Murriyang updates

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Murriyang update and the wide-bandwidth receivers

Jane Kaczmarek

ATUC requests:

- 7.6: Details on the UWMH project itself, the properties of the receivers and the status and the timeline for the project will be presented at the next ATUC meeting.

Updates on & around site

New signage following Murriyang naming guidelines

On-site accommodation trial for ATNF staff & affiliates

Maintenance Projects

- Successful refurbishment of azimuth gearboxes & roller bearings in June 2024
  - Once-every-20-years job!
- Zenith gearbox refurb & modification planned for 2025APR semester

Scheduling Constraints

- Remainder of 2024OCT semester to be released soon
  - Subject to CryoPAF installation timeline
- Spacecraft tracking commitments continue to have a fluid schedule
  - ~2-week support anticipated early 2025
- Month-long gearbox refurbishment has been shifted to the 2025APR semester

The Ultra Wide-bandwidth Mid & High (UWM-H)

Mid

4160 – 15680 MHz

High

15680 – 27072 MHz

- Two distinct receivers
- Will share the UWL platform & warm electronics
- Removes all foreseeable receiver changes

Proposed Ultra Wide-bandwidth System

- Jimbles for the entire Ultra Wide package
  - UWL adjusted frequency of 704 - 4288 MHz
  - Oversampled filterbank for all receivers
- Digitised calibration signal
  - Can be completely removed from sky signal
  - Gain & phase calibration without pulsed signal
- GPU backend
- ST data available as digital or analogue
  - Non-commensal with astronomy modes

Low

704 – 4288 MHz

Mid

4160 – 15680 MHz

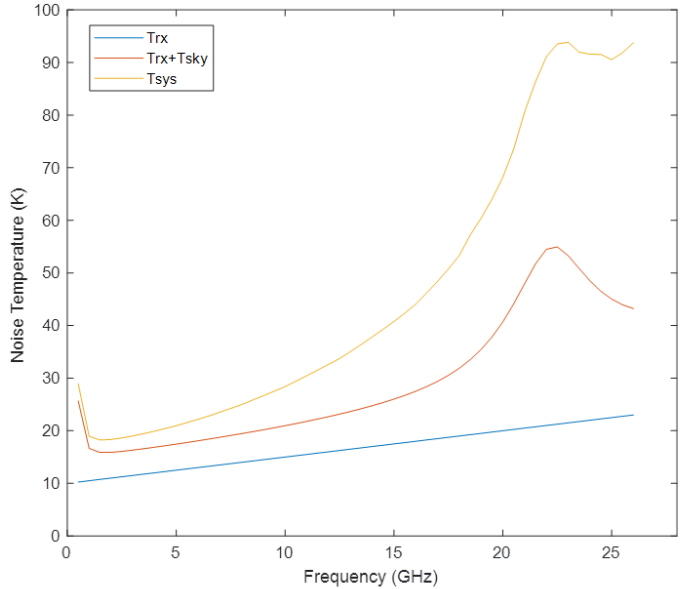
High

15680 – 27072 MHz

ST

< 32300 MHz

Expected System Performance



Credit: Alex Dunning

- Spillover becomes noticeable at higher frequencies
- Improved (or equivalent) performance to existing fleet:

Receiver	Frequency Range (GHz)	Average Tsys (K)
METH6	6.3 - 6.8	58
MARS	8 – 9 GHz	~25
13MM	20 – 23.5	80

Anticipated Timeline

- Project is planned to run for three years
  - Potential to start Jan 2025
  - Installation late 2027
- Will require UWL to be offline for 8-10 weeks
- Timeline is subject to SKA tender (see talk by Mark)
  - Start time will be known by the end of the year

CryoPAF update

Simon Johnston

CryoPAF General Specifications

Frequency range of 700-1950 MHz in two bands: 700-1100 MHz and 1100-1950 MHz

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

T_{sys} < 20K, Ssys ~ 25 Jy

Phased array feed with 98 dual linear polarized elements

Maximum of 72 beams (8 for pulsar timing and VLBI). FoV approx 2 sq deg.

Rotation allows tracking in parallactic angle

The good, the less good and the future

Good news

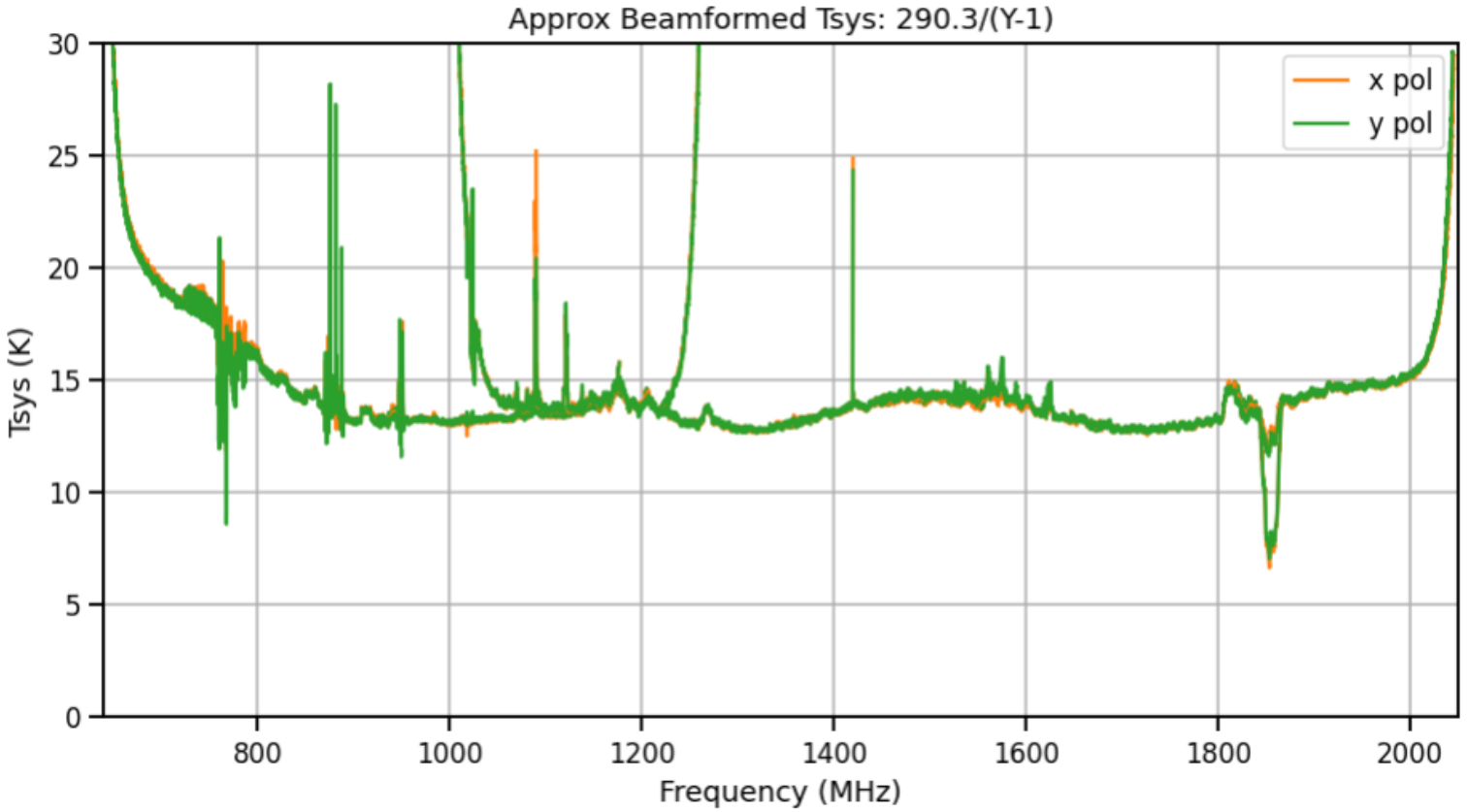
- On dish since end August
- Excellent Tsys performance
- Cryogenic issues seem largely to be resolved (fingers crossed)
- Voltage mode (8 beams) largely working with some caveats
- 9 beam-formed beams created at 1300 MHz with 240 MHz bandwidth.
- Progress with TOS/Garriwang

Less good news

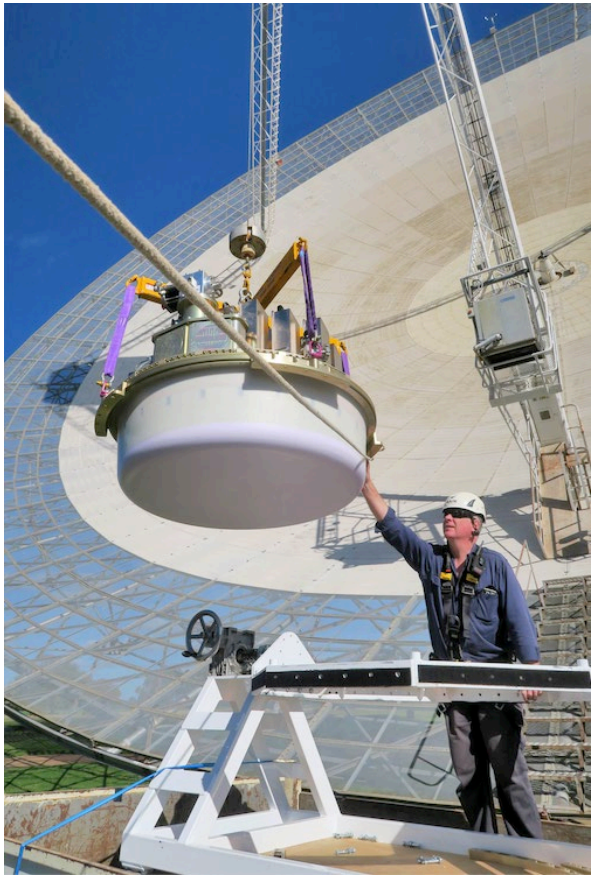
- Project delayed 2 years in the last 2 years
- LNA bias cards need replacing
- Pulsar search mode under testing
- Spectrometer mode under testing
- Beamforming still to be demonstrated across the entire band (RFI)
- Black belt operation/observing
- Transient buffer and real time transient detection mode only started
- SETI mode not started

Hot box testing – mid August

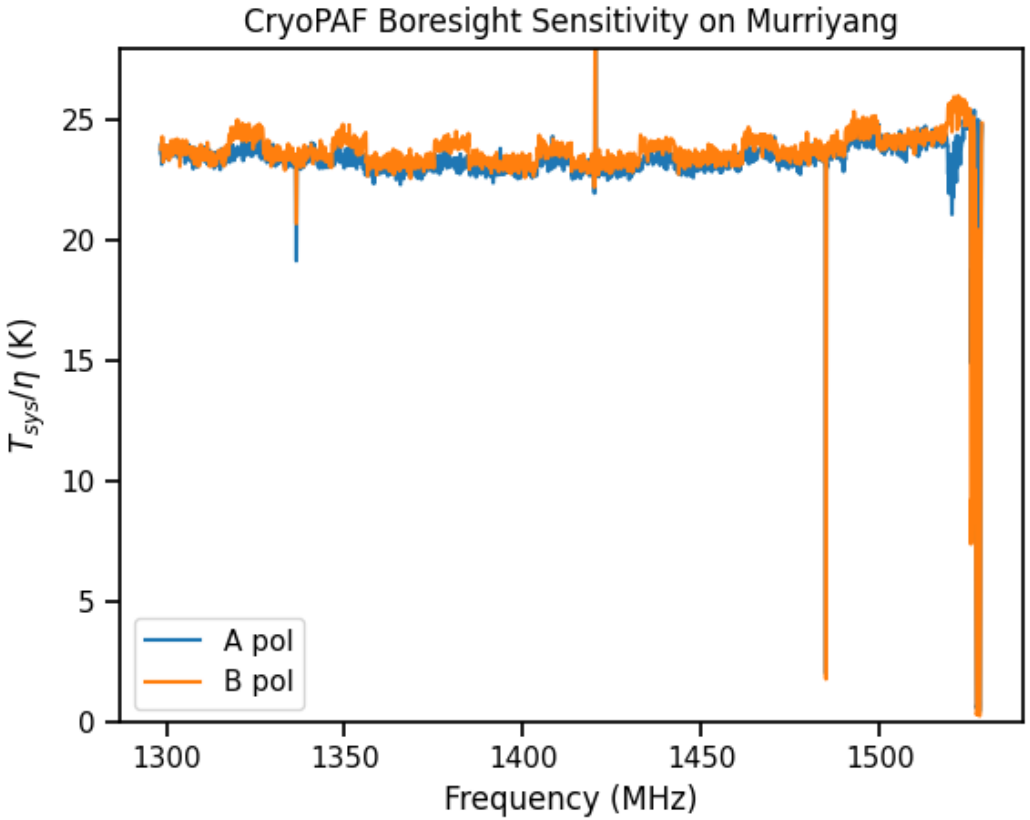
Hot box testing - Results



Installation on the Dish – end August



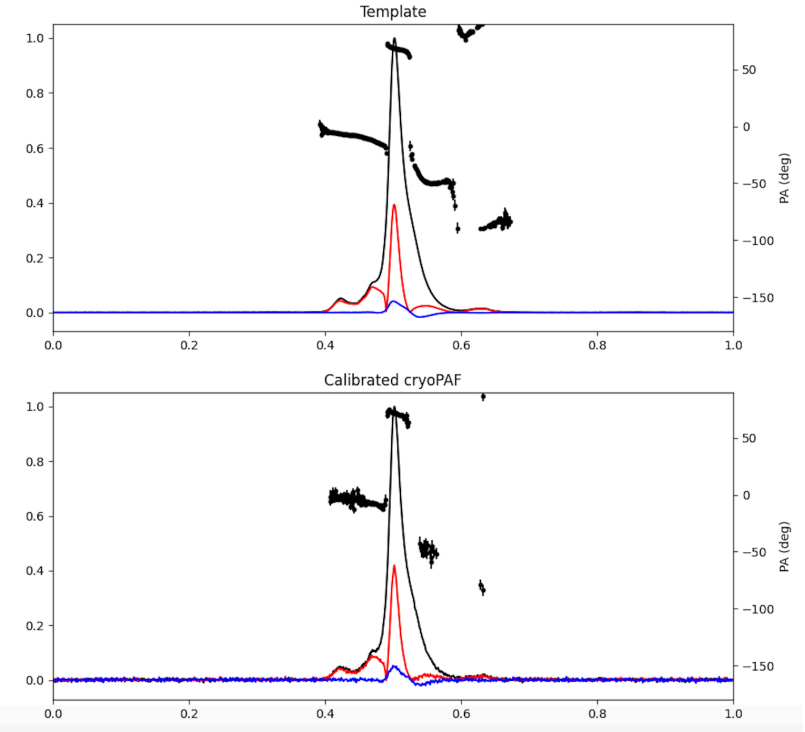
First Results – on dish testing



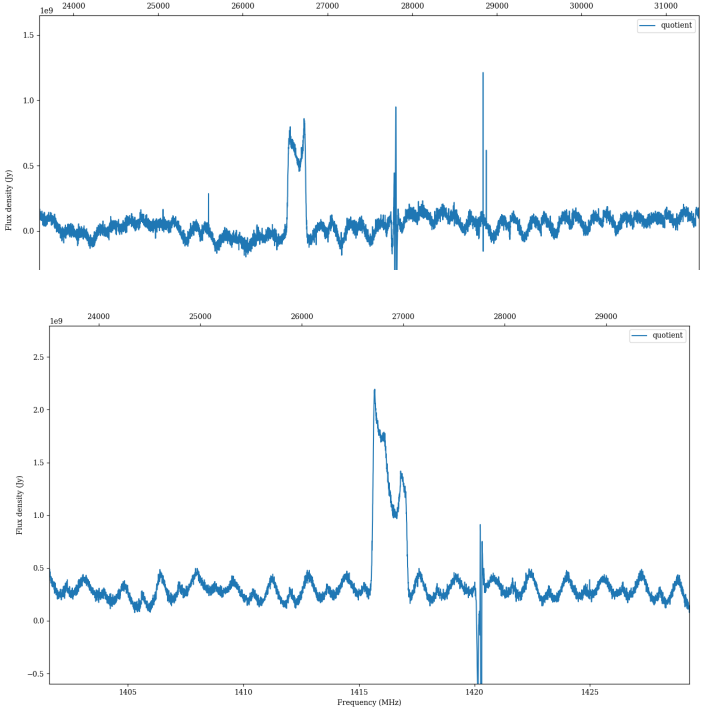
Preliminary results at 1300 MHz with 240 MHz of bandwidth.

Some artifacts but overall excellent performance and a bit below the spec of 27 K.

First Results – on dish testing



Polarization of the pulsar J0437-4715. Voltage/fold mode



HI spectrum from NGCs 6744 and 4592. Voltage mode.

The good, the less good and the future

Future

- The CryoPAF needs to return to Marsfield to fix the WEM/LNA issue
  - Dec/Jan or Mar/Apr still to be decided
- Work continues on :
  - Quantifying system performance
  - Getting science modes operational
  - Making beam weights easier to compute / upload
  - System integration into TOS / Gariwang
  - Simplifying taking data
- Observing proposals already submitted will go forward into next semester
  - Resubmission of cover page / targets required

The pulsar search pipeline

Shi Dai/Lawrence Toomey

ATUC requests:

- 4.2: Report on the feasibility of providing pulsar searching as a service for the Murriyang community

Pulsar searching as a service for the Murriyang community

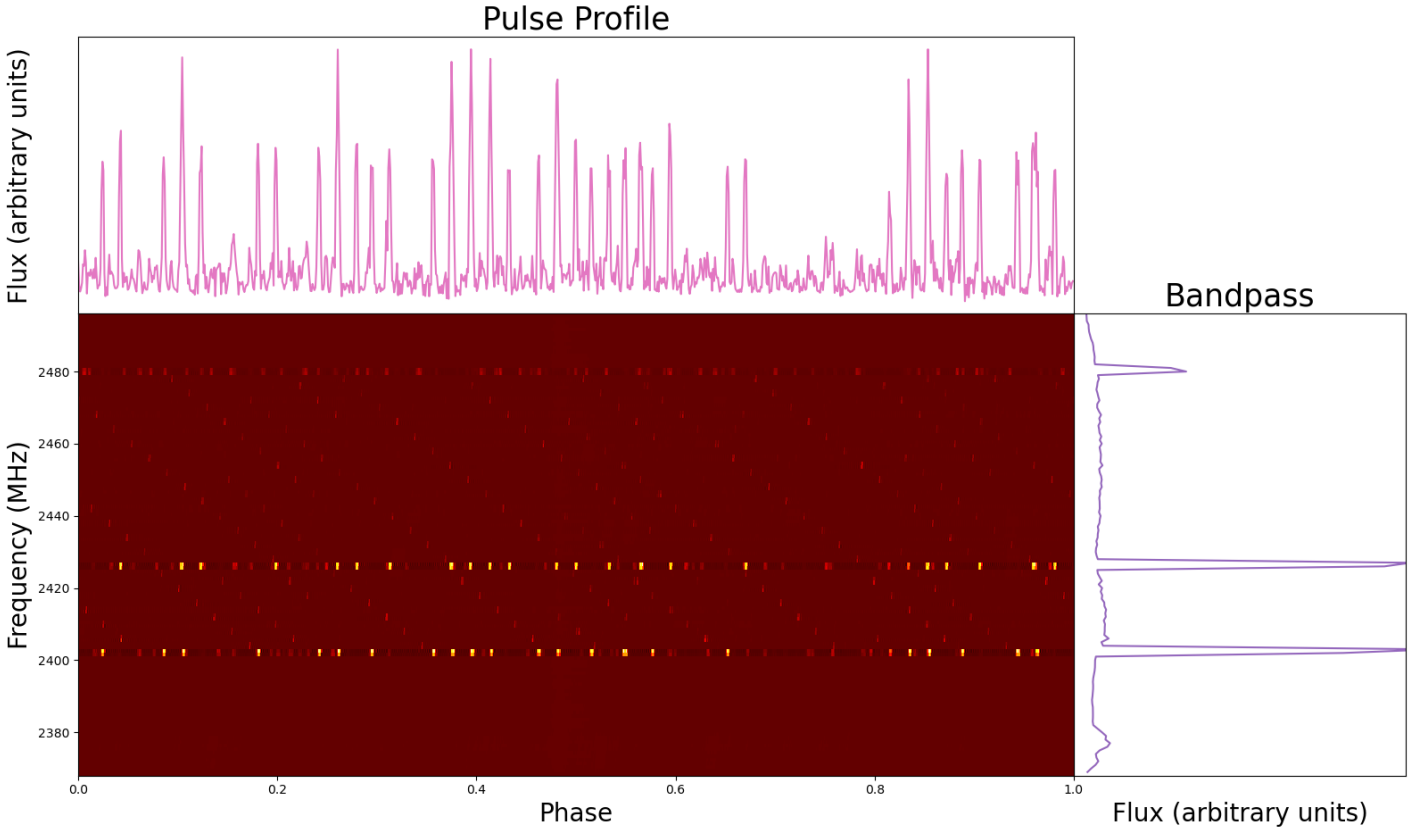
- We will be trialling an end-to-end pulsar search pipeline and a real-time FRB detection mode as part of CryoPAF commissioning – the trial has not yet started

- Two options for users:
  - The pipeline service will likely be a “one-shot” process – the user will receive a candidate list, and raw data will be deleted
  - The pipeline itself is available as a container, however the user will need to allocate their own computing/storage resources

Removing RFI from Parkes data

Tommy Marshman

Parkes Default Settings (No Spectral Kustosis)



Parkes Default Spectral Kurtosis Settings