Zi-Liang Zhang

Updated November 7, 2023

Institute of Astrophysics
Central China Normal University
Wuhan 430079
PR China

Email: zlz@mails.ccnu.edu.cn

ORCID: 0000-0002-9110-4336
Phone: (86) 132 4613 4536

Research interests

Fast radio bursts; High-energy transient phenomena; Multi-messenger astronomy

Education

Central China Normal University — Wuhan, China
M.Sc. in Astronomy — 2021/9 – Present
Advisor: Prof. Yun-Wei Yu *GPA: 90.5/100*

Central China Normal University — Wuhan, China
B.Sc. in Physics — 2017/9 – 2021/6
Thesis: Dispersion Measure and Rotation Measure of Core-Collapse Supernova Remnant (Grade: Excellent)
Advisor: Prof. Yun-Wei Yu

Publications

Diverse origins for non-repeating fast radio bursts: Rotational radio transient sources and cosmological compact binary merger remnants
Zi-Liang Zhang, Yun-Wei Yu, Xiao-Feng Cao.
Astronomy & Astrophysics, 675, A66.

Honors and scholarships

National Scholarship, Ministry of Education of China	2023
Outstanding Graduate Student	2023
Second Class Scholarship for Academic Achievement*3	2021, 2022, 2023
Proactive Member of Student Club Activities	2020
ShuRen Scholarship	2020
Active Undergraduate Learner	2020
Theoretical Physics Talent Training Base Class Scholarship*3	2018, 2019, 2020

Research experience

Diverse Origins for Non-repeating Fast Radio Bursts (FRBs)

2022/09 – Present

- Discovered a potential low-energy population of non-repeating FRBs, enriching the current understanding of FRB diversity and origins.
- Considered the direction-dependent sensitivity of the CHIME telescope to unveil the true galactic latitude distribution of low-energy FRBs.
- Discussed the possible explanations behind the observed galactic plane concentration of these low-energy FRBs.

• Engaged in ongoing efforts to gather more comprehensive evidence to substantiate the existence and characteristics of the identified low-energy FRB population.

Scattering time of FRBs and Their Relation with Persistent Radio Source 2022/10 – Present

• Applying the galactic electron density model to dissect the scattering time and dispersion measure of FRBs, distinguishing contributions from the Milky Way, intergalactic medium, and host galaxy medium.
• Engaging in a thorough exploration aimed at elucidating the persistent radio source of FRBs, hypothesizing synchrotron radiation resulting from the interaction between pulsar wind nebulae and supernova remnants.
• Endeavoring to construct a cohesive model that interlinks scattering time, dispersion measure, rotation measure, and the evolution of persistent radio sources to offer a more unified understanding of the phenomena.
• Conducting a meticulous literature review and deriving theoretical frameworks concerning radiation and angular distribution of a point charge in motion, curvature radiation, and coherence radiation.

Programming Markov Chain Monte Carlo Method 2021/09 – 2022/03

• Studying the principles of Markov Chain Monte Carlo Method.
• Writing a simple 2 dimension Markov Chain Monte Carlo algorithm.

Redshift Distribution and Energy Function of CHIME Non-repeating FRBs 2021/06 – 2022/07

• Testing whether redshift distribution of FRBs tracks cosmic star formation rate or compact binary merger rate.
• Constraining energy function of FRBs.
• Considering the selection effects of CHIME telescope.
• Utilizing the Monte Carlo method with various redshift distributions to simulate mock FRBs, determining which could most accurately reproduce real observations.

Dispersion Measure and Rotation Measure of Core-Collapse Supernova Remnant 2021/01 – 2021/06

• Researching the evolution of dispersion measure and rotation measure of Fast Radio bursts for two environments: core-collapse supernova and compact binary merger.
• Calculating the shock wave radius of different ejecta, and dispersion measure and rotation measure from shocked and unshocked region.

Research on Issues Related to White Dwarf and Neutron Star/Black Hole Merger Events 2018/09 – 2020/08

• Studying numerical solutions of Lane–Emden equation and calculating Mass-Radius relation of stars and white dwarfs by MATLAB.
• Programming runge-kutta method of ODE system to solve TOV equation of neutron star and calculating Mass-Radius relation.

Teaching experience

Undergraduate supervision at Central China Normal University

ChangLan Linghu: Statistical study of repeating FRBs. 2022/12 – 2023/05
TianEn Chen: Statistical study of non-repeating FRBs. 2021/12 – 2022/05
Co-supervisor with Prof. Yun-Wei Yu

Teaching assistants at Central China Normal University

An Introduction to Astronomy (mixed undergraduate and graduate Course), TA and observation organizer Fall 2021, 2022, 2023
General Physics Spring 2023

Skills

Programming

Proficient in: MATLAB, Python and LaTex; skillful in numerical calculation and scientific data analysis.

Languages

Chinese (native speaker and speak several dialects), English (IELTS: band6.5)

Public Outreach

Speaker & Organizer, *Not So Simple Star Party.* 2023/10
• Curated an interactive astronomical observation session focused on normal stars and deep sky objects.
• Utilized telescopes and astrography cameras to facilitate public observations, enhancing their celestial experience.
• Communicated complex astrophysical concepts in an accessible manner, fostering a deeper appreciation and understanding of the observed stars and star clusters.

Core member & star party organizer, Amateur Astronomers Association of CCNU. 2017–2023
Observation manager of several astronomy courses. 2021–2023
Examiner, Hubei Province astronomy knowledge competition. 2022/07

Conference Talks

"Diverse origins for non-repeating fast radio bursts: Rotational radio transient sources and cosmological compact binary merger remnants", Fast/Future Pulsar Symposium 12, Nanyang, Henan 2023/07
"The origin diversity of non-repeating fast radio bursts: Rotational radio transient sources and cosmological compact binary merger remnants?", 14th Zhang Heng Academic Symposium of the Chinese Astronomical Society, Wuhan, Hubei 2023/04

	"Revisiting the event rate and energy function of fast radio bursts: Are they originate from compact binary mergers?", Fast/Future Pulsar Symposium 11, Xiangtan, Hunan	2022/08
Conferences and Summer Schools	POLAR-2 Scientific Mission and HERD Design Plan Symposium, Nanning, Guangxi	2021/04
	Gravitational Wave Astrophysics Conference 2021, Hefei, Anhui	2021/06
	Hubei Astronomical Society 2021 Annual Meeting, Wuhan, Hubei	2021/07
	Chinese Astronomical Society 2021 Academic Annual Meeting, Online	2021/10
	FAST 2022 Summer School, 4 days, Pingtang, Guizhou	2022/07
	Fast/Future Pulsar Symposium 11, Xiangtan, Hunan	2022/08
	2022 Pulsar Summer School, 10 days, Xiamen, Fujian	2022/08
	1st CSST Scientific Annual Meeting, Beijing	2023/03
	14th Zhang Heng Academic Symposium of the Chinese Astronomical Society, Wuhan, Hubei	2023/04
	Fast Radio Bursts and Their Astrophysics Symposium, Hefei, Anhui	2023/05
	The First LHAASO Symposium, Chengdu, Sichuan	2023/05
	Fast/Future Pulsar Symposium 12, Nanyang, Henan	2023/07
	1st FAST Science Forum, Pingtang, Guizhou	2023/09