

Dr. LIJING SHAO

Junior Scientist/Postdoc

MPI für Gravitationsphysik
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Scientific Interests

- Physics Tests of gravity theories, Gravitational waves, Lorentz & CPT violation, Field theories, Quantum gravity phenomena
- Astrophysics Pulsar timing, Neutron stars, γ -ray bursts, Cosmology

Education

- 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-Institut für Radioastronomie, 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 **Intercourse**, *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

Memberships in Research Activities

- LIGO The Laser Interferometer Gravitational-Wave Observatory Scientific Collaboration
- SKA Pulsar Science Working Group of The Square Kilometre Array

Selected Publication

- 2014 **L. Shao**, Physical Review D 90 (2014) 122009 [arXiv:1412.2320].
New pulsar limit on local Lorentz invariance violation of gravity in the standard-model extension.
- 2014 **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.
- 2014 **L. Shao**, Physical Review Letters 112 (2014) 111103 [arXiv:1402.6452].
Tests of local Lorentz invariance violation of gravity in the standard model extension with pulsars.
- 2013 **L. Shao**, R.N. Caballero, M. Kramer, N. Wex, D.J. Champion, A. Jessner, Classical and Quantum Gravity 30 (2013) 165019 [arXiv:1307.2552]
Highlighted A new limit on local Lorentz invariance violation of gravity from solitary pulsars.

- 2013 **L. Shao**, N. Wex, *Classical and Quantum Gravity* 30 (2013) 165020 [arXiv:1307.2637].
Highlighted New limits on the violation of local position invariance of gravity.
- 2012 **L. Shao**, N. Wex, *Classical and Quantum Gravity* 29 (2012) 215018 [arXiv:1209.4503].
Highlighted New tests of local Lorentz invariance of gravity with small-eccentricity binary pulsars.
- 2011 **L. Shao**, B.-Q. Ma, *Phys. Rev. D* 83 (2011) 127702 [arXiv:1104.4438].
 Lorentz violation induced vacuum birefringence and its astrophysical consequences.
- 2010 **L. Shao**, B.-Q. Ma, *Physica A* 389 (2010) 3109 [arXiv:1005.0660].
Wolfram The significant digit law in statistical physics.

Referee Function

- 2014 – present *International Journal of Modern Physics D* (World Scientific)
 2014 – present *Research in Astronomy and Astrophysics* (IOPscience)
 2014 – present *Science China – Physics, Mechanics and Astronomy* (Springer)

Computer skills

- OS Linux, Mac OS X, Windows
 Programming ROOT/C++/C, Python, etc
 Toolkit R, Mathematica, \LaTeX , Emacs, Octave, Matlab, etc

Bachelor & Doctorate Theses

- Ph.D Testing Spacetime Symmetries with Radio Pulsars
 Supervised by Prof. Dr. Bo-Qiang Ma, Prof. Dr. Michael Kramer, Dr. Norbert Wex
 Bachelor Quantum Gravity Phenomenology and Astrophysical Tests on Lorentz Violation
 Supervised by Prof. Dr. Bo-Qiang Ma

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*.
Award Linear Algebra
- Summer 2007 **Aid Education**, *Luodian City, Guizhou Province*.
- Summer 2006 **Aid Education**, *Danling City, Shanxi Province*.

Academic Activities

- Nov 2015 **Seminar**, *Max Planck Institute for Gravitational Physics*.
 Tests of Local Lorentz Invariance of post-Newtonian Gravity
- July 2015 **Invited Talk**, *Huazhong University of Science and Technology*.
 Testing Spacetime Symmetries with Radio Pulsars
- July 2015 **Oral Presentation**, *Mingantu, Inner Mongolia, China*.
 FAST Pulsar Symposium 4

- Apr 2015 **Lunch Talk**, *National Astronomical Observatories, Chinese Academy of Sciences.*
Testing Spacetime Symmetries with Radio Pulsars
- Mar 2015 **Lunch Talk**, *The Kavli Institute for Astronomy and Astrophysics, Peking University.*
Testing Spacetime Symmetries with Radio Pulsars
- Aug 2014 **Invited Talk**, *Indiana University, Bloomington, US.*
Gravitational Tests of Lorentz Invariance
- July 2014 **Oral Presentation**, *Shanghai Astronomical Observatory, Shanghai, China.*
FAST Pulsar Symposium 3
- June 2014 **Oral Presentation**, *Giardini Naxos, Italy.*
Advancing Astrophysics with the Square Kilometre Array
- Apr 2013 **Oral Presentation**, *Max Planck Institut für Radioastronomie & Universität Bonn.*
The 3rd Bonn Workshop on Gravitational Waves and Gravity Tests
- Jan 2013 **Invited Talk**, *Aspen Center for Physics, Aspen CO, US.*
Physical Applications of Millisecond Pulsars
- Aug 2012 **Poster Presentation**, *China National Convention Center.*
The 28th General Assembly of the International Astronomical Union (IAU)
- July 2012 **Invited Talk**, *Stockholm University, Stockholm Sweden.*
The 13th Marcel Grossmann Meeting
- May 2011 **Oral Presentation**, *Institute of High Energy Physics, Chinese Academy of Sciences.*
Workshop on Lorentz and CPT Violation in Astrophysics and Cosmology
- Jan 2011 **Oral Presentation**, *Department of Physics, National Taiwan University.*
The Second APCosPA Winter School/Workshop on Cosmology and Particle Astrophysics
- Aug 2010 **Summer School**, *Department of Astronomy, Nanjing University.*
Summer School on Frontiers of Astronomy and Astrophysics
- Jan 2010 **Oral Presentation**, *Department of Physics, National Taiwan University.*
The First APCosPA Winter School on Cosmology and Particle Astrophysics
- Sept 2009 **Oral Presentation**, *Institute of High Energy Physics, Chinese Academy of Sciences.*
The 5-th International Conference on Quarks and Nuclear Physics

Publication List 1 – Refereed

- ◁ 21 ▷ 2014 **L. Shao**, *Physical Review D* 90 (2014) 122009 [arXiv:1412.2320].
New pulsar limit on local Lorentz invariance violation of gravity in the standard-model extension.
- ◁ 20 ▷ 2014 **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.
- ◁ 19 ▷ 2014 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.
- ◁ 18 ▷ 2014 **L. Shao**, *Physical Review Letters* 112 (2014) 111103 [arXiv:1402.6452].
Tests of local Lorentz invariance violation of gravity in the standard model extension with pulsars.
- ◁ 17 ▷ 2013 **L. Shao**, N. Wex, *Classical and Quantum Gravity* 30 (2013) 165020 [arXiv:1307.2637].
New limits on the violation of local position invariance of gravity.
- ◁ 16 ▷ 2013 **L. Shao**, R.N. Caballero, M. Kramer, N. Wex, D.J. Champion, A. Jessner, *Classical and Quantum Gravity* 30 (2013) 165019 [arXiv:1307.2552]
A new limit on local Lorentz invariance violation of gravity from solitary pulsars.

- ◁ 15 ▷ 2012 **L. Shao**, N. Wex, Classical and Quantum Gravity 29 (2012) 215018 [arXiv:1209.4503].
New tests of local Lorentz invariance of gravity with small-eccentricity binary pulsars.
- ◁ 14 ▷ 2011 **L. Shao**, B.-Q. Ma, Sci. China Ser. G 54 (2011) 1771 [arXiv:1006.3031].
Note on a new fundamental length scale l instead of the Newtonian constant G .
- ◁ 13 ▷ 2011 **L. Shao**, B.-Q. Ma, Phys. Rev. D 83 (2011) 127702 [arXiv:1104.4438].
Lorentz violation induced vacuum birefringence and its astrophysical consequences.
- ◁ 12 ▷ 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.
- ◁ 11 ▷ 2011 X. Zhang, **L. Shao**, B.-Q. Ma, Astropart. Phys. 34 (2011) 840 [arXiv:1102.2613].
Photon gas thermodynamics in doubly special relativity.
- ◁ 10 ▷ 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.
- ◁ 09 ▷ 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.
- ◁ 08 ▷ 2010 **L. Shao**, B.-Q. Ma, Phys. Rev. E 82 (2010) 041110 [arXiv:1010.2699].
First digit law in non-extensive statistics.
- ◁ 07 ▷ 2010 **L. Shao**, B.-Q. Ma, Physica A 389 (2010) 3109 [arXiv:1005.0660].
The significant digit law in statistical physics.
- ◁ 06 ▷ 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.
- ◁ 05 ▷ 2010 **L. Shao**, B.-Q. Ma, Astropart. Phys. 33 (2010) 255 [arXiv:1005.1702].
Empirical mantissa distributions of pulsars.
- ◁ 04 ▷ 2010 **L. Shao**, Y.-J. Zhang, B.-Q. Ma, Phys. Lett. B 686 (2010) 136 [arXiv:1002.4747].
Sea quark contents of octet baryons.
- ◁ 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.

Publication List 2 – Unrefereed

- ◁ 08 ▷ 2015 A. Li, J. Wang, **L. Shao**, R.-X. Xu, Acta Astronomica Sinica (2015).
The type of Vela-like pulsars: a normal neutron star or a hybrid star?
- ◁ 07 ▷ 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.
- ◁ 06 ▷ 2012 **L. Shao**, N. Wex, M. Kramer, in Robert T. Jantzen, Kjell Rosquist, Remo Ruffini (eds.), 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.
- ◁ 05 ▷ 2012 **L. Shao**, N. Wex, M. Kramer, in J. van Leeuwen (ed.), Proceedings of the International Astronomical Union, Symposium S291 — Neutron Stars and Pulsars: Challenges and Opportunities after 80 years (Cambridge University Press, 2013), p. 496 [arXiv:1209.5171].
New constraints on preferred frame effects from binary pulsars.
- ◁ 04 ▷ 2011 **L. Shao**, B.-Q. Ma, Frontier Science 20 (2011) 4.
OPERA superluminal neutrinos and evolutions of spacetime concepts (in Chinese).

- ◁ **03** ▷ 2011 **L. Shao**, B.-Q. Ma, Journal of Shanxi Datong University 27 (2011) 19.
Quantum gravitational relic effects on low energy photons (in Chinese).
- ◁ **02** ▷ 2010 **L. Shao**, B.-Q. Ma, Sci. & Tech. Rev. 28 (2010) 98.
First digit law of the Nature (in Chinese).
- ◁ **01** ▷ 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.