

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

Bachelor of Science 09/2014 – 06/2018
Department of Physics, College of Physics and Electronic Engineering, 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

[12] **Qianhang Ding**, Minxi He, and Volodymyr Takhistov “Primordial Black Hole Mergers as Probes of Dark Matter in Galactic Center,” [arXiv:2410.02591](https://arxiv.org/abs/2410.02591) [[astro-ph.CO](#)], Under review in APJ.

[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,” [arXiv:2211.06857](https://arxiv.org/abs/2211.06857) [[astro-ph.CO](#)], Under review in PRD.

[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](#): 198 citations, h-index: 7, 16.5 citations per paper

[Google Scholar](#): 206 citations, h-index: 7, 17.2 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*

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, L^AT_EX

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

100 + 9 GR & Beyond, Current Topics in Cosmology, <i>Jeju National University</i> <i>Primordial black hole merger as a cosmological probe</i>	20/11/2024
Seminar Talk, <i>Shenzhen University</i> <i>A Dark Matter Probe in Accreting Pulsar-Black Hole Binaries</i>	20/09/2024
IBS CTPU-CGA, Tokyo Tech, USTC workshop on cosmology, gravity, and particle physics <i>Primordial Black Hole Merger as Probes of Dark Matter in Galactic Center</i>	11/09/2024
IBS CTPU-CGA 2024 Workshop for Particle Physics and Cosmology in Korea <i>Imprint of Dark Matter Spike on Primordial Black Hole Merger Rate History</i>	23/07/2024
Cosmology from Home 2024 [Video] <i>The Merger Rate of Primordial Black Hole Binaries as a Probe of Hubble Parameter</i>	27/06/2024
Seminar Talk, <i>Jinan University</i> <i>A Dark Matter Probe in Accreting Pulsar-Black Hole Binaries</i>	20/06/2024
International Symposium on Cosmology and Particle Astrophysics CosPA 2024, <i>Ningbo U</i> <i>The Merger Rate of Primordial Black Hole Binaries as a Probe of Hubble Parameter</i>	16/06/2024
Seminar Talk, <i>High Energy Accelerator Research Organization, KEK</i> <i>A Gigaparsec-scale Local Void and Cosmological Principle</i>	06/06/2024
IBS CTPU-CGA 2024 Workshop on (Primordial) Black Holes and Gravitational Waves <i>Primordial Black Hole Binaries as a Probe of Hubble Parameter</i>	19/03/2024
Gravity and Cosmology 2024, <i>Yukawa Institute for Theoretical Physics, Kyoto University</i> <i>Reconciling Cosmic Dipolar Tensions with a Gigaparsec Void</i>	06/02/2024
High1 Workshop on Particle, String and Cosmology, <i>KIAS and IBS CTPU-CGA</i> <i>Primordial Black Hole Binaries as a Probe of Hubble Parameter</i>	24/01/2024
New Perspectives on Cosmology 2024, <i>APCTP</i> <i>Primordial Black Hole Binaries as a Probe of Hubble Parameter</i>	11/01/2024
International Workshop on Multi-probe approach to wavy dark matters, <i>Korea University</i> <i>A Dark Matter Probe in Accreting Pulsar-Black Hole Binaries</i>	30/11/2023
International Symposium on Cosmology and Particle Astrophysics CosPA 2023, <i>CUHK</i> <i>A Dark Matter Probe in Accreting Pulsar-Black Hole Binaries</i>	12/11/2023
Seminar Talk, <i>Huazhong University of Science and Technology</i> <i>A Dark Matter Probe in Accreting Pulsar-Black Hole Binaries</i>	14/09/2023
2023 Joint Annual Conference of Physical Societies in Greater Bay Area, <i>CityU</i> <i>Reconciling Cosmic Dipolar Tensions with a Gigaparsec Void</i>	02/08/2023
Cosmology from Home 2023 [Video] <i>Reconciling Cosmic Dipolar Tensions with a Gigaparsec Void</i>	06/07/2023
Seminar Talk, <i>Chongqing University</i> <i>A Dark Matter Probe in Accreting Pulsar-Black Hole Binaries</i>	26/04/2023
Gravitation and Relativistic Astrophysics 2023, CPS, <i>Chongqing University</i> <i>A Gigaparsec-scale Local Void and Cosmological Principle</i>	23/04/2023
Seminar Talk, <i>Sun Yat-Sen University</i> <i>Measure the Universe with Cosmological Standard Timers</i>	10/03/2023
Seminar Talk, <i>Sun Yat-Sen University</i> <i>A Gigaparsec-scale Local Void and Cosmological Principle</i>	08/03/2023

Seminar Talk, <i>Tsung-Dao Lee Institute</i> <i>A Gigaparsec-scale Local Void and Cosmological Principle</i>	13/02/2023
Seminar Talk, <i>Tsinghua University</i> <i>A Gigaparsec-scale Local Void and Cosmological Principle</i>	26/10/2022
Seminar Talk, <i>Institute of Theoretical Physics, Chinese Academy of Science</i> [Video] <i>Measure the Universe with Cosmological Standard Timers</i>	20/10/2022
The 15th Asia Pacific Physics Conference, <i>AAPPS, Korean Physical Society</i> <i>Cosmological Standard Timers in Primordial Black Hole Scenarios</i>	23/08/2022
The 23rd International Conference on General Relativity and Gravitation, <i>ITP, CAS</i> <i>Cosmological Standard Timers in Primordial Black Hole Scenarios</i>	07/07/2022
Cosmology from Home 2022 [Video] <i>Cosmological Standard Timers in Primordial Black Hole Scenarios</i>	05/07/2022
Gravity: Current challenges in black hole physics and cosmology, <i>YITP, Kyoto University</i> <i>Cosmological Standard Timers from Unstable Primordial Relics</i>	29/06/2022
Atlantic General Relativity 2022, <i>Memorial University of Newfoundland and Labrador</i> <i>Cosmological Standard Timers from Unstable Primordial Relics</i>	18/05/2022
The KEK-PH + KEK-Cosmo joint workshop on “Primordial Black Holes”, <i>KEK</i> <i>Ultrahigh-energy Gamma Rays and Gravitational Waves from Primordial Exotic Stellar Bubbles</i>	19/10/2021
The 24th International Conference on Particle Physics and Cosmology, <i>UIUC</i> <i>Ultrahigh-energy Gamma Rays and Gravitational Waves from Primordial Exotic Stellar Bubbles</i>	05/08/2021
Innovative Talk, USTC Seminar Series, <i>University of Science and Technology of China</i> <i>Ultrahigh-energy Gamma Rays and Gravitational Waves from Primordial Exotic Stellar Bubbles</i>	30/05/2021
Seminar Talk, <i>Particle Cosmology Group, University of Science and Technology of China</i> <i>Detectability of Gravitational Waves from the Coalescence of Massive PBHs with Initial Clustering</i>	19/11/2019
Gordon Research Seminar on Particle Physics, <i>HKUST</i> <i>Detectability of Gravitational Waves from the Coalescence of Massive PBHs with Initial Clustering</i>	29/06/2019