Qianhang Ding

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Education

PhD in Physics 09/2018 – 06/2023
Department of Physics, The Hong Kong University of Science and Technology Supervisor: Prof. Yi Wang

Bachelor of Science 09/2014 – 06/2018
Department of Physics, Shanxi University

Employment

Senior Researcher 10/2023 – present
Center for Theoretical Physics of the Universe (CGA Group), Institute for Basic Science

QUPIP Researcher 05/2024 – 06/2024
International Center for Quantum-field Measurement Systems for Studies of the Universe and Particles

Research Assistant 09/2022 – 08/2023
Department of Physics, The Hong Kong University of Science and Technology

Research

Research Interests

Theory: gravitational wave cosmology, cosmic tensions, primordial black hole, and fundamental topics

Observation: multi-messenger astronomy such as CMB physics, gravitational wave and pulsar astronomy

Research Works

Standard Timers: tracking redshift-time relation through the statistics in cosmological dynamical systems

Hubble Parameter Measurement with PBHs: using the statistics in PBH systems to probe Hubble parameter

Dark Matter in Multi-messenger Astronomy: studying the imprints of dark matter with multi-messengers

Cosmic Tension in Void: reconciling Hubble tension and CMB anomalies in void cosmology

Collider in the Universe: studying cosmological collider in CMB and gravitational collider in PSR-BH binary

Publications

[13] **Qianhang Ding**, Minxi He, Volodymyr Takhistov, and Hui-Yu Zhu "Superradiant Bosons Driving Supermassive Black Hole Mergers," arXiv:2505.09696 [hep-ph].

[12] **Qianhang Ding**, Minxi He, and Volodymyr Takhistov "Primordial Black Hole Mergers as Probes of Dark Matter in Galactic Center," *Astrophys.J.* **981** no. 1, (2025) 62.

[11] **Qianhang Ding** "Merger rate of primordial black hole binaries as a probe of Hubble parameter," *Phys. Rev. D* **110** no. 6, (2023) 063542.

[10] Ali Akil, **Qianhang Ding** "A Dark Matter Probe in Accreting Pulsar-Black Hole Binaries," *JCAP* **09** (2023) 011.

[9] Tingqi Cai, **Qianhang Ding**, and Yi Wang "Reconciling cosmic dipolar tensions with a gigaparsec void," *Phys. Rev. D* **111** no. 10, (2025) 103502.

[8] **Qianhang Ding**, "Toward cosmological standard timers in primordial black hole binaries," *Phys. Rev. D* **108** no. 2, (2023) 023514.

[7] Yi-Fu Cai, Chao Chen, **Qianhang Ding**, and Yi Wang, "Cosmological Standard Timers from Unstable Primordial Relics," *Eur. Phys. J. C* **83** no. 913, (2023).

[6] Yi-Fu Cai, Chao Chen, **Qianhang Ding**, and Yi Wang, "Ultrahigh-energy Gamma Rays and Gravitational Waves from Primordial Exotic Stellar Bubbles," *Eur. Phys. J. C* **82** no. 464, (2022).

[5] **Qianhang Ding**, "Detectability of primordial black hole binaries at high redshift," *Phys. Rev. D* **104** no. 4, (2021) 043527.

[4] **Qianhang Ding**, Xi Tong, and Yi Wang, "Gravitational Collider Physics via Pulsar-Black Hole Binaries," *Astrophys.J.* **908** no. 1, (2021) 78.

[3] **Qianhang Ding**, Tomohiro Nakama, and Yi Wang, "A gigaparsec-scale local void and the Hubble tension," *Sci.China Phys.Mech.Astron.* **63** no. 9, (2020) 290403.

[2] **Qianhang Ding**, Tomohiro Nakama, Joseph Silk and Yi Wang, "Detectability of Gravitational Waves from the Coalescence of Massive Primordial Black Holes with Initial Clustering," *Phys. Rev. D* **100** no. 10, (2019) 103003.

[1] Wan Zhen Chua, **Qianhang Ding**, Yi Wang, and Siyi Zhou, "Imprints of Schwinger Effect on Primordial Spectra," *JHEP* **04** (2019) 066.

Summary of Publications

INSPIRE HEP: 231 citations, h-index: 7, 17.8 citations per paper
Google Scholar: 257 citations, h-index: 7, 19.8 citations per paper

Teaching Assistant

PHYS3031: Mathematical Methods in Physics II, HKUST — Fall Term 2020 – 2021

PHYS1114: General Physics II, HKUST — Fall & Spring Term 2019 – 2020

PHYS1002: Introduction to Astrophysics and Astronomy, HKUST — Spring Term 2018 – 2019

Project Mentoring

Capstone Project: Three Body System Analysis, Mentoring for three students, HKUST — 2020 – 2021

Awards and Distinctions

Selected Young Scientist Participant, *The Hong Kong Laureate Forum* — 2022

Honorable Mention for Best Teaching Assistant, *Department of Physics, HKUST* — 2020

Postgraduate Studentship, *HKUST* — 2018 – 2022

National Scholarship, *Ministry of Education of the People's Republic of China* — 2016

Service

The journal referee for *The Astrophysical Journal Letters*, *Physics of the Dark Universe*

The co-host of Cosmology from Home 2025 — 2025

The organizer of IBS CTPU-CGA Workshop on (Primordial) Black Holes and Gravitational Waves — 2024

The chair of 2023 Joint Annual Conference of Physical Societies in Greater Bay Area — 2023

The organizer of journal club talk series at fundamental physics group of IAS HKUST — 2018 – 2022

The assistant of IAS Program on High Energy Physics — 2019, 2020, 2022

The assistant of IAS Workshop on Black Holes, Inflation and Gravitational Waves — 2019

The assistant of Pan Pearl River Delta Physics Olympiad — 2019, 2020, 2022

Skills

Computer Languages	Mathematica, Python, C, HTML, CSS, LaTeX
Programming	MCMC, N–body simulation, Gradient descent, Error BP algorithm
Software Tools	BlackHawk, CAMB, MathGR, Blender
Outreach	Astrophotography [Channel] Popular science article for the Hong Kong Laureate Forum [Link]

Conference & Seminar Talks

IBS CTPU-CGA 2025 Workshop for High Energy Physics and Cosmology in Korea — 31/07/2025
Primordial Black Hole: Future Perspective in Gravitational Wave Cosmology

International Symposium on Cosmology and Particle Astrophysics 2025, *IBS CTPU-CGA* — 08/07/2025
How a Local Structure Impacts Our Understanding on Fundamental Physics

Seminar Talk, *City University of Hong Kong* — 27/06/2025
Bound on Ultralight Bosons from Superradiance

Cosmology from Home 2025 [Video] — 26/06/2025
The Merger Rate of Primordial Black Hole Binaries as a Probe of Hubble Parameter

Seminar Talk, *The Hong Kong University of Science and Technology* — 24/06/2025
Primordial Black Hole Mergers as a Cosmological Probe

Seminar Talk, *The Education University of Hong Kong* — 23/06/2025
Bound on Ultralight Bosons from Superradiance in OJ287

Seminar Talk, *Majorana-Raychaudhuri Seminar Series* [Video] — 30/05/2025
Primordial Black Hole Mergers as a Cosmological Probe

Seminar Talk, *Institut d'Astrophysique de Paris* — 24/04/2025
How a Local Structure Impacts Our Understanding on Fundamental Physics

Seminar Talk, *Université libre de Bruxelles* — 18/04/2025
Primordial Black Hole Mergers as a Cosmological Probe

CAS-IBS CTPU-CGA-ISCT Workshop in Cosmology, Gravitation and Particle Physics — 07/04/2025
How a Local Structure Impacts Our Understanding on Fundamental Physics

High1 Workshop on Paritcle, String and Cosmology, *KIAS, IBS CTPU-CGA, CKC* — 13/01/2025
Primordial Black Hole Mergers as a Cosmological Probe

100 + 9 GR & Beyond, Current Topics in Cosmology, *Jeju National University* — 20/11/2024
Primordial Black Hole Mergers as a Cosmological Probe

Seminar Talk, *Shenzhen University* — 20/09/2024
A Dark Matter Probe in Accreting Pulsar-Black Hole Binaries

IBS CTPU-CGA, Tokyo Tech, USTC workshop on cosmology, gravity, and particle physics — 11/09/2024
Primordial Black Hole Merger as Probes of Dark Matter in Galactic Center

IBS CTPU-CGA 2024 Workshop for Particle Physics and Cosmology in Korea — 23/07/2024
Imprint of Dark Matter Spike on Primordial Black Hole Merger Rate History

Cosmology from Home 2024 [Video] — 27/06/2024
The Merger Rate of Primordial Black Hole Binaries as a Probe of Hubble Parameter

Seminar Talk, *Jinan University* — 20/06/2024
A Dark Matter Probe in Accreting Pulsar-Black Hole Binaries

International Symposium on Cosmology and Particle Astrophysics CosPA 2024, *Ningbo U* — 16/06/2024
The Merger Rate of Primordial Black Hole Binaries as a Probe of Hubble Parameter

Seminar Talk, *High Energy Accelerator Research Organization, KEK* — 06/06/2024
A Gigaparsec-scale Local Void and Cosmological Principle

IBS CTPU-CGA 2024 Workshop on (Primordial) Black Holes and Gravitational Waves — 19/03/2024
Primordial Black Hole Binaries as a Probe of Hubble Parameter

Gravity and Cosmology 2024, *Yukawa Institute for Theoretical Physics, Kyoto University* — 06/02/2024
Reconciling Cosmic Dipolar Tensions with a Gigaparsec Void

High1 Workshop on Paritcle, String and Cosmology, *KIAS and IBS CTPU-CGA* 24/01/2024
Primordial Black Hole Binaries as a Probe of Hubble Parameter

New Perspectives on Cosmology 2024, *APCTP* 11/01/2024
Primordial Black Hole Binaries as a Probe of Hubble Parameter

International Workshop on Multi-probe approach to wavy dark matters, *Korea University* 30/11/2023
A Dark Matter Probe in Accreting Pulsar-Black Hole Binaries

International Symposium on Cosmology and Particle Astrophysics CosPA 2023, *CUHK* 12/11/2023
A Dark Matter Probe in Accreting Pulsar-Black Hole Binaries

Seminar Talk, *Huazhong University of Science and Technology* 14/09/2023
A Dark Matter Probe in Accreting Pulsar-Black Hole Binaries

2023 Joint Annual Conference of Physical Societies in Greater Bay Area, *CityU* 02/08/2023
Reconciling Cosmic Dipolar Tensions with a Gigaparsec Void

Cosmology from Home 2023 [Video] 06/07/2023
Reconciling Cosmic Dipolar Tensions with a Gigaparsec Void

Seminar Talk, *Chongqing University* 26/04/2023
A Dark Matter Probe in Accreting Pulsar-Black Hole Binaries

Gravitation and Relativistic Astrophysics 2023, CPS, *Chongqing University* 23/04/2023
A Gigaparsec-scale Local Void and Cosmological Principle

Seminar Talk, *Sun Yat-Sen University* 10/03/2023
Measure the Universe with Cosmological Standard Timers

Seminar Talk, *Sun Yat-Sen University* 08/03/2023
A Gigaparsec-scale Local Void and Cosmological Principle

Seminar Talk, *Tsung-Dao Lee Institute* 13/02/2023
A Gigaparsec-scale Local Void and Cosmological Principle

Seminar Talk, *Tsinghua University* 26/10/2022
A Gigaparsec-scale Local Void and Cosmological Principle

Seminar Talk, *Institute of Theoretical Physics, Chinese Academy of Science* [Video] 20/10/2022
Measure the Universe with Cosmological Standard Timers

The 15th Asia Pacific Physics Conference, *AAPPS, Korean Physical Society* 23/08/2022
Cosmological Standard Timers in Primordial Black Hole Scenarios

The 23rd International Conference on General Relativity and Gravitation, *ITP, CAS* 07/07/2022
Cosmological Standard Timers in Primordial Black Hole Scenarios

Cosmology from Home 2022 [Video] 05/07/2022
Cosmological Standard Timers in Primordial Black Hole Scenarios

Gravity: Current challenges in black hole physics and cosmology, *YITP, Kyoto University* 29/06/2022
Cosmological Standard Timers from Unstable Primordial Relics

Atlantic General Relativity 2022, *Memorial University of Newfoundland and Labrador* 18/05/2022
Cosmological Standard Timers from Unstable Primordial Relics

The KEK–PH + KEK–Cosmo joint workshop on "Primordial Black Holes", *KEK* 19/10/2021
Ultrahigh-energy Gamma Rays and Gravitational Waves from Primordial Exotic Stellar Bubbles

The 24th International Conference on Particle Physics and Cosmology, *UIUC* 05/08/2021
Ultrahigh-energy Gamma Rays and Gravitational Waves from Primordial Exotic Stellar Bubbles

Innovative Talk, USTC Seminar Series, *University of Science and Technology of China* 30/05/2021
Ultrahigh-energy Gamma Rays and Gravitational Waves from Primordial Exotic Stellar Bubbles

Seminar Talk, *Particle Cosmology Group, University of Science and Technology of China* 19/11/2019
Detectability of Gravitational Waves from the Coalescence of Massive PBHs with Initial Clustering

Gordon Research Seminar on Particle Physics, *HKUST* 29/06/2019
Detectability of Gravitational Waves from the Coalescence of Massive PBHs with Initial Clustering