RUI LUO

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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. K.J. 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 (FRBs), Pulsars, Radio Frequency Interference (RFI), the unknown unknowns
Statistics: Bayesian inference, Markov Chain Monte Carlo (MCMC)
Machine Learning: Convolutional Neural Network (CNN), Bayesian Optimization

AWARDS AND PRIZES

Rank No.1, Top 10 Research Progresses, Chinese Astronomy (Team Award)	2020
Vela Prize for oral presentations, FAST/Future Pulsar Symposium 8	2019
Second Academic Scholarship, Peking University	2013 – 2018
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: *Monitoring the repeating FRB candidates*, 12 hours	Jul – Oct 2019
Engineering: *Helped configure ROACH2 and monitor the real-time bandpass*	Apr 2016

Parkes 64-m radio telescope

Co-I: *Monitoring the repeating FRB 180301*, 32.5 hours	2021APRS
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, 70+ hours	Nov 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
Engineering: *Installed FRB backend and configured the FRB real-time searching software* Aug 2017
Engineering: *Assisted calibration for two polarization channels of the digital backend* Oct 2014

Miyun 50-m radio telescope
Engineering: *Tested ROACH2 to observe bright pulsars* Aug 2015

INVITED TALKS IN COLLOQUIA OR SEMINARS

MQ AAAstroseminar, Macquarie University, Sydney, Australia May 2021
In-person talk: *Diverse polarization angle swings from a repeating fast radio burst source*
ASKAP-CRAFT Group Meeting, ATNF-Swinburne-Curtin, Australia Mar 2021
Remote talk: *Current FRB Science Outcomes with FAST*
Pulsar Group Meeting, MPIfR, Bonn, Germany Feb 2021
Remote talk: *Diverse polarization angle swings from a repeating fast radio burst source*
Colloquium, Curtin Institute of Radio Astronomy, Perth, Australia Jan 2021
Remote talk: *Diverse polarization angle swings from a repeating fast radio burst source*
Colloquium, Department of Astrophysics, University of Radboud, Netherlands Dec 2020
Remote talk: *Diverse polarization angle swings from a repeating fast radio burst source*
Lunch Talk, Kavli IPMU, University of Tokyo, Japan Dec 2020
Remote talk: *Diverse polarization angle swings from a repeating fast radio burst source*
CSIRO-ATNF Co-learnium, Marsfield, NSW, Australia Dec 2020
Remote talk: *Life changes of the local residents around the FAST site*
Video recording: [Co-learnium link]
CHIME/FRB Journal Club, Canada Dec 2020
Remote talk: *Diverse polarization angle swings from a repeating fast radio burst source*
Video recording: [YouTube link]
Seminar, AUS-NZ-PSR Group Meeting, Australasia Nov 2020
Remote talk: *Diverse polarization angle swings from a repeating fast radio burst source*
CSIRO-ATNF Co-learnium, Marsfield, NSW, Australia Dec 2019
In-person talk: *A beginner's guide to Bayesian inference*
Video recording: [Co-learnium link]
CSIRO-ATNF Colloquium, Marsfield, NSW, Australia Sep 2019
In-person talk: *Measurement of the luminosity function of Fast Radio Bursts*
Cosmology Group Meeting, NAOC, Beijing, China Mar 2019
In-person talk: *Measurements on the FRB luminosity function*
KIAA Graduate Dinner Talk, Peking University, Beijing, China Dec 2018
In-person talk: *An Overview on Fast Radio Bursts and FRB luminosity function*
NAOC Graduate Student Seminar, NAO-CAS, Beijing, China Apr 2018
In-person talk: *A Review of Fast Radio Bursts and FRB luminosity function*

CONTRIBUTED TALKS IN CONFERENCES OR WORKSHOPS

FRB 2021 International Meeting, Zoom Webinar Jul – Aug 2021
Plenary talk: *Diverse polarization angle swings from a repeating fast radio burst source*
Video recordings: [Plenary 3A] and [Plenary 3B]
C3DIS 2021 Conference, Virtual, Australia Jul 2021
Session talk: *simulateSearch – A package for simulating high time-resolution data in radio astronomy*
FRB 2020 International Meeting, Zoom Webinar Jul 2020
Pleanry talk: *Measurement of the luminosity function of Fast Radio Bursts*
Video recording: [Session 5]
ATNF Bolton Symposium, Kensington, Perth, Australia Mar 2020

Plenary talk: *A new repeating FRB discovered by the FAST telescope*

FAST/Future Pulsar Symposium 8, Xi'an, China — Jun 2019
Plenary talk: *Measurement of the luminosity function of Fast Radio Bursts*

Radio Astronomy Forum 2017, Pingtang, China — Sep 2017
Poster talk: *Simulating DM of host galaxies to derive FRB luminosity function*

Chinese Astronomical Society Annual Meeting 2016, Wuhan, China — Nov 2016
Session talk: *Simulating the dispersion measure of host galaxies*

Jing-Guang-Xia Astrophysics Meeting, Xiamen, China — Jul 2016
Plenary talk: *Simulating the dispersion measure of host galaxies*

QTT Colloquium Series 2016, Zunyi, China — Jul 2016
Plenary talk: *Simulating the dispersion measure of FRB host galaxies*

PKU-XAO Bilateral Meeting, Urumqi, China — Jun 2016
Plenary talk: *Simulating the dispersion measure of FRB host galaxies*

Chinese Astronomical Society Annual Meeting 2015, Beijing, China — Oct 2015
Session talk: *Consideration of Research on FRBs*

QTT Colloquium Series 2015, Ming'antu, China — Jul 2015
Plenary talk: *Consideration of Research on FRBs*

KIAA-SHAO Bilateral Workshop, Beijing, China — May 2015
Plenary talk: *Consideration of FRB searching*

STUDENTS CO-ADVISED

Lunhua Shang: Joint-PhD student at NJUST and CSIRO — 2020 – present
Research projects: Studies on the pulsed variable stars with radio observations

Weiyang Wang: PhD at UCAS-NAOC, graduated in the end of 2020 — 2017 – 2020
Research projects: Theoretical studies on Fast Radio Bursts

TEACHING AND OUTREACH

PULSE@Parkes: An outreach on Parkes pulsar observing for high-school students — 2019 – present

TA: General Physics, School of Earth and Space Sciences, Peking University — 2017
TA: Atomic Physics, School of Physics, Peking University — 2015

PEER REVIEW

Anonymous Reviewer for FAST Open Call 2021 — Jun – Jul 2021

SUPPORTS AND SERVICES

SOC member for ACAMAR Fast Radio Bursts Virtual Workshop — Oct 2021
Updates on the ATNF-PSRCAT — 2020 – present
The CSIRO-ATNF Co-learnia: One of main organisers — 2019 – present
The ATCA Duty Astronomer: 4 weeks — 2019 – present
LOC member for the first Chinese Pulsar Timing Array Meeting — May 2017

TECHNICAL SKILLS

Programming	Python (Proficient), C, C++, Unix
Softwares	Matlab, Mathematica, presto, tempo2, MultiNest
Tools	Git, LaTeX, Wiki, HTML

CODES DEVELOPED

- simulateSearch(in developing): A software for simulating the 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 for Monte Carlo simulations on the dispersion measure of FRB host galaxies in the nearby universe.

LANGUAGES

Chinese	Native
English	Fluent
Japanese	Elementary

REFERENCES

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PUBLICATIONS

(Summary: 19 publications in total, including one first-author paper in Nature. H-index: 8, – Aug 2021)

First-author papers:

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., Caballero, R. N., Chen, M. Z., Chen, X. L., Gan, H. Q., Guo, Y. J., Hao, L. F., Huang, Y. X., Jiang, P., Li, H., Li, J., Li, Z. X., Luo, J. T., Pan, J., Pei, X., Qian, L., Sun, J. H., Wang, M., Wang, N., Wen, Z. G., Xu, R. X., Xu, Y. H., Yan, J., Yan, W. M., Yu, D. J., Yuan, J. P., Zhang, S. B., & Zhu, Y., *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., et al. *CRAFTS for Fast Radio Bursts – II. 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, 4, 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:

9. 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.**, Mahony, E. K., Ryder, S. D., Sadler, E. M., Shannon, R. M., Han, J. L., Lee, K. J., & Zhang, B., *Characterizing the FRB host galaxy population and its connection to transients in the local and extragalactic Universe*, 2021, ApJ, submitted

8. 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.**, Li, G.-D., Miao, C.-C., Niu, J.-R., Anna-Thomas, R., Stern, D., Wang, W.-Y., Yuan, M., Yue, Y.-L., Zhou, D.-J.,

Yan, Z., Zhu, W.-W., & Zhang, B., *A highly active repeating fast radio burst in a complex local environment*, 2021, Nature, submitted

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, accepted

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.**, Russell, C. J., Sarkissian, J., Spiewak, R., Wang, S., Wang, J. B., Zhang, L., & Zhang, S., *On the evidence for a common-spectrum process in the search for the nanohertz gravitational wave background with the Parkes Pulsar Timing Array*, 2021, ApJL, accepted

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 Non-detection of Circular Polarisation from Repeating Fast Radio Bursts*, 2020, ApJ, accepted

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(7), 979511