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)
Colloquium*, Department of Astronomy, Guangzhou University, China Jul 2022
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, China Feb 2022
MQ AAAstroseminar, Macquarie University, Sydney, Australia May 2021
ASKAP-CRAFT Group Meeting*, ATNF-Swinburne-Curtin, Australia Mar 2021
Pulsar Group Meeting*, MPIfR, Germany Feb 2021
Colloquium*, Curtin Institute of Radio Astronomy, 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 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 2017 – 2020
Research projects: Theoretical studies on Fast Radio Bursts

TEACHING AND OUTREACH

Seek Out Nature Mysteries: A public Chinese science documentary series 2022
Narrative in Episode 4 Season 2: *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 2022
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

Programming	Python (Proficient), C, C++, Unix
Softwares	Matlab, Mathematica, presto, tempo2, psrchive, 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, 22 publications in total.
Citations: 617 (350 from leading-author papers); H-index: 12 (as of Aug 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, accepted

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, accepted

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, 609, 685

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., Machester, 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

Papers in preparation:

3. Kumar, P.*, **Luo, R.***, Price, D. C.*, Shannon, R. M., Deller, A. T., Flynn, C., et al., *Spectro-Polarimetric variability in the repeating fast radio burst source FRB 20180301A*, 2022, MNRAS, to be submitted

2. Marshman, T., Hobbs, G., **Luo, R.**, Dai, S., Dawson, J. R., Toomey, L., Green, J., Li, D., Sadler, E., Cameron, A., Moss, V., Kaczmarek, J., Zhang, L., Zic, A., Zhang, S. B., Price, D., *Baade's Window Survey I: The Survey Strategy and Searching for Fast Transient Events*, 2022, MNRAS, in prep

1. **Luo, R.***, Ekers, R. D.*, Hobbs, G., Dunning, A., James, C. W., Staveley-Smith, L., Bannister, K. W, et al., *All-sky Fast Radio Burst monitor with cryogenically-cooled phased array feed*, 2022, PASA, in prep