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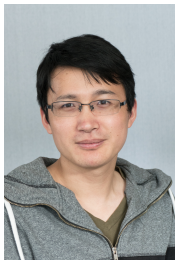

Scientific Interests

Physics	tests of gravity, gravitational waves, new physics beyond standard model
Astrophysics	pulsar timing, neutron stars, black holes, dark matter, cosmology
Statistics	data analysis, Bayesian inference, Monte Carlo experiments

Education & Profession

2017–present **Scientific Staff**, *Max Planck Institute for Radio Astronomy, Bonn*.
In the group "Fundamental Physics in Radio Astronomy" supervised by Michael Kramer

2015–2017 **Junior Scientist**, *Max Planck Institute for Gravitational Physics (Albert Einstein Institute)*.
In the group "Astrophysical and Cosmological Relativity" supervised by Alessandra Buonanno

2010–2015 **Doctor of Theoretical Physics**, *School of Physics, Peking University*.
Jointly supervised by Michael Kramer, Bo-Qiang Ma, and Norbert Wex

2011–2013 **Visiting Scholar**, *Max Planck Institute for Radio Astronomy, Bonn*.
Supported by China Scholarship Council (CSC)

2007–2010 **Bachelor of Physics**, *School of Physics, Peking University*.
Grade-Point Average (GPA): 3.64/4.00

2007–2010 **Double Degree of Economics**, *National School of Development, Peking University*.
Grade-Point Average (GPA): 3.30/4.00

Summer 2009 **Interchange**, *Institute of Astronomy, National Tsing Hua University*.
Supported by Hui-Chun Chin and Tsung-Dao Lee Chinese Undergraduate Research Endowment

2005–2007 **Electronics**, *School of Electronics Engineering and Computer Science, Peking University*.
Changing Major to Physics in July 2007

Selected Publication

2018 **L. Shao**, N. Wex, M. Kramer, *Phys. Rev. Lett.* 120 (2018) 241104.
Testing the universality of free fall towards dark matter with radio pulsars.
⋆ Featured by PRL editors as an *Editors' Suggestion*

2017 **L. Shao**, N. Sennett, A. Buonanno, M. Kramer, N. Wex, *Phys. Rev. X* 7 (2017) 041025.
Constraining nonperturbative strong-field effects in scalar-tensor gravity by combining pulsar timing and laser-interferometer gravitational-wave detectors.
⋆ Featured by the Max Planck Institute for Gravitational Physics (Albert Einstein Institute)

2017 A. Bohé, **L. Shao**, A. Taracchini, A. Buonanno, *et al.*, *Phys. Rev. D* 95 (2017) 044028.
Improved effective-one-body model of spinning, nonprecessing binary black holes for the era of gravitational-wave astrophysics with advanced detectors.
⋆ Implemented as the SEOBNRv4 waveform model in LIGO Algorithm Library (LAL)

2016 **L. Shao**, *Phys. Rev. D* 93 (2016) 084023.
Testing the strong equivalence principle with the triple pulsar PSR J0337+1715.
⋆ Featured by PRD editors as an *Editors' Suggestion*

2014 **L. Shao**, *Phys. Rev. Lett.* 112 (2014) 111103.
Tests of local Lorentz invariance violation of gravity in the standard model extension with pulsars.
⋆ Featured by School of Physics, Peking University

2013 **L. Shao**, R.N. Caballero, M. Kramer, N. Wex, D.J. Champion, A. Jessner, *Class. Quantum Grav.* 30 (2013) 165019.
A new limit on local Lorentz invariance violation of gravity from solitary pulsars.
⋆ Communicated by Editor-in-Chief & Selected in *Highlights of 2013–2014*

2013 **L. Shao**, N. Wex, *Class. Quantum Grav.* 30 (2013) 165020.
New limits on the violation of local position invariance of gravity.
⋆ Communicated by Editor-in-Chief & Selected in *Highlights of 2013–2014*

2012 **L. Shao**, N. Wex, *Class. Quantum Grav.* 29 (2012) 215018.
New tests of local Lorentz invariance of gravity with small-eccentricity binary pulsars.
⋆ Communicated by Editor-in-Chief & Selected in *Highlights of 2012–2013*

2010 **L. Shao**, B.-Q. Ma, *Physica A* 389 (2010) 3109.
The significant digit law in statistical physics.
⋆ Invited to *Wolfram Demonstrations* ("Benford's law in statistical physics," by D. Pan, L. Shao, B.-Q. Ma)

Academic Service for Journals

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Teaching Experience

Autumn 2013 **Teaching Assistant**, *School of Physics, Peking University*.
Quantum Statistical Physics

Autumn 2010 **Teaching Assistant**, *Peking University*.
What is Science?

Spring 2010 **Teaching Assistant**, *National School of Development, Peking University*.
Probability Theory and Statistics

Autumn 2009 **Teaching Assistant**, *National School of Development, Peking University*.
Linear Algebra (awarded as an *Excellent Teaching Assistant)*

Summer 2007 **Aid Education**, *Luodian City, Guizhou Province*.

Summer 2006 **Aid Education**, *Daning City, Shanxi Province*.

Publication List ◁◁ with stars (⋆) marking first-author/corresponding-author papers ▷▷

◁ **69** ▷ 2018 B.P. Abbott, *et al.*, arXiv:1805.11579
Properties of the binary neutron star merger GW170817.

◁ **68** ▷ 2018 B.P. Abbott, *et al.*, arXiv:1805.11581
GW170817: Measurements of neutron star radii and equation of state.

◁ **67** ▷ 2018 A. De Rosa, P. Uttley, L. Gou, Y. Liu, *et al.*, *Sci. China Phys. Mech. Astron.* (accepted)
Accretion in strong field gravity with eXTP.

◁ **66** ▷ 2018 J.J.M. in 't Zand, E. Bozzo, J. Qu, X.-D. Li, *et al.*, *Sci. China Phys. Mech. Astron.* (accepted)
Observatory science with eXTP.

◁ **65** ▷ 2018 G.C. Bower, S. Chatterjee, J. Cordes, P. Demorest, J.S. Deneva, J. Dexter, M. Kramer, T.J.W. Lazio, S. Ransom, **L. Shao**, N. Wex, R. Wharton (submitted), a chapter in *ngVLA Science Book*.
Galactic center pulsars with the ngVLA.

* ◁ **64** ▷ 2018 **L. Shao**, N. Wex, M. Kramer, *Phys. Rev. Lett.* 120 (2018) 241104 [arXiv:1805.08408]
Testing the universality of free fall towards dark matter with radio pulsars.

◁ **63** ▷ 2018 B.P. Abbott, *et al.*, *Phys. Rev. Lett.* 120 (2018) 201102 [arXiv:1802.10194]
Search for tensor, vector, and scalar polarizations in the stochastic gravitational-wave background.

◁ **62** ▷ 2018 B.P. Abbott, *et al.*, *Phys. Rev. D* 97 (2018) 102003 [arXiv:1802.05241].
Full band all-sky search for periodic gravitational waves in the O1 LIGO data.

◁ **61** ▷ 2018 B.P. Gong, Y.P. Li, J.P. Yuan, J. Tian, Y.Y. Zhang, D. Li, B. Jiang, X.D. Li, H.G. Wang, Y.C. Zou, **L. Shao**, *Astrophys. J.* 855 (2018) 35.
Searching ultra-compact pulsar binaries with abnormal timing behavior.

◁ **60** ▷ 2018 B.P. Abbott, *et al.*, *Phys. Rev. Lett.* 120 (2018) 091101 [arXiv:1710.05837].
GW170817: Implications for the stochastic gravitational-wave background from compact binary coalescences.

◁ **59** ▷ 2018 B.P. Abbott, *et al.*, *Phys. Rev. Lett.* 120 (2018) 031104 [arXiv:1709.09203].
First search for nontensorial gravitational waves from known pulsars.

◁ **58** ▷ 2018 Y.W. Wu, G. Torricelli-Ciamponi, M. Massi, R.J. Reid, B. Zhang, **L. Shao**, X.W. Zheng, *Mon. Not. R. Astron. Soc.* 474 (2018) 4245 [arXiv:1711.07598].
Revisiting LS I $+61^{\circ}303$ with VLBI astrometry.

◁ **57** ▷ 2018 B.P. Abbott, *et al.*, *Phys. Rev. D* 97 (2018) 102002 [arXiv:1712.01168].
Constraints on cosmic strings using data from the first Advanced LIGO observing run.

◁ **56** ▷ 2017 B.P. Abbott, *et al.*, *Phys. Rev. D* 96 (2017) 122006 [arXiv:1710.02327].
First narrow-band search for continuous gravitational waves from known pulsars in advanced detector data.

◁ **55** ▷ 2017 B.P. Abbott, *et al.*, *Astrophys. J. Lett.* 850 (2017) L40 [arXiv:1710.05838].
On the progenitor of binary neutron star merger GW170817.

◁ **54** ▷ 2017 B.P. Abbott, *et al.*, *Astrophys. J. Lett.* 850 (2017) L39 [arXiv:1710.05836].
Estimating the contribution of dynamical ejecta in the kilonova associated with GW170817.

◁ **53** ▷ 2017 B.P. Abbott, *et al.*, *Nature* 551 (2017) 85 [arXiv:1710.05835].
A gravitational-wave standard siren measurement of the Hubble constant.

◁ **52** ▷ 2017 B.P. Abbott, *et al.*, *Astrophys. J. Lett.* 848 (2017) L13 [arXiv:1710.05834].
Gravitational waves and gamma-rays from a binary neutron star merger: GW170817 and GRB170817A.

◁ **51** ▷ 2017 B.P. Abbott, *et al.*, *Phys. Rev. Lett.* 119 (2017) 161101 [arXiv:1710.05832].
GW170817: Observation of gravitational waves from a binary neutron star inspiral.

◁ **50** ▷ 2017 B.P. Abbott, *et al.*, *Astrophys. J. Lett.* 848 (2017) L12 [arXiv:1710.05833].
Multi-messenger observations of a binary neutron star merger.

◁ **49** ▷ 2017 A. Albert, *et al.*, *Astrophys. J. Lett.* 850 (2017) L35 [arXiv:1710.05839].
Search for high-energy neutrinos from binary neutron star merger GW170817 with ANTARES, IceCube, and the Pierre Auger Observatory.

◁ **48** ▷ 2017 B.P. Abbott, *et al.*, *Astrophys. J. Lett.* 851 (2017) L16 [arXiv:1710.09320].
Search for post-merger gravitational waves from the remnant of the binary neutron star merger GW170817.

◁ **47** ▷ 2017 B.P. Abbott, *et al.*, *Phys. Rev. Lett.* 119 (2017) 141101 [arXiv:1709.09660].
GW170814: A three-detector observation of gravitational waves from a binary black hole coalescence.

◁ **46** ▷ 2017 B.P. Abbott, *et al.*, *Astrophys. J. Lett.* 851 (2017) L35 [arXiv:1711.05578].
GW170608: Observation of a 19-solar-mass binary black hole coalescence.

* ◁ **45** ▷ 2017 N. Sennett, **L. Shao**, J. Steinhoff, *Phys. Rev. D* 96 (2017) 084019 [arXiv:1708.08285].
Effective action model of dynamically scalarizing binary neutron stars.

◁ **44** ▷ 2017 B.P. Abbott, *et al.*, *Phys. Rev. D* 96 (2017) 062002 [arXiv:1707.02667].
All-sky search for periodic gravitational waves in the O1 LIGO data.

◁ **43** ▷ 2017 B.P. Abbott, *et al.*, *Phys. Rev. D* 96 (2017) 122004 [arXiv:1707.02669].
First low-frequency Einstein@Home all-sky search for continuous gravitational waves in Advanced LIGO data.

* ◁ **42** ▷ 2017 **L. Shao**, *Class. Quantum Grav.* 34 (2017) 175011 [arXiv:1707.06535].
An independent test on the local position invariance of gravity with the triple pulsar PSR J0337+1715.

◁ **41** ▷ 2017 B.P. Abbott, *et al.*, *Astrophys. J.* 847 (2017) 47 [arXiv:1706.03119].
Upper limits on gravitational waves from Scorpius X-1 from a model-based cross-correlation search in Advanced LIGO data.

◁ **40** ▷ 2017 B.P. Abbott, *et al.*, *Phys. Rev. Lett.* 118 (2017) 221101 [arXiv:1706.01812].
GW170104: Observation of a 50-solar-mass binary black hole coalescence at redshift 0.2.

* ◁ **39** ▷ 2017 **L. Shao**, B. Zhang, *Phys. Rev. D* 95 (2017) 123010 [arXiv:1705.01278].
Bayesian framework to constrain the photon mass with a catalog of fast radio bursts.

◁ **38** ▷ 2017 B.P. Abbott, *et al.*, *Phys. Rev. D* 96 (2017) 022001 [arXiv:1704.04628].
Search for intermediate mass black hole binaries in the first observing run of Advanced LIGO.

◁ **37** ▷ 2017 B.P. Abbott, *et al.*, *Phys. Rev. D* 95 (2017) 122003 [arXiv:1704.03719].
Search for gravitational waves from Scorpius X-1 in the first Advanced LIGO observing run with a hidden Markov model.

* ◁ **36** ▷ 2017 **L. Shao**, N. Sennett, A. Buonanno, M. Kramer, N. Wex, *Phys. Rev. X* 7 (2017) 041025 [arXiv:1704.07561].
Constraining nonperturbative strong-field effects in scalar-tensor gravity by combining pulsar timing and laser-interferometer gravitational-wave detectors.

* ◁ **35** ▷ 2017 A. Bohé, **L. Shao**, A. Taracchini, A. Buonanno, S. Babak, I.W. Harry, I. Hinder, S. Ossokine, M. Pürrer, V. Raymond, T. Chu, H. Fong, P. Kumar, H.P. Pfeiffer, M. Boyle, D.A. Hemberger, L.E. Kidder, G. Lovelace, M.A. Scheel, B. Szilágyi, *Phys. Rev. D* 95 (2017) 044028 [arXiv:1611.03703].
Improved effective-one-body model of spinning, nonprecessing binary black holes for the era of gravitational-wave astrophysics with advanced detectors.

◁ **34** ▷ 2016 D. Muna, *et al.*, [arXiv:1610.03159].
The astropy problem.

* ◁ **33** ▷ 2016 **L. Shao**, *Universe* 2 (2016) 29.
Experimental studies on the Lorentz symmetry in post-Newtonian gravity with pulsars.

* ◁ **32** ▷ 2016 J. Liu, G. Wang, Y.-M. Hu, T. Zhang, Z. Luo, Q.-L. Wang, **L. Shao**, *Chin. Sci. Bull.* 61 (2016) 1502 [LIGO-P1600108].
GW 150914 and gravitational-wave astronomy (in Chinese).

* ◁ **31** ▷ 2016 **L. Shao**, N. Wex, *Sci. China Phys. Mech. Astron.* 59 (2016) 699501 [arXiv:1604.03662].
Tests of gravitational symmetries with radio pulsars.

* ◁ **30** ▷ 2016 **L. Shao**, *Phys. Rev. D* 93 (2016) 084023 [arXiv:1602.05725].
Testing the strong equivalence principle with the triple pulsar PSR J0337+1715.

* ◁ **29** ▷ 2015 **L. Shao**, I.H. Stairs, J. Antoniadis, A.T. Deller, P.C.C. Freire, J.W.T. Hessels, G.H. Janssen, M. Kramer, J. Kunz, C. Lämmerzahl, V. Perlick, A. Possenti, S. Ransom, B.W. Stappers, W. van Straten, *PoS* (AASKA14) 042 [arXiv:1501.00058].
Testing gravity with pulsars in the SKA era.

◁ **28** ▷ 2015 G.H. Janssen, G. Hobbs, M. McLaughlin, C.G. Bassa, A.T. Deller, M. Kramer, K.J. Lee, C.M.F. Mingarelli, P.A. Rosado, S. Sanidas, A. Sesana, **L. Shao**, I.H. Stairs, B.W. Stappers, J.P.W. Verbiest, *PoS* (AASKA14) 037 [arXiv:1501.00127].
Gravitational wave astronomy with the SKA.

◁ **27** ▷ 2015 A. Li, J. Wang, **L. Shao**, R.-X. Xu, *Acta Astron. Sin. Suppl.* 56 (2015) 22.
The type of Vela-like pulsars: a normal neutron star or a hybrid star?

* ◁ **26** ▷ 2015 **L. Shao**, N. Wex, M. Kramer, in *Proceedings of the Thirteenth Marcel Grossmann Meeting on General Relativity* (World Scientific, Singapore, 2015), p. 1704 [arXiv:1211.6558].
New tests of local Lorentz invariance and local position invariance of gravity with pulsars.

* ◁ **25** ▷ 2014 **L. Shao**, *Phys. Rev. D* 90 (2014) 122009 [arXiv:1412.2320].
New pulsar limit on local Lorentz invariance violation of gravity in the standard-model extension.

* ◁ **24** ▷ 2014 **L. Shao**, *Phys. Rev. Lett.* 112 (2014) 111103 [arXiv:1402.6452].
Tests of local Lorentz invariance violation of gravity in the standard model extension with pulsars.

◁ **23** ▷ 2014 A. Li, J. Wang, **L. Shao**, R.-X. Xu [arXiv:1406.4994].
The amount of crustal entrainment and the type of Vela-like pulsars.

* ◁ **22** ▷ 2013 **L. Shao**, N. Wex, *Class. Quantum Grav.* 30 (2013) 165020 [arXiv:1307.2637].
New limits on the violation of local position invariance of gravity.

* ◁ **21** ▷ 2013 **L. Shao**, R.N. Caballero, M. Kramer, N. Wex, D.J. Champion, A. Jessner, *Class. Quantum Grav.* 30 (2013) 165019 [arXiv:1307.2552]
A new limit on local Lorentz invariance violation of gravity from solitary pulsars.

* ◁ **20** ▷ 2013 **L. Shao**, N. Wex, M. Kramer, in *Proceedings of the International Astronomical Union*, Symposium S291 (Cambridge University Press, 2013), p. 496 [arXiv:1209.5171].
New constraints on preferred frame effects from binary pulsars.

* ◁ **19** ▷ 2012 **L. Shao**, N. Wex, *Class. Quantum Grav.* 29 (2012) 215018 [arXiv:1209.4503].
New tests of local Lorentz invariance of gravity with small-eccentricity binary pulsars.

* ◁ **18** ▷ 2011 **L. Shao**, B.-Q. Ma, *Sci. China Phys. Mech. Astron.* 54 (2011) 1771 [arXiv:1006.3031].
Note on a new fundamental length scale l instead of the Newtonian constant G.

* ◁ **17** ▷ 2011 **L. Shao**, B.-Q. Ma, *Phys. Rev. D* 83 (2011) 127702 [arXiv:1104.4438].
Lorentz violation induced vacuum birefringence and its astrophysical consequences.

* ◁ **16** ▷ 2011 **L. Shao**, B.-Q. Ma, *Frontier Sci.* 5 (2011) 4.
OPERA superluminal neutrinos and evolutions of spacetime concepts (in Chinese).

* ◁ **15** ▷ 2011 **L. Shao**, B.-Q. Ma, *J. Shanxi Datong Univ.* 27 (2011) 19.
Quantum gravitational relic effects on low energy photons (in Chinese).

◁ **14** ▷ 2011 H. Liu, Y. Chi, **L. Shao**, B.-Q. Ma, *Europhys. Lett.* 94 (2011) 31001 [arXiv:1104.3737].
Octet quark contents from SU(3) flavor symmetry.

◁ **13** ▷ 2011 X. Zhang, **L. Shao**, B.-Q. Ma, *Astropart. Phys.* 34 (2011) 840 [arXiv:1102.2613].
Photon gas thermodynamics in doubly special relativity.

◁ **12** ▷ 2010 Z. Xiao, **L. Shao**, B.-Q. Ma, *Eur. Phys. J. C* 70 (2010) 1153 [arXiv:1011.5074].
Eikonal equation of the Lorentz-violating Maxwell theory.

* ◁ **11** ▷ 2010 **L. Shao**, B.-Q. Ma, *Mod. Phys. Lett. A* 25 (2010) 3251 [arXiv:1007.2269].
Lorentz violation effects on astrophysical propagation of very high energy photons.

* ◁ **10** ▷ 2010 **L. Shao**, B.-Q. Ma, *Phys. Rev. E* 82 (2010) 041110 [arXiv:1010.2699].
First digit law in non-extensive statistics.

* ◁ **09** ▷ 2010 **L. Shao**, B.-Q. Ma, *Physica A* 389 (2010) 3109 [arXiv:1005.0660].
The significant digit law in statistical physics.

* ◁ **08** ▷ 2010 **L. Shao**, B.-Q. Ma, *Sci. Tech. Rev.* 28 (2010) 98.
Applications of the first digit law in physics (in Chinese).

* ◁ **07** ▷ 2010 **L. Shao**, Z. Xiao, B.-Q. Ma, *Astropart. Phys.* 33 (2010) 312 [arXiv:0911.2276].
Lorentz violation from cosmological objects with very high energy photon emissions.

* ◁ **06** ▷ 2010 **L. Shao**, B.-Q. Ma, *Astropart. Phys.* 33 (2010) 255 [arXiv:1005.1702].
Empirical mantissa distributions of pulsars.

* ◁ **05** ▷ 2010 **L. Shao**, Y.-J. Zhang, B.-Q. Ma, *Phys. Lett. B* 686 (2010) 136 [arXiv:1002.4747].
Sea quark contents of octet baryons.

* ◁ **04** ▷ 2010 **L. Shao**, Y. Zhang, B.-Q. Ma, *Chin. Phys. C* 34 (2010) 1417 [arXiv:1008.1689].
Parton distribution functions and nuclear EMC effect in a statistical model.

* ◁ **03** ▷ 2009 **L. Shao**, B.-Q. Ma, *Mod. Phys. Lett. A* 24 (2009) 3275 [arXiv:1004.3077].
First digit distribution of hadron full width.

◁ **02** ▷ 2009 Y. Zhang, **L. Shao**, B.-Q. Ma, *Nucl. Phys. A* 828 (2009) 390 [arXiv:0909.0454].
Nuclear EMC effect in a statistical model.

◁ **01** ▷ 2009 Y. Zhang, **L. Shao**, B.-Q. Ma, *Phys. Lett. B* 671 (2009) 30 [arXiv:0812.3294].
Statistical effect in the parton distribution functions of the nucleon.