CryoPAF

A new cryogenically-cooled phased-array feed receiver on the 64m Murriyang Telescope in Parkes, Australia

What is the CryoPAF?

- Phased-array feed, cryogenically cooled, to be installed on the Parkes Murriyang telescope
- ARC LIEF funded, CSIRO designed and built.
- The next generation replacement of the Multibeam receiver (1996-2020).
- Science includes: pulsars, FRBs, red-shifted HI, OH, VLBI, SETI and more …
- Massive thanks to the project team!

CryoPAF Testing October 2022

General Specifications

- Phased array feed
  - 98 dual linear polarized elements
- Maximum of 72 beams (8 for pulsar timing and VLBI). Approx 1.5 sq deg FoV.
  - cf Multibeam 13 beams
- Feed package rotation allows tracking in parallactic angle (cf ASKAP dish rotation)

Frequency Range and Processed Bandwidth

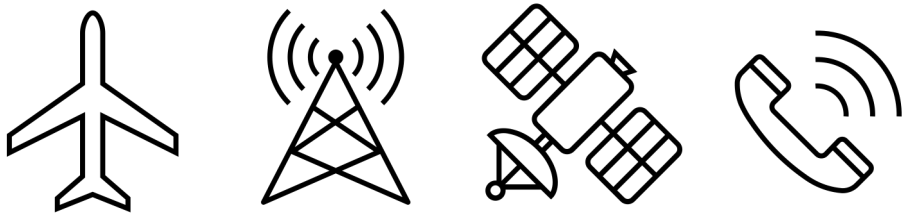
Frequency range of 700-1950 MHz

- Two bands: 700-1200 MHz and 1100-1950 MHz
- cf Multibeam 1.22-1.53 GHz

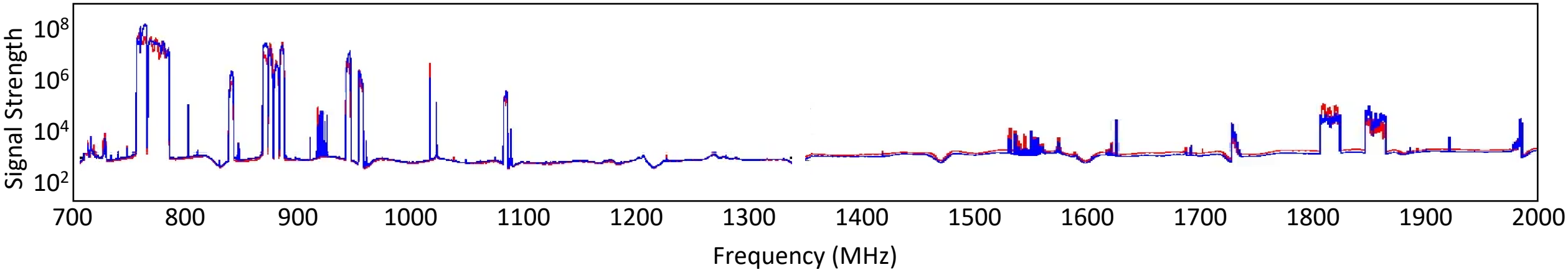
Processed bandwidth of ~600 MHz, with potential to expand to 900 MHz

- cf ASKAP 336 MHz

RFI Environment at Parkes

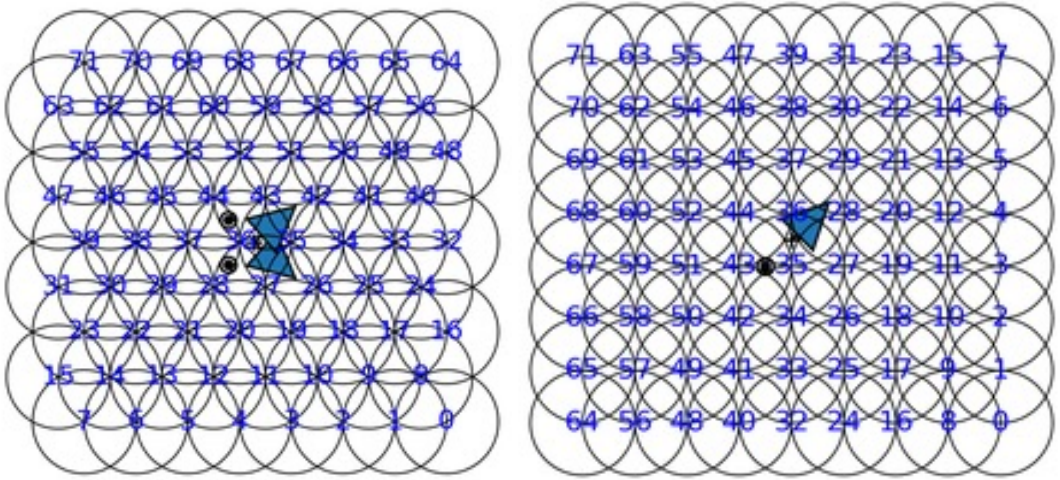


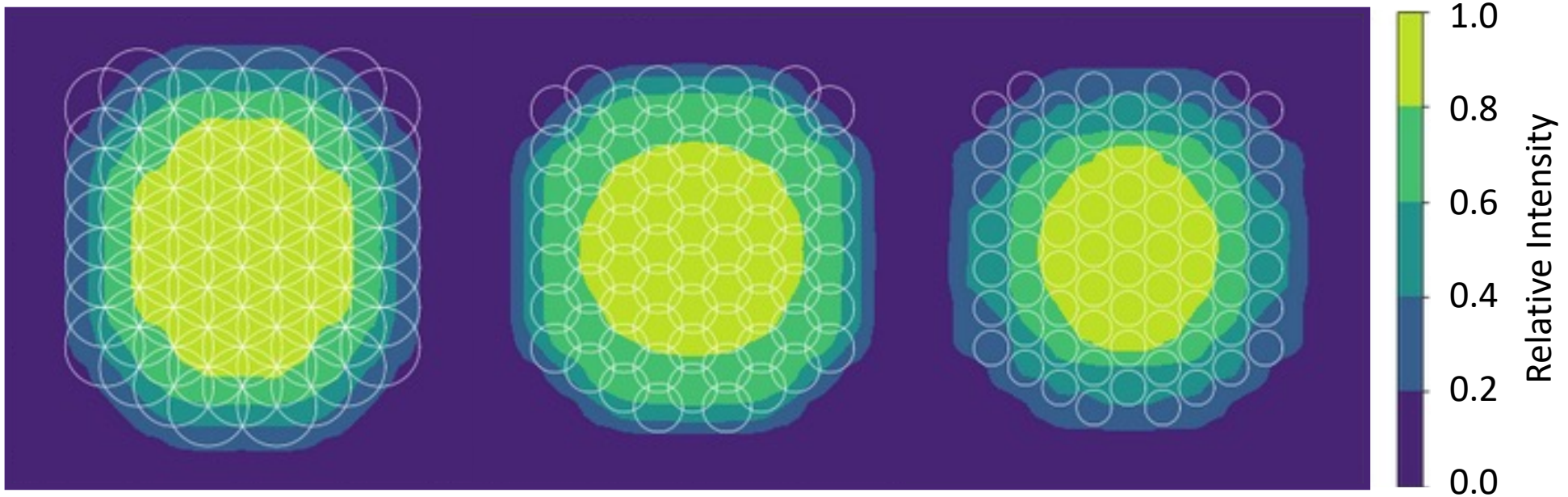
- RFI is a challenge for all radio telescopes!
- Significant sources include mobile phone and broadband internet transmitters, mobile handsets, aircraft, satellites, WiFi/BlueTooth…



Beam Footprints

Alternative patterns, such as:

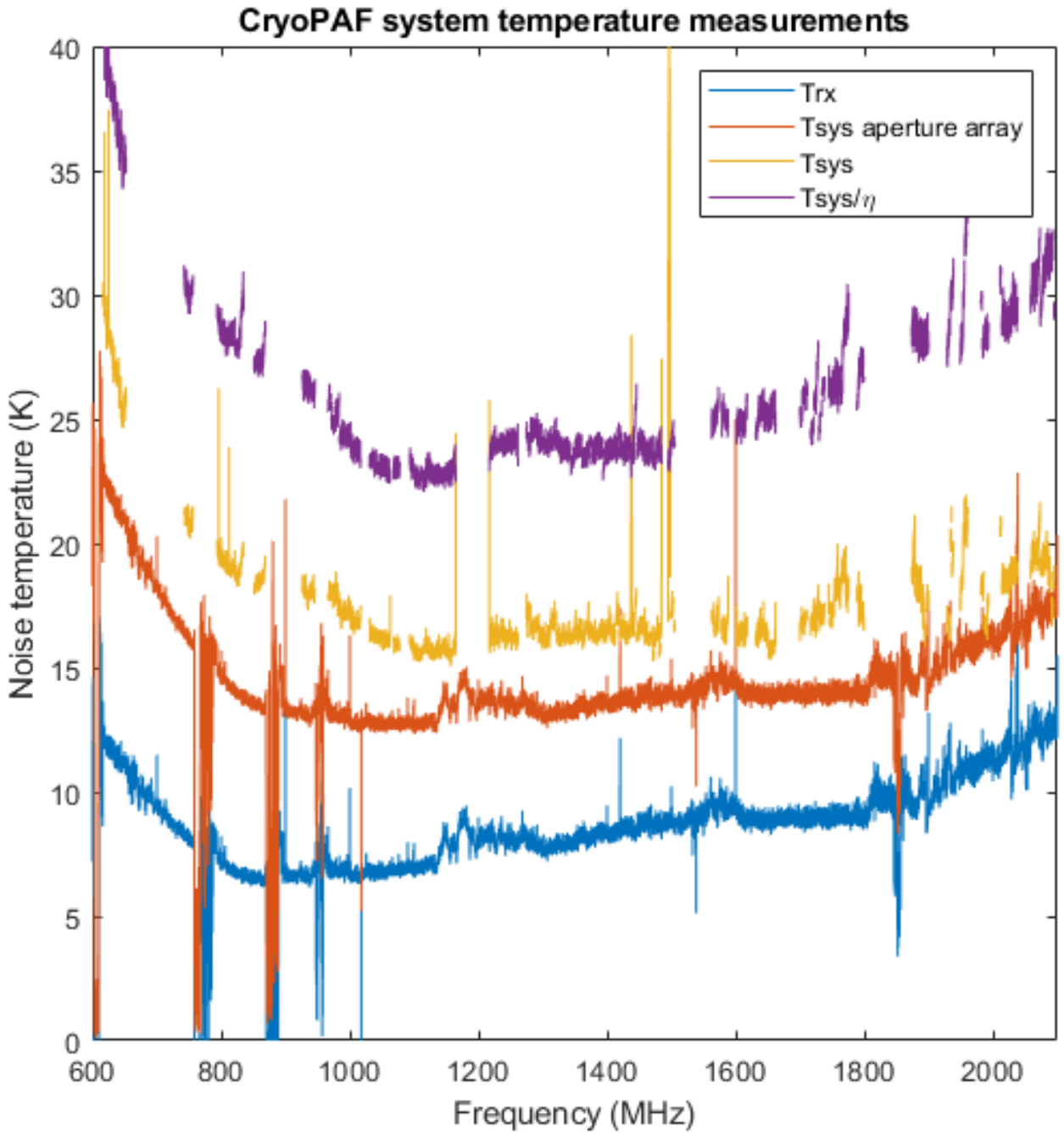




Increasing Frequency OR Increasing Beam Separation

System Temperature

Results from Parkes testing



Timeline

- August - September 2023
  - Installation in the focus cabin
  - Beamformer + 150 MHz BW
  - Limited modes
  - Science commissioning

- October 2023 semester
  - Shared risk observing, phased roll-out to 600 MHz BW

Science Commissioning

Step-by-step observing plans and checklists for:

- Beamforming and weights
- Pulsar search and fold (led by Simon Johnston)
- FRB/time domain (led by Keith Bannister)
- HI/spectral line (led by Lister Staveley-Smith)
- OH/spectral line (led by Anita Petzler)
- Continuum/polarization (led by Alec Thomson)
- VLBI (led by Chris Phillips)
- Breakthrough (led by Danny Price)