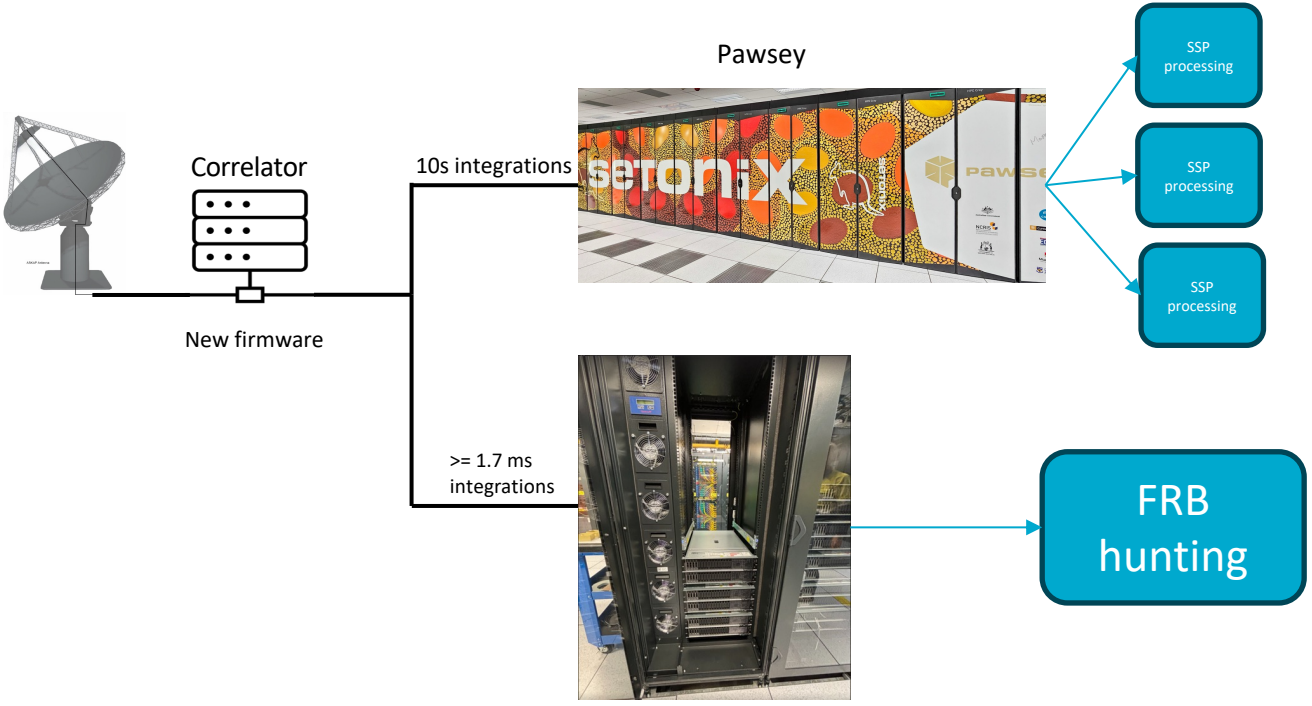
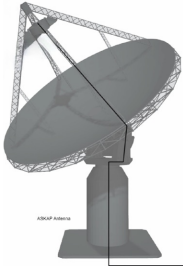
CRACO status

Vivek Gupta | 8 Apr 2024

CRACO design



CRACO FRB hunting

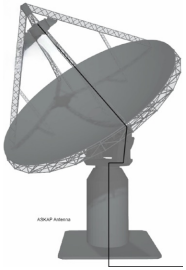


Fully commensal observations*

Acquisition	Pre-processing	Searching	Classification	Notification /trigger
• Cornerturn • Downsampling • Saving to disk	• Calibration • RFI flagging • Sky subtraction	• Dedispersion • Gridding • Imaging • Boxcar • Threshold	• Clustering • Cross-matching • RFI rejection	• Slack message • Voltage download

*except for zoom mode (spectral line) observations

CRACO FRB hunting - status



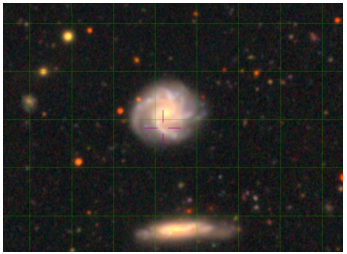
Fully commensal observations*

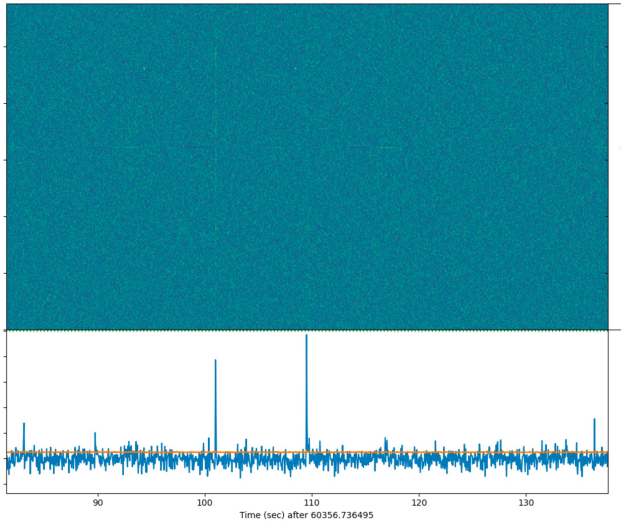
Acquisition	Pre-processing	Searching	Classification	Notification /trigger
• Cornerturn • Downsampling • Saving to disk	• Calibration • RFI flagging • Sky subtraction	• Dedispersion • Gridding • Imaging • Boxcar • Threshold	• Clustering • Cross-matching • RFI rejection	• Slack message • Voltage download

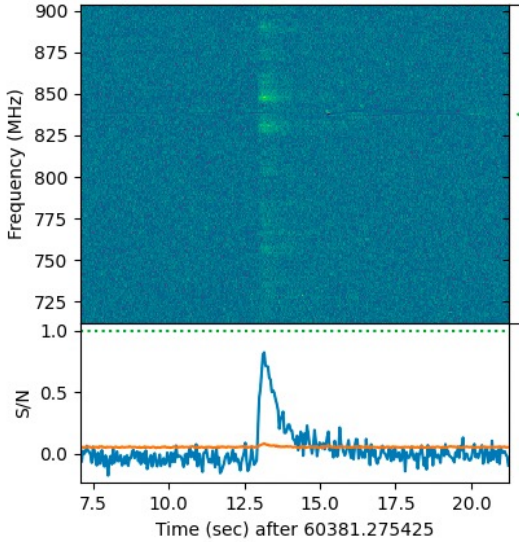
*except for zoom mode (spectral line) observations

CRACO science - FRBs

- Transient survey at 15 ms underway since 25th Dec 2023
- 14 FRBs – with localisations
- 1 repeating FRB
- 1 highly scattered FRB



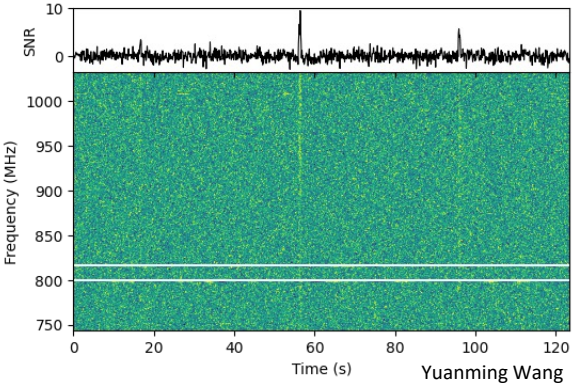


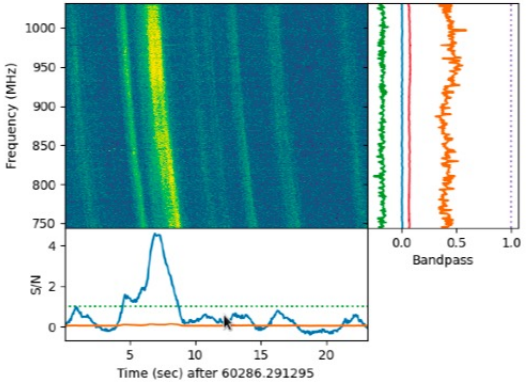


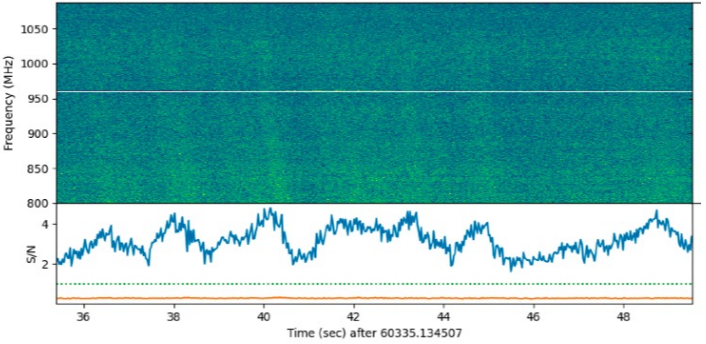
CRACO science – new galactic sources

Slew of galactic sources –

- Excellent sensitivity at low DMs
- Intermittent pulsar
- RRATs (~5)
- Slow pulsars (40 s)
- Ultra-long period sources (2)

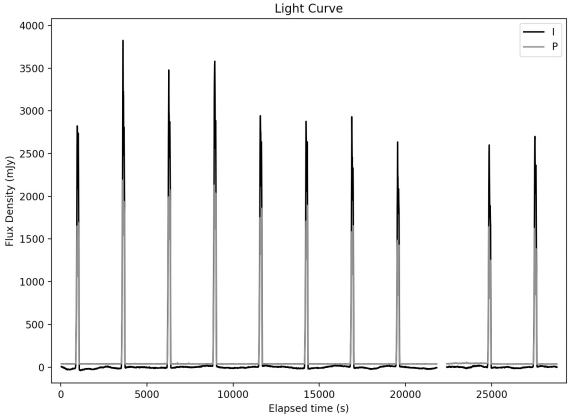




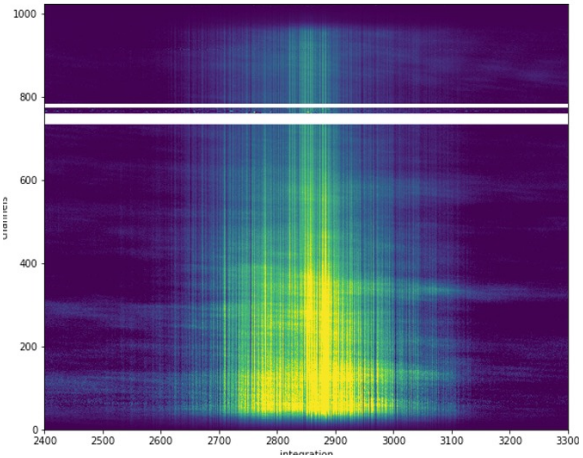


CRACO science – ULPs

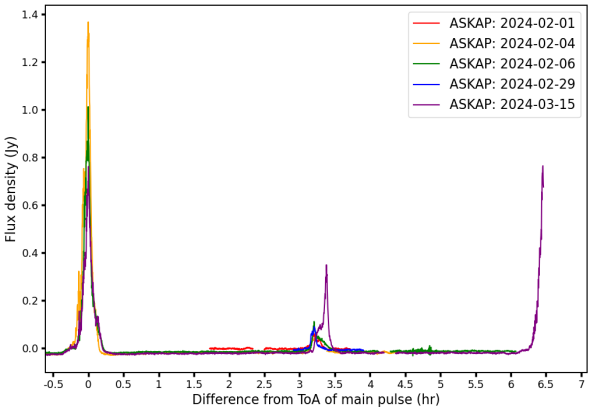
- Periods - 44 min, 6.5 hours!
- Intriguing pulse morphology, polarization and periods
- Follow-up obs underway



Emil Lenc



Joshua Lee



Joshua Lee

CRACO summary & future-plans

- Amazing transient hunting machine – operational in offline mode
- FRBs, Pulsars, RRATs, ULPs and satellites!

Busy week

- Realtime detection + voltage downloads
- Higher time resolution
- Search pipeline improvements – DM range, better imaging
- Commensal intensity tied array beams for monitoring sources
- Making it a national facility

CRACO National Facility plans
OCT 2024 semester – shared risk

Product 1 - Visibilities

High time resolution visibilities:

- 110ms time resolution
- 288 x 1 MHz channels
- Stokes I only
- Uncalibrated, uvfits format
- 1.2 TB/hr
- Upto 2 hour continuous run (local disk space constraint)
- Total 10 hours per month (Pawsey disk quota constraint)
- Uploaded to Acacia/Pawsey, downloaded by user, and deleted after ~60 days

Product 2 - Transients

Single pulse search candidates:

- List of candidates as a csv file
- 13.8ms* resolution search
- Upto 2.2 s dispersive delay search
- Reported values include – S/N, RA-Dec, width, DM, Toa.
- Uploaded to Acacia/Pawsey, downloaded by user, and deleted after 60 days
- By collaboration with CRAFT team – High-time resolution visibility snippets for candidates detected with certain properties

*could go down to 7ms or 3.5ms in future

CRACO National Facility plans
OCT 2024 semester – shared risk

Product 1 - Visibilities

High time resolution visibilities:

- 110ms time resolution
- 288 x 1 MHz channels
- Stokes I only
- Uncalibrated, uvfits format
- 1.2 TB/hr
- Upto 2 hour continuous run (local disk space constraint)
- Total 10 hours per month (Pawsey disk quota constraint)
- Uploaded to Acacia/Pawsey, downloaded by user, and deleted after ~60 days

Talk to us

Product 2 - Transients

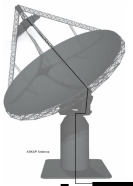
Single pulse search candidates:

- List of candidates as a csv file
- 13.8 ms* resolution search
- Upto 2.2 s dispersive delay search
- Reported values include – S/N, RA-Dec, width, DM, Toa.
- Uploaded to Acacia/Pawsey, downloaded by user, and deleted after 60 days
- By collaboration with CRAFT team – High-time resolution visibility snippets for candidates detected with certain properties

*could go down to 7ms or 3.5ms in future

Thank you and suggestions!

CRACO design



Correlator

New firmware

Voltage ring buffer

10s integrations

>= 1.7 ms integrations

Pawsey

SSP processing

SSP processing

SSP processing

New cluster ‘SKADI’ (on-site)

FRB hunting
In “realtime”

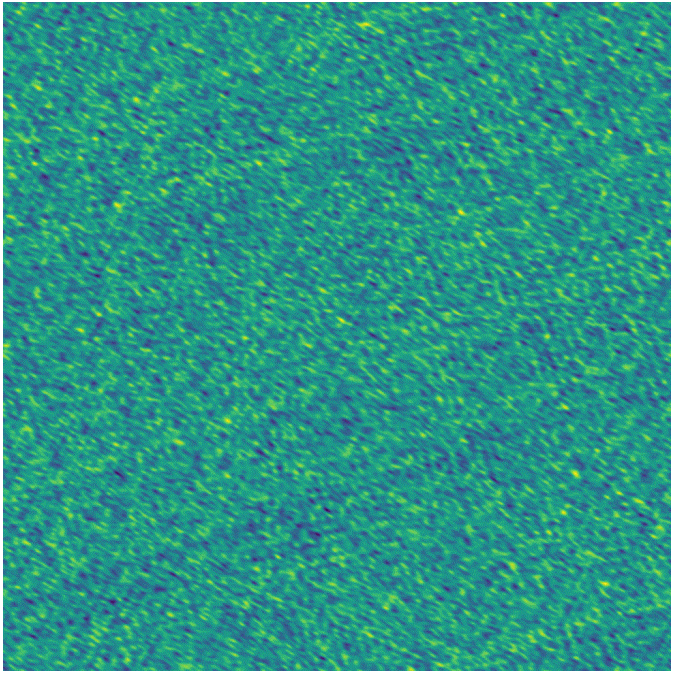
Trigger

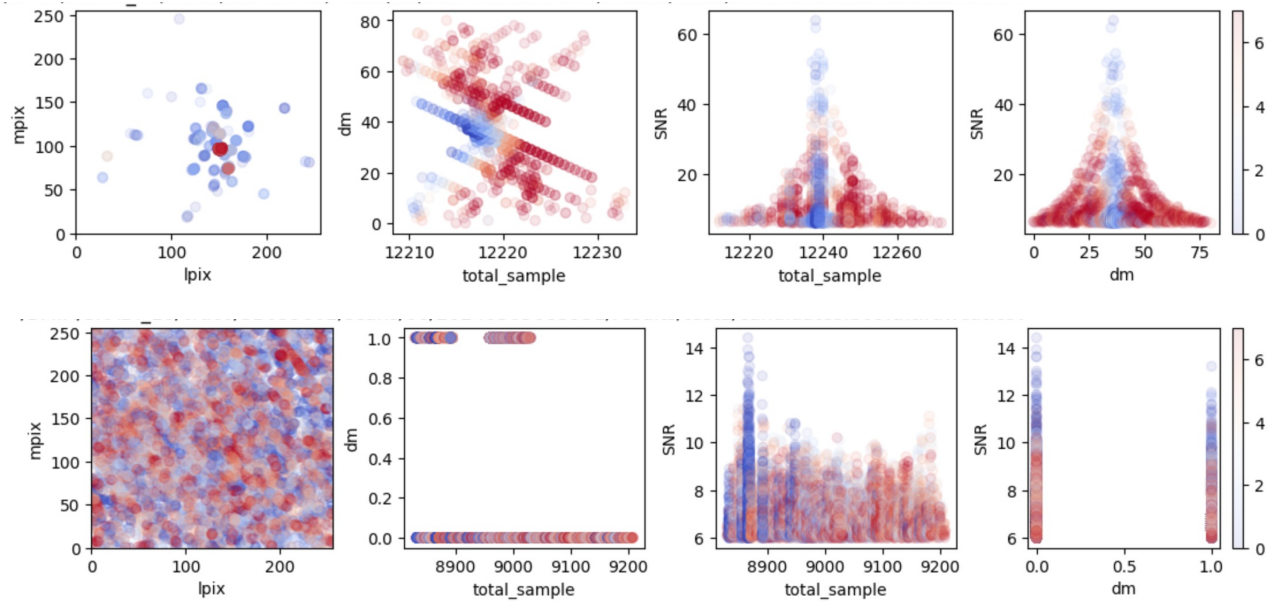
CRACO – Semester 2024 Oct data (shared risk)

- Product 1: Fast visibilities
  - 110ms, inner ak01-ak29 only, 36 beams, 288 x 1 MHz channels, stokes I, uncalibrated, UVFITS format = 1.2 TB/hr.
  - Maximum continuous run duration: 2 hrs (local disk space limit)
  - Maximum observations: 10 hrs / 30 day window (data volume and Pawsey data rate limit)
  - Data will be uploaded to Pawsey/Acacia (S3 like object store) to be downloaded by user – deleted after 60 days.
- Product 2: Dispersed pulse candidate lists / manually-chosen UVFITS snippets
  - Search pipeline runs on 288x1 MHz channels, 36 beams, stokes I, 13.8ms (or shorter depending on CRACO teams' progress) time resolution, DMs out to 2.2 seconds across the band (whichever is chosen by the user).
  - Pipeline output: CSV files – 1 per beam.
  - Columns: Ra/dec, time, DM, S/N
  - Uploaded to Pawsey/Acacia to be downloaded by user – deleted after 60 days.
  - By collaboration: CRAFT team can triage candidates and provide calibrated snippets of visibilities in UVFITS format of interesting candidates in consultation with project PI. Snippets must be chosen within 24 hrs of observation. Cutouts uploaded to Pawsey/Acacia. Deleted after 60 days.

CRACO operations

- ~300 hours in 110ms mode
- ~15 weeks in 13.8 ms mode
- >90% observing efficiency
- ~ 30 hour recording turnaround




mpix
lpix
dm
total_sample
SNR
total_sample
SNR
dm
mpix
lpix
dm
total_sample
SNR
total_sample
SNR
dm