

# Rui LUO

Email: rui.luo@csiro.au ◇ Tel: +61 2-93724434 ◇ Web: <https://ruiluoastro.github.io/>

Postal Address: PO Box 76, Epping, NSW 1710, Australia

## EDUCATION

---

### Peking University

Sep 2013 – Jul 2019

Department of Astronomy, School of Physics

*Doctor of Philosophy, Astrophysics*

Dissertation: *Measurement of the luminosity function of Fast Radio Bursts*

Advisor: Prof. Kejia Lee (KIAA-PKU)

### Huazhong University of Science and Technology

Sep 2009 – Jun 2013

School of Physics

*Bachelor of Science, Applied Physics*

## EMPLOYMENT

---

### CSIRO Space and Astronomy

Aug 2019 – present

Australia Telescope National Facility

*Research Plus Postdoctoral Fellow*

Supervisor: Dr. George Hobbs (CSIRO-ATNF)

## RESEARCH INTERESTS

---

**Radio Astronomy:** Fast Radio Bursts, Pulsars, Radio Frequency Interference, the unknown unknowns

**Statistics:** Bayesian inference, Markov Chain Monte Carlo

**Machine Learning:** Convolutional Neural Network, Out-of-Distribution detection

## AWARDS AND HONOURS

---

Ranking No.1, Top 10 Research Progresses, Chinese Astronomy (Team Award) 2020

Vela Prize for oral presentations, FAST/Future Pulsar Symposium 8 2019

Kwang-Hua Scholarship, Peking University 2016

Second Prize of Chen Hu-Xiong Scholarship, Peking University 2015

Annual Scholarship, National Astronomical Observatories, Chinese Academy of Sciences 2013

## OBSERVING EXPERIENCE

---

### Five-hundred-meter Aperture Spherical radio Telescope

PI: *Searching for fast radio transients from short gamma-ray bursts*, 15 hours 2021 – 2022

PI: *Monitoring the repeating FRB candidates*, 12 hours 2019

Instrumentation: *Configuring ROACH2 and monitoring the real-time bandpass* Apr 2016

### Parkes 64-m radio telescope (Murriyang)

PI: *Searching for fast radio bursts from short gamma-ray bursts*, 22 hours 2021OCTS

PI: *Observing the repeating FRB 180301 with the Parkes UWL*, 32.5 hours 2020OCTS

PI: *Monitoring the repeating FRB candidates in the Southern Sky*, 16 hours 2020APRS

Contributions: Parkes Pulsar Timing Array, 100+ hours 2020 – present

### Australia Telescope Compact Array

PI: *Observing CU Virginis at 16cm wavelength using the Green Time*, 9 hours 2019OCTS

## Kunming 40-m radio telescope

Instrumentation: *Installing the FRB backend and configuring its searching software*

Aug 2017

Instrumentation: *Calibration for two polarization channels from the feed*

Oct 2014

## Miyun 50-m radio telescope

Instrumentation: *Testing ROACH2 and observing pulsars*

Aug 2015

## INVITED TALKS IN COLLOQUIA AND SEMINARS

---

(Notes: \* – in virtual; Others – in person; Blue hyperlink – video recording)

Seminar\*, Yukawa Institute for Theoretical Physics, Kyoto University, Japan Apr 2022

[AUS-NZ-PSR Australasia \(Orange\) Pulsar Meeting\\*](#), Australia and New Zealand Apr 2022

Colloquium\*, Department of Astronomy, Xiamen University, Xiamen, China Feb 2022

MQ AAASeminar, Macquarie University, Sydney, Australia May 2021

ASKAP-CRAFT Group Meeting\*, ATNF-Swinburne-Curtin, Australia Mar 2021

Pulsar Group Meeting\*, MPIfR, Bonn, Germany Feb 2021

Colloquium\*, Curtin Institute of Radio Astronomy, Perth, Australia Jan 2021

Colloquium\*, Department of Astrophysics, University of Radboud, Netherlands Dec 2020

Lunch Talk\*, Kavli IPMU, University of Tokyo, Japan Dec 2020

[CSIRO-ATNF Co-learnium\\*](#), Marsfield, NSW, Australia Dec 2020

[CHIME/FRB Journal Club\\*](#), Canada Dec 2020

AUS-NZ-PSR Australasia (Orange) Pulsar Meeting\*, Australia and New Zealand Nov 2020

[CSIRO-ATNF Co-learnium](#), Marsfield, NSW, Australia Dec 2019

CSIRO-ATNF Colloquium, Marsfield, NSW, Australia Sep 2019

KIAA Graduate Dinner Talk, Peking University, Beijing, China Dec 2018

NAOC Graduate Student Seminar, NAOC, Beijing, China Apr 2018

## CONTRIBUTED TALKS IN CONFERENCES AND WORKSHOPS

---

[ACAMAR 7\\*](#): Australia-China Workshop on Astrophysics Nov 2021

ACAMAR Fast Radio Bursts Virtual Workshop\* Oct 2021

FRB 2021 International Meeting\*: [\[Plenary 3A\]](#) and [\[Plenary 3B\]](#) Jul – Aug 2021

C3DIS 2021 Conference\*, Australia Jul 2021

[FRB 2020 International Meeting\\*](#) Jul 2020

ATNF Bolton Symposium, Kensington, WA, Australia Mar 2020

FAST/Future Pulsar Symposium 8, Xi'an, China Jun 2019

Radio Astronomy Forum 2017, Pingtang, China Sep 2017

FAST/Future Pulsar Symposium 6, Wuhan, China, Jun 2017

Chinese Astronomical Society Annual Meeting 2016, Wuhan, China Nov 2016

Jing-Guang-Xia Astrophysics Meeting, Xiamen, China Jul 2016

QTT Colloquium Series 2016, Zunyi, China Jul 2016

PKU-XAO Bilateral Meeting, Urumqi, China Jun 2016

Chinese Astronomical Society Annual Meeting 2015, Beijing, China Oct 2015

QTT Colloquium Series 2015, Ming'antu, China Jul 2015

KIAA-SHAO Bilateral Workshop, Beijing, China May 2015

## STUDENT MENTORING

---

Tommy Marshman: Co-advised. Joint-PhD student at MQ Uni. and CSIRO 2021 – present

Research projects: *Searching for Fast Radio Bursts in the Parkes Baades' Window Survey*

Lunhua Shang: Co-advised. Joint-PhD student at NJUST and CSIRO 2020 – 2021

Research projects: *Studies on the pulsed variable stars with radio observations*

**Weiyang Wang:** Co-advised. PhD at UCAS, now a postdoc at PKU  
*Research projects: Theoretical studies on Fast Radio Bursts*

2017 – 2020

## TEACHING AND OUTREACH

---

**Seeking the secret of nature:** A public Chinese science documentary series 2022  
Narrative in Episode 4 Season 2: *What are Fast Radio Bursts?*

**Mr Science · Astronomy:** A Chinese special column for public sciences Nov 2020  
Article: [Hunting for fast radio bursts with the FAST telescope \(Chinese\)](#)

**PULSE@Parkes:** An educational program for high-school students to use the CSIRO Parkes radio telescope to observe pulsars 2019 – present  
**Special session on the National Youth Science Forum** Jan 2022

**TA:** GENERAL PHYSICS, School of Earth and Space Sciences, Peking University 2017  
**TA:** ATOMIC PHYSICS, School of Physics, Peking University 2015

## PROFESSIONAL SERVICE

---

**Journal Referee**  
*Monthly Notices of the Royal Astronomical Society* 2021 – present  
*The Astrophysical Journal* 2021 – present

**Proposal Reviewer**  
[Call for FAST Science Observing Proposals](#) 2021

## DUTIES AND SUPPORT

---

[ACAMAR Fast Radio Bursts Virtual Workshop](#): Served as SOC member Oct 2021  
Commissioning the Parkes Cryogenic PAF Receiver: Data benchmark 2021 – present  
Updates on the [ATNF-PSRCAT](#) 2020 – present  
[The CSIRO-ATNF Co-learnia](#): Main chair 2019 – 2021  
The ATCA [Duty Astronomer](#): On duty for every semester 2019 – present  
The first Chinese Pulsar Timing Array Meeting: Served as LOC member May 2017

## TECHNICAL SKILLS

---

<b>Programming</b>	PYTHON (Proficient), C, C++, UNIX
<b>Softwares</b>	MATLAB, MATHEMATICA, PRESTO, TEMPO2, PSRCHIVE, MULTINEST
<b>Tools</b>	GIT, LATEX, WIKI, HTML

## CODES DEVELOPMENT

---

- [SIMULATESEARCH](#): A software for simulating high-time resolution radio observations.
- [BAYESWEIB](#): A Python package for calculating the repeating burst rate under the Weibull distribution.
- [FRBLFERD](#): A Bayesian code for inferring the event rate density of FRB luminosity function.
- [FRBNORMLF](#): An FRB mock data simulator and a Bayesian code to measure the normalized FRB luminosity function.
- [DMHOST](#): A package of Monte Carlo simulations on the dispersion measure of FRB host galaxies in the nearby universe.

## LANGUAGES

---

<b>Chinese</b>	Native
<b>English</b>	Fluent
<b>Japanese</b>	Elementary

## REFERENCES

---

### **George Hobbs**

*Research Scientist & Group Leader*

CSIRO Space and Astronomy, Australia National Telescope Facility

PO Box 76, Epping, NSW 1710, Australia

Tel: +61 2-9372-4652

Email: george.hobbs@csiro.au

### **Kejia Lee**

*Associate Professor*

Kavli Institute for Astronomy and Astrophysics, Peking University

No.5 YiHeYuan Rd, Haidian District, Beijing 100871, China

Tel: +86 10-62766380

Email: kjlee@pku.edu.cn

### **Duncan Lorimer**

*Professor & Associate Dean for Research*

Department of Physics and Astronomy, West Virginia University

White Hall, PO Box 6315, Morgantown, WV 26506, USA

Tel: +1 304-293-4867

Email: duncan.lorimer@mail.wvu.edu

### **Richard N. Manchester**

*CSIRO Fellow & Fellow of the Australian Academy of Science*

CSIRO Space and Astronomy, Australia National Telescope Facility

PO Box 76, Epping, NSW 1710, Australia

Tel: +61 2-9372-4313

Email: dick.manchester@csiro.au

### **Bing Zhang**

*Distinguished Professor*

Department of Physics and Astronomy, University of Nevada, Las Vegas

MPE-A 129, UNLV, Las Vegas, NV 89154, USA

Tel: +1 702-895-3170

Email: zhang@physics.unlv.edu

## PUBLICATIONS

Summary: 4 first-author papers, including **one article published in Nature**. 11 leading-author papers, 21 publications in total.

Citations: 482 (181 from first-author papers); H-index: 12 (as of Apr 2022).

### First/Corresponding-author papers:

(Notes: \* – corresponding author)

4. **Luo, R.\***, Hobbs, G.\*, Yong, S. Y., Zic, A., Tommey, L., Dai, S., Dunning, A., Li, D., Marshman, T., Wang, C., Wang, P., Wang, S. Q., & Zhang, S. B., *Simulating high-time resolution radio-telescope observations*, 2022, MNRAS, accepted
3. **Luo, R.**, Wang, B. J., Men, Y. P., Zhang, C. F., Jiang, J. C., Xu, H., Wang, W. Y., Lee, K. J.\*, Han, J. L.\*, Zhang, B.\*, et al., *Diverse polarization angle swings from a repeating fast radio burst source*, 2020, [Nature](#), **586**, 693
2. **Luo, R.\***, Men, Y. P., Lee, K. J.\*, Wang, W. Y., Lorimer, D. R., & Zhang, B., *On the FRB luminosity function - II. Event rate density*, 2020, [MNRAS](#), **494**, 665
1. **Luo, R.\***, Lee, K. J.\*, Lorimer, D. R., & Zhang, B., *On the normalized FRB luminosity function*, 2018, [MNRAS](#), **481**, 2320

### Second/Third-author papers:

7. Niu, C.-H., Li, D., **Luo, R.**, Wang, W.-Y., Yao, J., Zhang, B., Zhu, W.-W., Wang, P., Ye, H., Niu, J.-R., et al., *CRAFTS for Fast Radio Bursts: Extending the dispersion-fluence relation with new FRBs detected by FAST*, 2021, [ApJ](#), **909**, L8
6. Zhu, W., Li, D., **Luo, R.**, Miao, C., Zhang, B., Spitler, L., Lorimer, D., Kramer, M., Champion, D., Yue, Y., Cameron, A., Cruces, M., Duan, R., Feng, Y., Han, J., Hobbs, G., Niu, C., et al., *A Fast Radio Burst discovered in FAST drift scan survey*, 2020, [ApJ](#), **895**, L6
5. Jiang, J. C., Wang, W. Y., **Luo, R.**, Du, S., Chen, X. L., Lee, K. J., & Xu, R. X., *FRB 171019: An event of binary neutron star merger?*, 2020, [RAA](#), **20**, 56
4. Men, Y. P., **Luo, R.**, Chen, M. Z., Hao, L. F., Lee, K. J., Li, J., Li, Z. X., Liu, Z. Y., Pei, X., Wen, Z. G., Wu, J. J., Xu, Y. H., Xu, R. X., Yuan, J. P., & Zhang, C. F., *Piggyback searching for fast radio bursts using Nanshan 26m and Kunming 40m radio telescopes – I. Observing and data analysis systems, discovery of a mysterious peryton*, 2019, [MNRAS](#), **488**, 3957
3. Yi, S.-X., Cheng, K. S., & **Luo, R.**, *Clumpy jets from black hole-massive star binaries as engines of Fast Radio Bursts*, 2019, [MNRAS](#), **483**, 4197
2. Wang, W. Y., **Luo, R.**, Yue, H., Chen, X. L., Lee, K. J., & Xu, R. X., *FRB 121102: A Starquake-induced Repeater?*, 2018, [ApJ](#), **852**, 140
1. Yang, Y.-P., **Luo, R.**, Li, Z., & Zhang, B., *Large Host-galaxy Dispersion Measure of Fast Radio Bursts*, 2017, [ApJ](#), **839**, L25

### Other co-author papers:

10. Xu, H., Niu, J. R., Chen, P., Lee, K. J., Zhu, W. W., Dong, S., Zhang, B., Jiang, J. C., Wang, B. J., Xu, J. W., Zhang, C. F., Fu, H., Filippenko, A. V., Peng, E. W., Zhou, D. J., Zhang, Y. K., Wang, P., Feng, Y., Li, Y., Brink, T. G., Li, D. Z., Lu, W., Yang, Y. P., Caballero, R. N., Cai, C., Chen, M. Z., Dai, Z. G., Djorgovski, S. G., Esamdin, A., Gan, H. Q., Guhathakurta, P., Han, J. L., Hao, L. F., Huang, Y. X., Jiang, P., Li, C. K., Li, D., Li, H., Li, X. Q., Li, Z. X., Liu, Z. Y., **Luo, R.**, et al., *A fast radio burst source at a complex magnetised site in a barred galaxy*, 2021, [Nature](#), submitted

9. Niu, C.-H., Aggarwal, K., Li, D., Zhang, X., Chatterjee, S., Tsai, C.-W., Yu, W., Law, C. J., Burke-Spolaor, S., Cordes, J. M., Zhang, Y.-K., Ocker, S., Yao, J.-M., Wang, P., Feng, Y., Niino, Y., Bochenek, C., Cruces, M., Connor, L., Jiang, J.-A., Dai, S., **Luo, R.**, et al., *A repeating fast radio burst associated with a persistent radio source*, 2022, [Nature](#), [accepted](#)
8. Bhandari, S., Heintz, K. E., Aggarwal, K., Marnoch, L., Day, C. K., Sydnor, J., Burke-Spolaor, S., Law, C. J., Prochaska, J. X., Tejos, N., Bannister, K. W., Butler, B. J., Deller, A. T., Ekers, R. D., Flynn, C., Fong, W.-F., James, C. W., Lazio, T. J. W., **Luo, R.**, et al., *Characterizing the FRB host galaxy population and its connection to transients in the local and extragalactic Universe*, 2021, [AJ](#), **163**, 69
7. Yang, X., Zhang, S.-B., Wang, J.-S., Hobbs, G., Sun, T.-R., Manchester, R. N., Geng, J.-J., Russell, C. J., **Luo, R.**, Tang, Z.-F., Wang, C., Wei, J.-J., Staveley-Smith, L., Dai, S., Li, Y., Yang, Y.-Y., & Wu, X.-F., *81 New Candidate Fast Radio Bursts in Parkes Archive*, 2021, [MNRAS](#), **507**, 3238
6. Goncharov, B., Shannon, R. M., Reardon, D. J., Hobbs, G., Zic, A., Bailes, M., Curylo, M., Dai, S., Kerr, M., Lower, M. E., Manchester, R. N., Mandow, R., Middleton, H., Miles, M. T., Parthasarathy, A., Thrane, E., Thyagarajan, N., Xue, X., Zhu, X.-J., Cameron, A. D., Feng, Y., **Luo, R.**, et al., *On the evidence for a common-spectrum process in the search for the nanohertz gravitational wave background with the Parkes Pulsar Timing Array*, 2021, [ApJ](#), **917**, L19
5. Zhang, C. F., Xu, J. W., Men, Y. P., Deng, X. H., Xu, H., Jiang, J. C., Wang, B. J., Lee, K. J., Li, J., Yuan, J. P., Liu, Z. Y., Huang, Y. X., Xu, Y. H., Li, Z. X., Hao, L. F., Luo, J. T., Dai, S., **Luo, R.**, Zakie, H., & Ma, Z. Y., *Fast radio burst detection in the presence of coloured noise*, 2021, [MNRAS](#), **503**, 5223
4. Dai, S., Lu, J. G., Wang, C., Wang, W. Y., Xu, R. X., Yang, Y.-P., Zhang, S.-B., Hobbs, G., Li, D., **Luo, R.**, Filipovic, M., & Jiang, J. C., *On the Circular Polarization of Repeating Fast Radio Bursts*, 2021, [ApJ](#), **920**, 46
3. Zhang, S.-B., Hobbs, G., Russell, C. J., Toomey, L., Dai, S., Dempsey, J., Manchester, R. N., Johnston, S., Staveley-Smith, L., Wu, X.-F., Li, D., Yang, Y.-Y., Wang, S.-Q., Qiu, H., **Luo, R.**, Wang, C., Zhang, C., Zhang, L., & Mandow, R., *Parkes transient events: I. Database of single pulses, initial results and missing FRBs*, 2020, [ApJS](#), **249**, 14
2. Men, Y. P., Aggarwal, K., Li, Y., Palaniswamy, D., Burke-Spolaor, S., Lee, K. J., **Luo, R.**, Demorest, P., Tendulkar, S., Agarwal, D., Young, O., & Zhang, B., *Non-detection of fast radio bursts from six gamma-ray burst remnants with a possible magnetar engine*, 2019, [MNRAS](#), **489**, 3643
1. Wang, W. Y., Lu, J. G., Zhang, S. B., Chen, X. L., **Luo, R.**, & Xu, R. X., *Pulsar giant pulse: coherent instability near light cylinder*, 2019, [SCPMA](#), **62**, 979511