

Dr. Yifan WANG

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Address: Room 068, Am Mühlenberg 1, 14476 Potsdam, Germany

CURRENT POSITION

Max Planck Institute for Gravitational Physics (Albert Einstein Institute), Potsdam

Department of Astrophysical and Cosmological Relativity

Junior Scientist/Postdoc

01/09/2023 - Present

EXPERIENCE

Max Planck Institute for Gravitational Physics (Albert Einstein Institute), Hannover

Department of Observational Relativity and Cosmology

Junior Scientist/Postdoc

04/11/2019 - 01/09/2023

Member of LIGO and Virgo Collaboration 01/03/2016 - 01/07/2019, 01/09/2023-present

The Chinese University of Hong Kong

01/08/2015 - 25/10/2019

Ph.D. in Physics (Supervisor: Prof. Tjonnje G. F. Li)

Thesis: *Hunting for Primordial Black Holes with Stochastic Gravitational-Wave Background*

Institute of Theoretical Physics, Chinese Academy of Sciences 01/06/2014 - 31/08/2014

Summer Intern Student (Supervisor: Prof. Qing-Guo Huang)

Research topic: Data Analysis of Cosmic Microwave Background

University of Science and Technology of China

14/08/2011 - 28/06/2015

B.S. in the Department of Modern Physics (Supervisor: Prof. Wen Zhao)

Thesis (in Chinese): *Separating E and B Polarization Modes of Cosmic Microwave Background from an Incomplete Sky*

RESEARCH INTERESTS

I focus on the data analysis and interpretation of *gravitational wave* from compact binary coalescence, and implications for relativity and cosmology. Recently I am especially interested in:

- Deep offline searches for gravitational-wave multimessenger signals, such as FRBs, GRBs, neutrinos, etc.
- Searching for compact-binary-coalescence gravitational waves with additional physics, such as eccentricity, precession, higher modes, non-GR, etc.
- Gravitational-wave data analysis with new tools from machine learning
- Searching for dark matter, in particular, primordial black holes from gravitational waves
- Testing general relativity with gravitational waves

See my personal academic website for more details.

PROFESSIONAL SKILLS

Programming:

Python, C, C++, Matlab, Mathematica, Fortran

High-performance computing:

HTCondor, Pegasus

Languages:

English(fluent), Chinese(native), German(basic)

SOFTWARE DEVELOPMENT

Github: github.com/yi-fan-wang

- `pycbc-testinggr`: A repository to collect gravitational wave waveforms of theories beyond general relativity (github.com/yi-fan-wang/TestingGR_with_Gravwaves)
- `Gwaveform-tools`: A easy-to-use tool to process gravitational waveforms. (github.com/yi-fan-wang/Gwaveform-tools)

JOURNAL REFEREE

Monthly Notices of the Royal Astronomical Society, The Astrophysical Journal, Physical Review D, Physical Review Letters

INVITED PRESENTATIONS

Invited speaker for Spring workshop on gravity and cosmology, Jagiellonian University 25/05/2020-29/05/2020

HONORS

- Selected as 200 young scientists participating The inaugural Hong Kong Laureate Forum for Shaw Prize 13-18/11/2023
- Seal of Excellence, project proposal to the Marie Skłodowska-Curie Actions Postdoctoral Fellowships. (granted to those who could not receive the funding but “was recognized as a high-quality project proposal in a highly competitive evaluation process”) 2021
- Princess of Asturias Award for Technical and Scientific Research; Einstein Medal from the Einstein Society in Bern, Switzerland; UK RAS Group Achievement Award in Astronomy (Jointly to the LIGO Scientific Collaboration). 2017
- Awards for Excellent Presentation, Annual Meeting of Gravitation and Relativistic Astrophysics, Chinese Physical Society (webpage in Chinese) 21/06/2015-26/06/2015
Presentation Title: *Separate E and B modes in CMB polarization*

SUPERVISING & MENTORING ACTIVITIES

Simran Dave (Imperial College London) 01/06/2021-31/08/2021
AEI Intern Student.
Research Topic: *Application of Machine Learning in Gravitational-Wave Data Analysis. (Gitlab Repository)*

Kailai Wang (Cornell University) 14/06/2022-17/08/2022
AEI Intern Student.
Research Topic: Comparison of eccentric waveform approximants with recent numerical relativity catalogs (Gitlab Repository)

TEACHING ACTIVITIES

- Guest lecturer, invited by Prof. Binbin Zhang at Nanjing University for *Gravitational Wave and Related Astrophysics*. May 2022
- Guest lecturer for Prof. Xilong Fan’s gravitational wave class at Wuhan University. Lecture notes, slides are in github.com/yi-fan-wang/whugwnotes Dec. 2021

In the Chinese University of Hong Kong:

PHYS4011 Classical Mechanics II (teaching assistant)	<i>Spring 2019</i>
UGEB2401B Astronomy (teaching assistant)	<i>Autumn 2018</i>
UGEB2401B Astronomy (teaching assistant)	<i>Spring 2018</i>
PHYS1003A General Physics for Engineer (teaching assistant)	<i>Autumn 2017</i>
UGEB2401B Astronomy (teaching assistant)	<i>Spring 2017</i>
PHYS1003A General Physics for Engineer (teaching assistant)	<i>Autumn 2016</i>
UGEB2401B Astronomy (teaching assistant)	<i>Spring 2016</i>
PHYS1003A General Physics for Engineer (teaching assistant)	<i>Autumn 2015</i>

In the University of Science and Technology of China:

022164 College physics experiment III (teaching assistant)	<i>Spring 2015</i>
022504 Electromagnetism B (teaching assistant)	<i>Autumn 2014</i>

OUTREACH ACTIVITIES

A popular science talk (in Chinese) given in the “Deutsch-Chinesischer Buchclub” and “Bo Shi Sheng”.
22/05/2021

Title: *Einstein, Gravitational Wave and Research in the Max Planck Institute (Youtube link)*

PUBLICATION LIST

Yifan Wang (also published under the name Yi-Fan Wang)

January 25, 2024

My profile in INSPIRE (excluding the collaboration papers in LIGO and Virgo Collaboration):

Number of Papers: 25, including 14 (co-)First-Author papers, Citations: 1229, h-index: 18, Citations/paper (avg): 49.2

- Search for Gravitational Waves:

- Targeted Search for Gravitational Waves from Highly Spinning Light Compact Binaries**

- arXiv:2308.16173*, accepted by Monthly Notice of Royal Astronomy Society

- **Yi-Fan Wang**, Alexander H. Nitz,

- Data Release: <https://github.com/gwastro/high-spin-light-binary>

- 4-OGC: Catalog of gravitational waves from compact-binary mergers**

- 2023 APJ 946 2 arXiv: 2112.06878*

- Alexander H. Nitz, Sumit Kumar, **Yi-Fan Wang**, Shilpa Kastha, Shichao Wu, Marlin Schäfer, Rahul Dhurkunde, Collin D. Capano

- Data Release: <https://github.com/gwastro/4-ogc>

- This work is reported as AEI research highlights.

- 3-OGC: Catalog of gravitational waves from compact-binary mergers**

- 2021 ApJ 922 76 arXiv: 2105.09151*

- Alexander H. Nitz, Collin D. Capano, Sumit Kumar, **Yi-Fan Wang**, Shilpa Kastha, Marlin Schäfer, Rahul Dhurkunde, Miriam Cabero

- Data Release: <https://github.com/gwastro/3-ogc>

- This work is reported as AEI research highlights.

- Black Hole Ringdown:

- Low evidence for ringdown overtone in GW150914 when marginalizing over time and sky location uncertainty**

- arXiv: 2312.14118*

- Alex Correia, **Yi-Fan Wang**, Collin D. Capano

- A frequency-domain perspective on GW150914 ringdown overtone**

- arXiv: 2310.19645*

- **Yi-Fan Wang**, Collin D. Capano, Jahed Abedi, Shilpa Kastha, Badri Krishnan, Alex B. Nielsen, Alexander H. Nitz, Julian Westerweck

- Spectroscopy for asymmetric binary black hole mergers**

- Phys. Rev. D 108, 104009 arXiv: 2309.03121*

- Jahed Abedi, Collin D. Capano, Shilpa Kastha, **Yi-Fan Wang**, Julian Westerweck, Alex B. Nielsen, Badri Krishnan

Statistical validation of the detection of a sub-dominant quasi-normal mode in GW190521

arXiv: 2209.00640

- Collin D. Capano, Jahed Abedi, Shilpa Kastha, Alexander H. Nitz, Julian Westerweck, **Yi-Fan Wang**, Miriam Cabero, Alex B. Nielsen, Badri Krishnan
- Data Release: <https://github.com/gwastro/BH-Spectroscopy-GW190521>

Observation of a multimode quasi-normal spectrum from a perturbed black hole

Phys. Rev. Lett. 131, 221402 arXiv: 2105.05238

- Collin D. Capano, Miriam Cabero, Julian Westerweck, Jahed Abedi, Shilpa Kastha, Alexander H. Nitz, **Yi-Fan Wang**, Alex B. Nielsen, Badri Krishnan
- Data Release: <https://github.com/gwastro/BH-Spectroscopy-GW190521>
- This work is reported as AEI research highlights.

• Multi-messenger Astronomy:

Search for Coincident Gravitational Wave and Long Gamma-Ray Bursts from 4-OGC and the Fermi/Swift Catalog

2022 ApJL 939 L14 arXiv: 2208.03279

- **Yi-Fan Wang**, Alexander H. Nitz, Collin D. Capano, Xiangyu Ivy Wang, Yu-Han Yang, Bin-Bin Zhang
- Data Release: <https://github.com/gwastro/gw-longgrb>
- This work is reported as AEI research highlights.

Search for Coincident Gravitational Wave and Fast Radio Burst Events from 4-OGC and the First CHIME/FRB Catalog

2022 ApJ 937 89 arXiv:2203.17222

- **Yi-Fan Wang**, Alexander H. Nitz,
- Data Release: <https://github.com/gwastro/high-spin-light-binary>

• Testing General Relativity with Gravitational Waves:

Tests of Gravitational-Wave Birefringence with the Open Gravitational-Wave Catalog

Phys. Rev. D 106, 084005 arXiv: 2109.09718

- **Yi-Fan Wang**, Stephanie M. Brown, Lijing Shao, Wen Zhao
- Data Release: <https://github.com/gwastro/4ogc-birefringence>

Gravitational Wave Implications for the Parity Symmetry of Gravity in the High Energy Region

Astrophys.J. 908 (2021) *arXiv:* 2002.05668

- **Yi-Fan Wang**, Rui Niu, Tao Zhu, Wen Zhao

- Data Release: <https://github.com/yi-fan-wang/ParitywithGW>

Potential observations of false deviations from general relativity in gravitational wave signals from binary black holes

Phys. Rev. D 98, 024019 (2018) *arXiv:* 1802.03306

- Peter T. H. Pang, Juan Calderon Bustillo, **Yifan Wang**, and Tjonnie G. F. Li

- **Hunting for Primordial Black Hole Dark Matter:**

Broad search for gravitational waves from subsolar-mass binaries through LIGO and Virgo's third observing run

Phys. Rev. D 106, 023024 *arXiv:* 2202.11024

- Alexander H. Nitz, **Yi-Fan Wang**

- Data Release: <https://github.com/gwastro/subsolar-O3-search>

Search for gravitational waves from the coalescence of sub-solar mass binaries in the first half of Advanced LIGO and Virgo's third observing run

Phys. Rev. Lett. 127, 151101 *arXiv:* 2106.08979

- Alexander H. Nitz, **Yi-Fan Wang**

- Data Release: <https://github.com/gwastro/subsolar-o3a-search>

- This work is reported as AEI research highlights.

Search for gravitational waves from the coalescence of sub-solar mass and eccentric compact binaries

Astrophys.J. 915 (2021) *arXiv:* 2102.00868

- Alexander H. Nitz, **Yi-Fan Wang**

- Data Release: <https://github.com/gwastro/subsolar-ecc-primordial-search>

Search for gravitational waves from high-mass-ratio compact-binary mergers of stellar mass and sub-solar mass black holes

Phys. Rev. Lett. 126, 021103 *arXiv:* 2007.03583

- Alexander Harvey Nitz, **Yi-Fan Wang**

- Data Release: <https://github.com/gwastro/stellar-pbh-search>

- This work is reported as AEI research highlights.

- **Primordial Black Hole Astronomy:**

Prospects for detecting gravitational waves from eccentric subsolar mass compact binaries

Astrophys.J. 912 (2021) *arXiv:* 2101.12269

- **Yi-Fan Wang**, Alexander H. Nitz

- Data Release: <https://github.com/gwastro/prospects-subsolarmass-ecc>

Searching for primordial black holes with stochastic gravitational-wave background in the space-based detector frequency band

Phys. Rev. D 101, 063019 (2020) *arXiv: 1910.07397*

- **Yi-Fan Wang**, Qing-Guo Huang, Tjonnie G.F. Li, Shihong Liao

Constraints on the Primordial Black Hole Abundance from the First Advanced LIGO Observation Run Using the Stochastic Gravitational-Wave Background

Phys. Rev. Lett. 120, 191102 (2018) *arXiv: 1610.08725*

- Sai Wang, **Yi-Fan Wang**, Qing-Guo Huang, and Tjonnie G. F. Li

- This work was reported as a research highlight by *Nature Physics*.

- Space-based Gravitational-wave Astronomy

Science with the TianQin observatory: Preliminary results on massive black hole binaries

Phys. Rev. D 100, 043003 (2019) *arXiv: 1902.04423*

- Hai-Tian Wang, Zhen Jiang, Alberto Sesana, Enrico Barausse, Shun-Jia Huang, **Yi-Fan Wang**, Wen-Fan Feng, Yan Wang, Yi-Ming Hu, Jianwei Mei, Jun Luo

The TianQin project: current progress on science and technology

Prog. Theor. Exp. Phys. 2020, 0000 *arXiv: 2008.10332*

- Jianwei Mei, ..., **Yi-Fan Wang**, et al.

- Cosmology

Constraints on the sum of neutrino masses using cosmological data including the latest extended Baryon Oscillation Spectroscopic Survey DR14 quasar sample

Chinese Physics C Vol. 42, No. 6 (2018) 065103 *arXiv: 1707.00588*

- Sai Wang, **Yi-Fan Wang**, Dong-Mei Xia

Impacts of dark energy on weighing neutrinos: mass hierarchies considered

Phys. Rev. D 94, 083519 (2016) *arXiv: 1608.00672*

- Sai Wang, **Yi-Fan Wang**, Dong-Mei Xia and Xin Zhang

Smoothing methods comparison for CMB E- and B- modes

Research in Astronomy and Astrophysics 16, 4 (2016) *arXiv: 1511.01220*

- **Yi-Fan Wang**, Kai Wang, Wen Zhao

Collaboration Papers:

I am also in the author list of all the papers that were published by LIGO and Virgo collaboration from 2017 - 2019. In particular, I made direct contributions to the following papers:

- **Tests of general relativity with the binary black hole signals from the LIGO-Virgo catalog GWTC-1**

Phys. Rev. D 100, 104036 (2019) *arXiv: 1903.04467*

LIGO Scientific Collaboration and Virgo Collaboration (I contributed by running the Lorentz Invariance Violation Tests on the newly detected gravitational-wave events.)
