ASKAP update for December 2023

This month we report on survey progress, the status of ASKAP's processing backlog and plans for the new year.

Survey progress report

An issue with cooling infrastructure at the Pawsey Supercomputing Research Centre necessitated a full shutdown of all computing resources on December 2nd. This included Setonix, the ASKAP ingest cluster, CASDA, and the network link to the telescope. The network and ingest cluster were brought back online after a few days, while Setonix and CASDA were returned to service on the 12th of December. CASDA was partially operational before that date, providing access to existing data only. Validation and release services are now available again. We have been able to verify that ASKAP's systems are functioning normally and have resumed processing of the data backlog along with new science observations.

SST	Deposited	Awaiting Validation	Released	Rejected
EMU	135	1	112	22
WALLABY	49	2	19	28
POSSUM	183	5	135	44
VAST	2123	0	2088	36
FLASH	85	10	37	38
GASKAP-HI	1	1	0	0

Table 1: Survey progress as of 11-12-2023

Table 1 (above) shows progress since the beginning of full survey operations. We have now observed at least one scheduling block for both GASKAP teams under their full survey project codes. The GASKAP-HI observation has been archived with full spectral resolution visibilities included. It is also being processed using the new joint deconvolution ASKAPsoft pipeline mode, so we can compare the results with GASKAP-HI's own processing scheme. The GASKAP-OH observations were done in conjunction with reference observations at the Australia Telescope Compact Array. These will be a high processing priority now that Setonix is available. The DINGO team is ready for their first observation, but their chosen survey region is currently only visible during the day. DINGO would prefer to observe during the night to ensure the Sun does not cause interference when stacking multiple observations. We are discussing whether one field should be observed during the day to test the impact of solar interference more quantitatively.

If these initial observations pass quality checks and are deemed suitable for science, we will be ready to include all Survey Science Projects in the active observing pool.

Once all the Survey Science Projects are active, ASKAP's autonomous scheduler SAURON will use time allocation and resource-based constraints to progress the surveys as efficiently as possible in the new year.

End of year activities

Our goal is to observe autonomously over the end of year CSIRO shutdown period. During this time there will be limited human capacity to respond to emerging issues, but the telescope and supercomputing systems should remain online if no new problems arise.

The recent Setonix downtime has prevented progress on ASKAP's data backlog, which means we still need to manage the active survey pool to avoid filling disks while keeping the telescope active and avoiding further backlog if possible. We are considering dedicating the holiday observing time to a third pass of the RACS-low observatory project, done using the same beam footprint as the -high and -mid frequency components to assist in forming a global sky model and provide another epoch for transient searching.

Autonomous operation

In a continuing effort to improve ASKAP's operational autonomy, we are investigating a few improvements that could be made before the end of the year. These include increased checks and logic around delay calibration in conjunction with holography beam shape measurements and improving the processing manager's awareness of

Setonix's resource utilisation to avoid overloading our dedicated job queue. We are also consolidating groups of pipeline tasks into individual jobs, to reduce the total number submitted to the queue.

Guest science project preparation

The next call for proposals has gone out to the community for the 2024APRS semester. We are currently working with the previous successful project teams to get 2023OCTS observations underway in January 2024.

The year in review

Since conducting the first full survey trial observations in November 2022, we have been working to increase our on-sky time and bring all Survey Science Projects into the active observing pool. The telescope itself is working relatively well and can observe efficiently under the control of SAURON. We continue to make small updates that improve reliability and fault tolerance.

However, issues with the Setonix supercomputer have limited our ability to keep up with incoming data. This is something we must solve in the new year if we are to complete the Survey Science Projects on time. Setonix will likely stabilise as it matures through upgrades and operational experience, but we are also investigating other options that could supplement our processing capacity. This includes using CSIRO high-performance computing resources other than Setonix. ASKAP's large raw data rate makes the logistics of processing outside the Pawsey Supercomputing Research Centre challenging, but we may be able to transfer continuum data products off-site without adding significant overhead. We have been able to successfully run the imaging software tools in a container on CSIRO's Petrichor supercomputer, but further testing is required to assess the performance of the full pipeline.

We have started to plan future upgrade pathways for ASKAP, with a view to improving our survey speed as soon as possible. This will likely involve upgrading the low-noise amplifiers in at least some of the phased array feed receivers to increase ASKAP's sensitivity without changing its data rate. Upgrades that increase the number of beams, antennas or the amount of bandwidth will also increase our supercomputing needs, which would only increase resource pressure in the short term. Larger upgrades will be planned to commence upon conclusion of the existing Survey Science Projects, which will give us time to continuously assess research priorities, technology developments and resourcing within ATNF over the next few years.

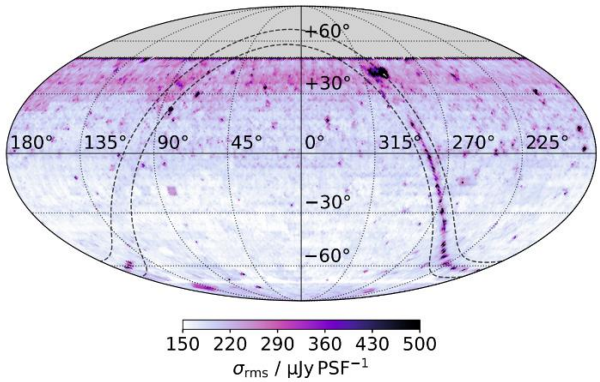

Figure 1: RACS-mid sensitivity map. The primary catalogue has a median RMS noise of 182 µJy/PSF and contains 3 105 668 radio sources. Figure from Duchesne, S.W., et al., 2023, PASA.

Science highlights

As the amount of data released to the public on CASDA increases, the rate of new discoveries and research output continues to climb. This year we have seen a wide range of science results from ASKAP including highlights from the GASKAP-HI Pilot Survey, the discovery of a Fast Radio Burst in an undisturbed galaxy, the coldest star ever observed to emit radio waves, the detection of a possible polar ring galaxy, and further insight into the radio emission properties of massive galaxies.

We have also published two major data releases from the mid-band Rapid ASKAP Continuum Survey at 1367.5 MHz (see Figure 1). Analysis of RACS data continues to improve our understanding of ASKAP's astrometry and flux scale, which should lead to improved calibration techniques.

Post-processing support at Pawsey for Survey Science Projects

For several years we have had a project at Pawsey to facilitate ASKAP post-processing, allowing Survey Science Teams to work on data after it has been deposited into CASDA by the operations-run ASKAPsoft pipeline. The results from the allocation round for 2024 have been released this week, and we were fortunate to receive 10.3 million core-hours on Setonix from a combination of NCMAS and the Pawsey Partners scheme. Survey Science Team members who require access should contact their PI as well as Matthew Whiting.

For further information

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