



Science and Technology Day Summary

Laura Driessen | CERC Research Fellow



ATNF SCIENCE AND TECHNOLOGY

NOVEMBER 2022

CONTEXT FOR THE MEETING

- Bring together scientists, engineers and instrumentation specialists for useful exchange of ideas that can inform the ATNF strategy and priorities for the next decade
- Community engagement and feedback to capture the range of ideas and science cases that will serve as important inputs for the ATUC to make some useful recommendations



Three focus areas

- Time domain, fast timescales, and multi-messenger
- Widefield surveys / Large field-of-view
- Cross-disciplinary applications and extra-ATNF synergies



Time domain, fast time scales, and multi-messenger

Invited overview: science drivers and technology developments - Laura Driessen & Keith Bannister

Transient science with the ATCA rapid-response mode - Gemma Anderson

Fast radio bursts possibilities for ASKAP and beyond - Ryan Shannon

Cherenkov Telescope Array and linkages to ATNF - Gavin Rowell

Masers with ATNF instruments - Max Voronkov

Sparkler talks:

Laura Driessen, "More stars with more RACS"

Clancy W. James, "Increasing the range of FRBs probed by ASKAP"

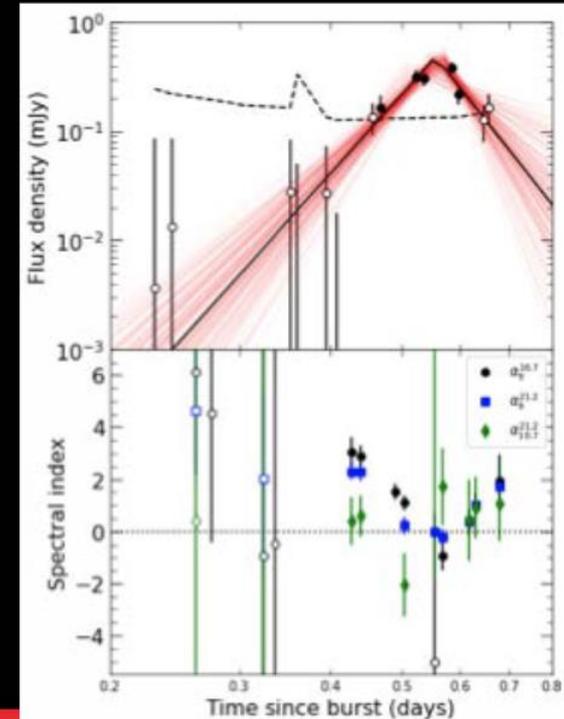
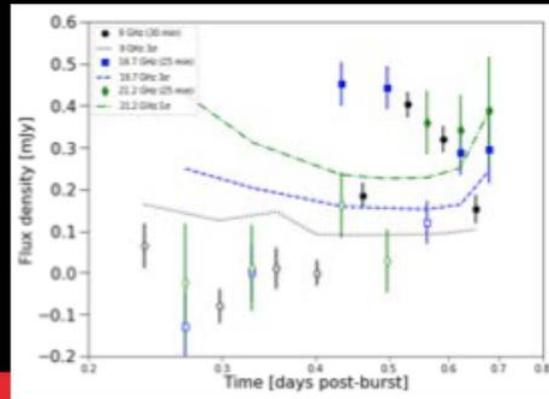
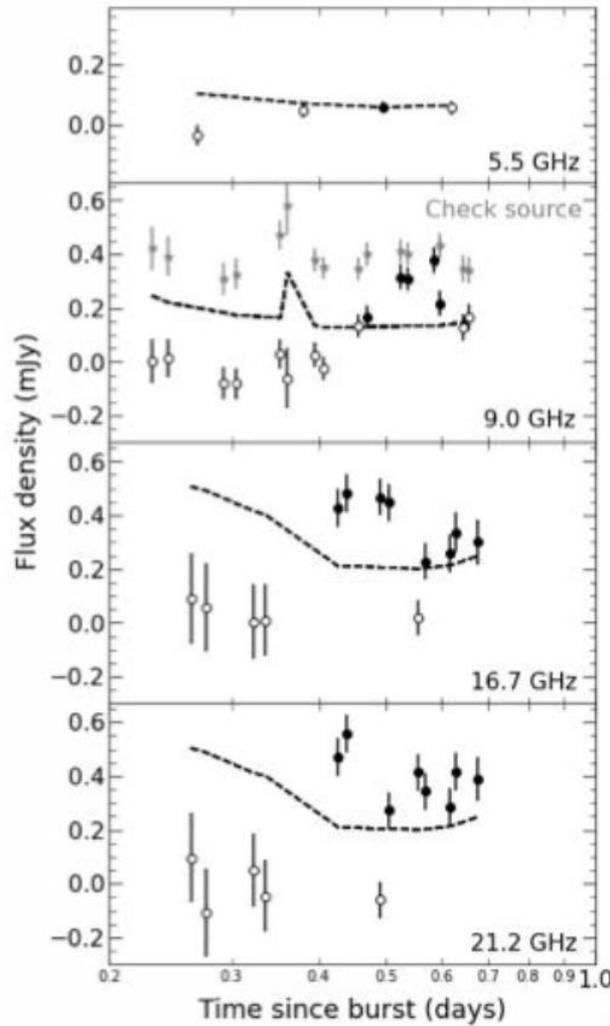
Natasha Hurley-Walker, "Ultra-long period transients"

GRB 210702A



ATCA trigger from HESS (HESS/TeV GRB ATCA triggering program)

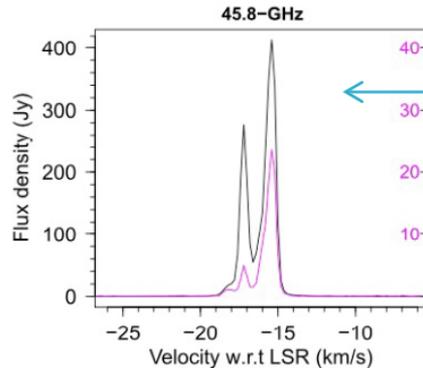
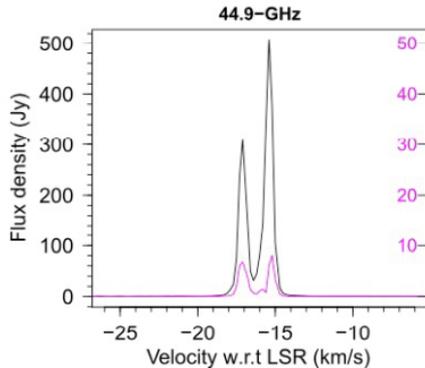
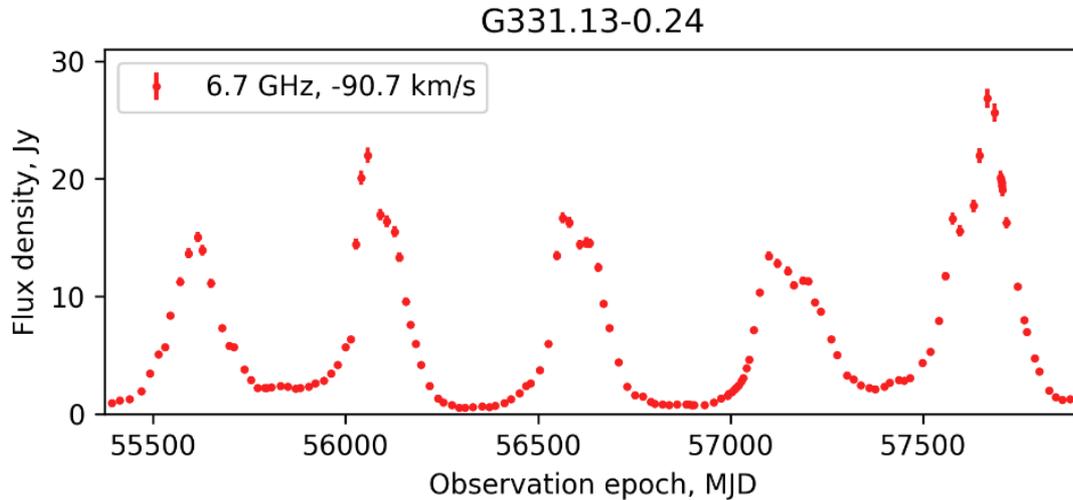
- On target 5.4 to 16.4 hrs post-burst (11 hrs)
- uvmultifit – no imaging, fitting for a point source in uv -plane
- 5.5 (60 min), 9 GHz (15 min), 16.7/21.2 GHz (12.5 min)
- 9 GHz flare 9-14 hrs
- Polarisation limits $<30\%$
- Earliest detection of \sim min timescale GRB radio variability?
- Cause? Likely Weak ISS
- Earliest GRB source size 8×10^{16} cm
- Source of radio emission boosted?



3. Periodic variability and bursts

About 30 (quasi)periodic masers known (largely class II methanol)

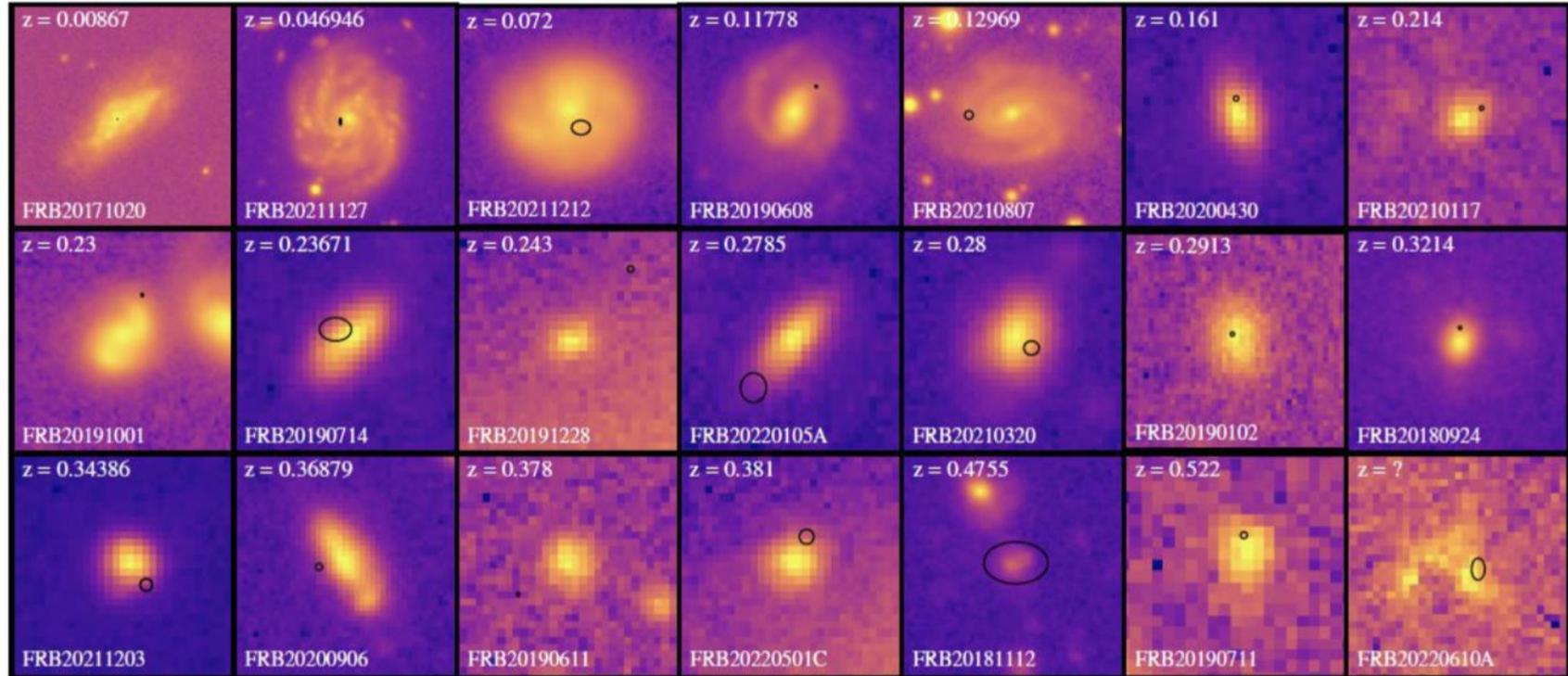
Example from
my own
monitoring →
work with
ATCA



Flare in G358.931-0.030
(Breen et al., 2019, ApJ,
876, 25)

Lots of unusual
transitions!

FRB host galaxies



Credit: Lachlan Marnoch



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Widefield surveys / Large field-of-view

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The Evolutionary Map of the Universe - Andrew Hopkins

Machine Learning Methods for Radio Galaxy Classifications - Nikhel Gupta

ASKAP in the era of SKA - Lister Staveley-Smith

ATCA Infrastructure Upgrade 35 - Tim Wilson

Xenosmilus - the evolution of BIGCAT - Chris Phillips

Sparkler talks:

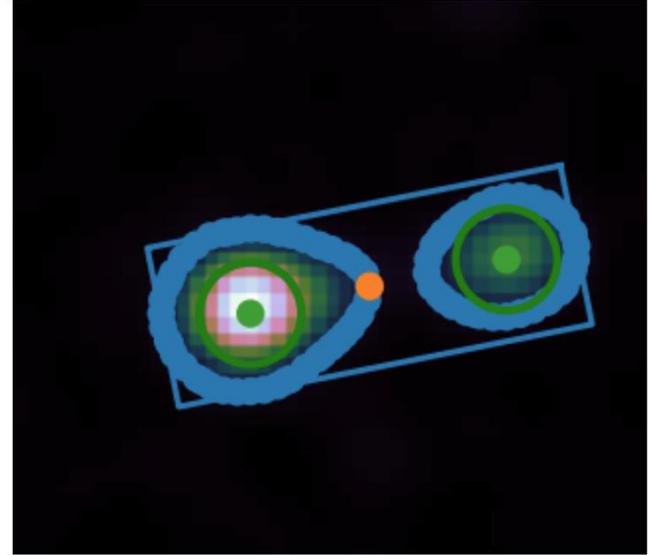
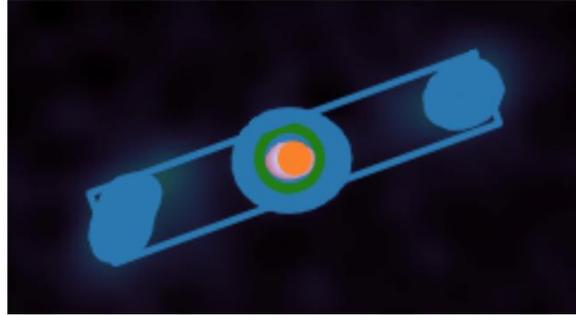
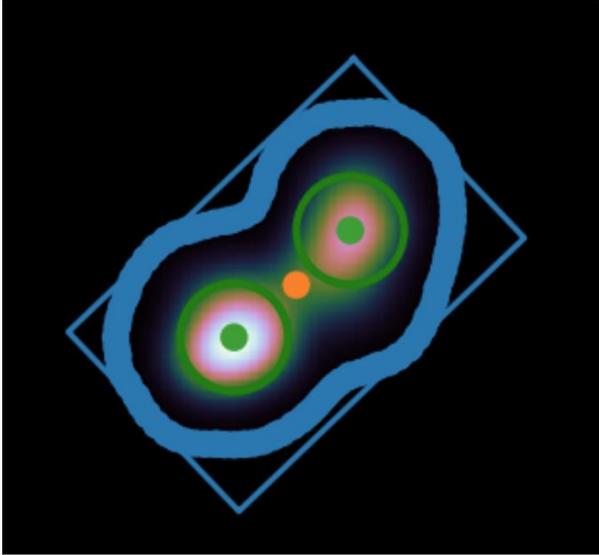
Ray Norris, "Odd Radio Circles: the latest news"

Qingxiang Chen, "Cubelet Stacking - A New Way of 21cm Stacking"

Rami Alsaberi, "ATCA Study of Small Magellanic Cloud Supernova Remnant 1E 0102.2–729"

Arash Bahramian, "Reaching SKA image depth with the Australia Telescope Compact Array"

What data do we have?



DRAGNs Catalog

~500 sources with boxes and Infrared source positions

Yew M., Norris R. et al. in prep





Xenosmilus-the evolution of BIGCAT - Chris Phillips

All the amazing things that could be done with BIGCAT, illustrated by cats





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Cross-disciplinary applications and extra-ATNF synergies

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Highlights from the AusSRC Design Study Program - Karen Lee-Waddell

Radio astronomy as a catalyst for new Australian industries - James Murray

Extended Southern Hemisphere Asteroid Radar Program - Shinji Horiuchi

Tracking Space Weather events with ASKAP and Parkes - John Morgan

Sparkler talks:

Oleg Titov, "K-band VLBI observations at East Asia VLBI network (EAVN)"

Vanessa Moss, "The role of automation and autonomy in current and next-generation ATNF facilities"



Call to Action

AAL wants to showcase more case studies and capabilities statements on our new industry engagement website.

Please get in touch with James Murray at AAL to discuss your industry engagement project.

AAL Industry Engagement Call to Action

Professor Karl Glazebrook – Keck Observatory RTC

Professor Karl Glazebrook, Swinburne University of Technology – Keck Observatory Real Time Controller

The RTC is the heart of the Keck Observatories' Real Time Controller (RTC). It is a complex system that allows the Keck Observatories to observe the sky in real time. The RTC is a complex system that allows the Keck Observatories to observe the sky in real time. The RTC is a complex system that allows the Keck Observatories to observe the sky in real time.

Dr Ilana Feain – QuasarSat

Dr Ilana Feain, CSIRO – Quasar Satellite Technologies

Dr Ilana Feain is a Senior Research Scientist at CSIRO. She is currently leading the QuasarSat project, which is a satellite-based system for observing quasars. The project is a joint venture between CSIRO and QuasarSat Technologies.

Dr Jose Bellido Caceres – Water Tanks to Peru

Dr Jose Bellido Caceres, University of Adelaide – Water Tanks to Peru

Dr Jose Bellido Caceres is a Senior Lecturer at the University of Adelaide. He is currently leading the Water Tanks to Peru project, which is a water storage project in Peru. The project is a joint venture between the University of Adelaide and Water Tanks to Peru.

An example of the case studies currently on AAL's IE website.

Left: The Keck Observatory RTC
Middle: Quasar Satellite Technologies.
Right: Water Tanks to Peru

Radio Observations are key

- (almost) The only methods for remotely sensing the solar wind in interplanetary space
- Heliosphere is a foreground for all astrophysical radio sources
- Modern wide-field interferometers are extremely well-suited to these observations

Interplanetary Scintillation

- IPS is not just useful for Heliosphere measurements
 - We can do astrophysics too!
- IPS is not the only radio probe of the heliosphere
 - Scatter broadening
 - Phase scintillation (LBA, Guifré Molera Calves and students, UTas)
 - Faraday rotation measurements
- We can also measure the ionosphere
- There is also radio imaging of the Sun



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Summary of the summary

- Lots of really amazing science is happening with ATNF facilities
- Lots of really amazing science ideas for future projects
- Plenty of ideas on how we can make the most of what we have
- Plenty of ideas on what we can do next to expand and improve upon our current facilities