

Rui LUO

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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*, 9 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, 110+ 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)

CSIRO S&A Co-learnium* , Marsfield, NSW, Australia	May 2022
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 S&A 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 S&A 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

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

The 2022 ASA's Annual Scientific Meeting† , Hobart, Australia	Jun 2022
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 from the Parkes Baades' Window Survey

Lunhua Shang: Co-advised. Joint-PhD student at NJUST and CSIRO <i>Research projects: Studies on the pulsed variable stars with radio observations</i>	2020 – 2021
Weiyang Wang: Co-advised. PhD at UCAS, now a postdoc at PKU <i>Research projects: Theoretical studies on Fast Radio Bursts</i>	2017 – 2020

TEACHING AND OUTREACH

Seek Out Natural Mysteries: A public Chinese science documentary series Narrative in Episode 4 Season 2: <i>What are Fast Radio Bursts?</i>	2022
Mr Science · Astronomy: A Chinese special column for public sciences Article: Hunting for fast radio bursts with the FAST telescope (Chinese)	Nov 2020
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 <i>Monthly Notices of the Royal Astronomical Society</i> <i>The Astrophysical Journal</i>	2021 – present 2021 – present
Proposal Reviewer <i>Call for FAST Science Observing Proposals</i> <i>Call for FAST Science Observing Proposals</i>	2022 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

Programming	PYTHON (Proficient), C, C++, UNIX
Softwares	MATLAB, MATHEMATICA, PRESTO, TEMPO2, PSRCAT, MULTINEST
Tools	GIT, LATEX, WIKI, HTML

CODES DEVELOPMENT

- **SIMULATESEARCH:** A software for simulating high-time resolution radio data.
- **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

Chinese	Native
English	Fluent
Japanese	Elementary

REFERENCES

Ronald Ekers

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PUBLICATIONS

Summary: 4 first-author papers, including **one article published in Nature**. 11 leading-author papers, 20 publications in total.

Citations: 562 (330 from leading-author papers); H-index: 12 (as of Jul 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](#), **513**, 5881
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:

15. Niu, J.-R., Zhu, W.-W., Zhang, B., Yuan, M., Zhou, D.-J., Zhang, Y.-K., Jiang, J.-C., Han, J. L., Li, D., Lee, K.-J., Wang, P., Feng, Y., Li, D.-Z., **Luo, R.**, Wang, F.-Y., Dai, Z.-G., Miao, C.-C., Niu, C.-H., et al., *FAST observations of an extremely active episode of FRB 20211124A: IV. Spin Period Search*, 2022, [RAA](#), submitted
14. Jiang, J.-C., Wang, W.-Y., Xu, H., Xu, J.-W., Zhang, C.-F., Wang, B.-J., Zhou, D.-J., Zhang, Y.-K., Niu, J.-R., Lee, K.-J., Zhang, B., Han, J.-L., Li, D., Zhu, W.-W., Dai, Z.-D., Feng, Y.,

- Jing, W.-C., Li, D.-Z., **Luo, R.**, et al., *FAST observations of an extremely active episode of FRB 20211124A: III. Polarimetry*, 2022, RAA, submitted
13. Zhang, Y.-K., Wang, P., Feng, Y., Zhang, B., Li, D., Tsai, C.-W., Niu, C.-H., **Luo, R.**, Yao, J.-M., Zhu, W.-W., Han, J. L., Lee, K.-J., Zhou, D.-J., Niu, J.-R., Jiang, J.-C., Wang, W.-Y., Zhang, C.-F., Xu, H., Wang, B.-J., Xu, J.-W., *FAST observations of an extremely active episode of FRB 20211124A: II. Energy Distribution*, 2022, RAA, submitted
 12. Zhou, D. J., Han, J. L., Zhang, B., Lee, K. J., Zhu, W. W., Li, D., Jing, W. C., Wang, W.-Y., Zhang, Y. K., Jiang, J. C., Niu, J. R., **Luo, R.**, Xu, H., Zhang, C. F., Wang, B. J., Xu, J. W., Wang, P., Yang, Z. L., Feng, Y., *FAST observations of an extremely active episode of FRB 20211124A: I. Burst Morphology*, 2022, RAA, submitted
 11. Yong, S. Y., Hobbs, G., Huynh, M. T., Rolland, V., Petersson, L., Norris, R. P., Dai, S., **Luo, R.**, Zic, A., *SPARKESX: Single-dish PARKES data sets for finding the unexpected — A Data Challenge*, 2022, MNRAS, submitted
 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](#), **606**, 873
 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](#)