Build the CMB Lensing analysis pipeline using Marginal Unbiased Score Expansion method for South Pole Telescope Winter-Field data.
- Test and validate the pipeline over a set of mock observations.

Atomic Dark Matter and Cosmological Tensions

- Identified the Free-Fall, Amplitude and Thompson (FFAT) scaling transformation of the cosmological perturbations that preserves the invariance of the dimension less cosmological observables, like CMB spectra.
- Applied the Atomic Dark Matter model to exploit the FFAT scaling transformation to resolve the Hubble tension problem.
- Utilized a series of scaling transformations, including the ADM enforeced one, to investigate the constraints on the amount of the light relics with two of them being novel causes.
- Investigated the physical effect of changes in the ADM parameters deviating from FFAT scaling on the cosmological observables and identified the CMB lensing effects to be the major impact.
- Proposed the ADM model with low dark photon temperature to be a possible model predicting low clustering strength and consistent with current dataset.

National Astronomical Observatory of China **July 2018 – May 2019**
Research Assistant *Beijing, China*

Multi-tracer Analysis with Galaxy Surveys

- Test for the multi-tracer analysis with eBOSS catalog by measuring the cross- and auto-power spectrum as well as the survey window function using mock catalog.

Fellowship and Award

Dean's Summer Graduate Fellowship *June/2023*
APS Graduate Student Travel Award *April/2022*

Publications

Main Author

1. **Ge, Fei**, Francis-Yan Cyr-Racine, and Lloyd Knox. Scaling transformations and the origins of light relics constraints from cosmic microwave background observations. *Phys. Rev. D*, 107(2):023517, 2023, arXiv: 2210.16335

2. Francis-Yan Cyr-Racine, **Ge, Fei**, and Lloyd Knox. Symmetry of Cosmological Observables, a Mirror World Dark Sector, and the Hubble Constant. *Phys. Rev. Lett.*, 128(20):201301, 2022, arXiv: 2107.13000

Co-Author

1. Yuting Wang, Gong-Bo Zhao, Kazuya Koyama, Will J. Percival, Ryuichi Takahashi, Chiaki Hikage, Héctor Gil-Marín, ChangHoon Hahn, Ruiyang Zhao, Weibing Zhang, Xiaoyong Mu, Yu Yu, Hong-Ming Zhu, and **Fei Ge**. Extracting high-order cosmological information in galaxy surveys with power spectra, 2022, arXiv: 2202.05248

Presentations

CMB-S4 Summer Collaboration Meeting *July/2023*
Atomic Dark Matter and Concordance of Cosmological Probes

American Physical Society April Meeting *April/2022*
A Symmetry of Cosmological Observables, a Mirror World Dark Sector and the Hubble Constant Tension

Teaching

Teaching Assistant at UC Davis

Introduction to Cosmology	*Spring/2023*
Cosmic Structure Formation (graduate level)	*Spring/2022*
Thermodynamics and Statistical Mechanics	*Fall/2021*
Introduction to Computational Physics	*Spring/2020*
Introduction to General Physics I	*Fall/2019*

Professional Activity

Junior member of South Pole Telescope collaboration
First-year graduate student mentor at Physics department

Technical Skills

- Python, Frotran, Julia and LaTeX
- CosmoMC, CAMB