Shihang Liu

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Graduate Student
Department of Physics, Guangxi University
Supervisor: Dr. Bohua Li

Email: sehighs@163.com **Phone**: (+86) 15676751681

Research Interests

21cm Cosmology, First Galaxies, Dark Matter, Large Scale Structure Formation and Evolution

Education

Graduate Student Sept. 2023 – present
Guangxi University(GXU)
Major: Cosmology
Supervisor: Dr. Bohua Li

Undergraduate Sept. 2018 – Jul. 2022
Yunnan University(YNU)
Elite Class for Astronomy
Major: Astronomy
Research Advisor: Prof. Xinzhong Er

Participant Jul. 2025
21cm Cosmology Summer School
Participant Aug. 2024
9th SKA Summer School
Participant Jul. 2021
Xinjiang Astronomical Observatory, CAS (XAO)
Summer School, "Love is the sky" summer camp

publication

Shihang Liu, Yilin Liu, Bowen Peng, Mengzhou Xie, Zelong Liu, Bohua Li, Yi Mao. Constraining fuzzy dark matter with the 21-cm power spectrum from Cosmic Dawn and Reionization.
In prep.

Xinzhong Er, Jiangchuan Yu, Adam Rogers, **Shihang Liu**, Shude Mao,
"Bias in apparent dispersion measure due to demagnification of plasma lensing on background radio sources".
In: *Monthly Notices of the Royal Astronomical Society* 510.1 (2022), pp. 197–204

Projects

University students innovation and entrepreneurship project (YNU) 2019-2021

Award — First-class scholarship for graduate students (GXU) — 2024

Research Experiences

Impact of Large Scale Structure Formation dominate by Fuzzy Dark Matter on Cosmic Dawn and Reionization

Advisor: Dr. Bohua Li (GXU)

Sep. 2023 – Mar. 2025

- We have implemented the fuzzy dark matter framework in the `21cmFAST`, the state of the art seminumerical simulation 21-cm signal code and performed Fisher matrix parameter space forecasts to, for first time to, test the prospects for constraining fuzzy dark matter using the 21-cm power spectrum with HMF based on numerical simulation. We forecasted the expected constraints on FDM mass and potential parameter FDM HMF index α from upcoming HERA and SKA1-Low central area measurements.

Evaluation of possible errors in FRB cosmology using two plasma lensing model on IGM

Advisor: Prof. Xinzhong Er (YNU)

Dec. 2020 – Sep. 2021

- Apply the plasma lensing modle to a simulation. We study the cross section of plasma lensing for two density profiles, the Gaussian and power-law models. And we set mock FRBs and place all the plasma clumps in the Milky Way. The observation frequency we adopted is 1GHz. We thus adopt a simple model and restrict the electron density in the range consistent with observations.
- Proposed and constructed a **DM bias estimation** to improve the accuracy of percision cosmology based on FRBs in the future. Under such conditions the magnification effect due to plasma lensing will present a systematic bias and will need to be accounted for. This result of this project have been successfully published on **MNRAS**.

Skills

Programming and Professional Software

- Python, C
- `21cmFAST` , `21cmSense`

Hobbies — Classical Music, Shell Collection, Animal Taxonomy