

ASKAP Commissioning Update, August 2019

In this issue, we report on the commencement of ASKAP pilot surveys, processing and quality control for the Rapid ASKAP Continuum Survey and a new project structure for development and improvements to ASKAP over the next three years.

ASKAP pilot surveys underway

The pilot survey program was designed to test strategies that have been developed by ASKAP's science teams and determine the telescope's readiness for full-scale surveys. 100 hours of time is available for each team to test its own specific strategy and we hope to learn how we might combine these strategies to make the most efficient use of observing time in future.

ASKAP's two headline projects, EMU and WALLABY, have both begun their pilot survey. Observations of EMU's nominated survey region are now complete and data processing is underway. EMU observations highlighted several issues with the telescope's operational efficiency, with the survey taking roughly 3 times longer than expected to complete. These issues will be addressed throughout the rest of the year.

The remaining pilot surveys will be scheduled based on technical feasibility and resource requirements.

We are expecting to receive a new disk array at Pawsey in mid-September, which will provide additional buffer space for raw data and intermediate processing products. One goal of the pilot surveys is to reduce the time between observation and data availability on CASDA, but we understand that some re-processing is still necessary.

The new disk array will help to extract as much information from pilot survey data as possible.

EMU pilot survey processing

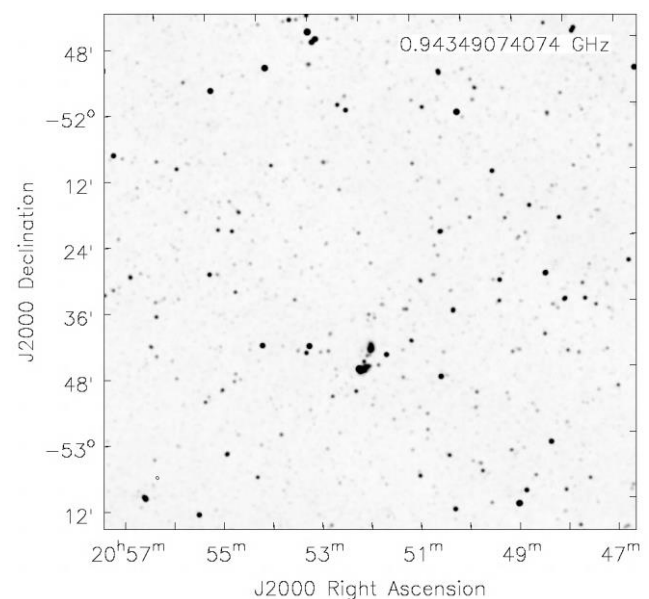
After extensive analysis of the GAMA23 test observations done earlier this year, EMU requested some small changes to the default continuum processing strategy. EMU pilot data will be imaged with a robustness parameter of 0.0, compared with -0.5 from previous tests. Deeper cleaning will also be done to ensure reliable spectral index information is reported. We are also creating an alternate image with a 30" Gaussian taper.

The first EMU pilot survey field has already been imaged and uploaded to CASDA for quality control by the EMU team (not yet released to everyone). Once these checks

have passed, we will proceed with processing the other 9 fields and releasing all the data on the public archive. The noise floor in the EMU pilot images is roughly 25 uJy/beam. Issues with the reliability of beam weight updates and correlator data streaming mean that typically 3 antennas and up to 20% of the bandwidth may be flagged, so sensitivity limits should improve as these issues are resolved.

Previous test observations showed a systematic bias towards more negative spectral index values when derived from Taylor term imaging. Work described in the last newsletter seems to have resolved this issue, at least for sources that have been well cleaned.

Efforts to better understand the telescope's delay calibration requirements have also improved the overall image quality, with early estimates showing a significant reduction in the level of residual artefacts around strong sources.



Small cut-out from the first of 10 fields in the EMU pilot survey

Initial processing of EMU's pilot survey will provide Stokes I and V multi-frequency synthesis images as well as a 1 MHz Stokes I cube for comparison. To determine whether

POSSUM can operate commensally with EMU, we will keep the 1 MHz visibility data and produce Stokes Q and U cubes once a viable method of leakage calibration has been developed.

WALLABY pilot survey observations

The WALLABY science team have identified three fields of interest for their pilot survey. Due to the disk space needed for spectral line mode, we have only been able to observe one of these fields (for a total of 32 hours covering two interleaved footprints) before pausing to process the data and clear the disks.

Processing of the full Eridanus test field has shown that in spectral line mode, some beams are still corrupted. This is likely due to individual fine channels that have been heavily flagged but still contain some unflagged visibilities. ASKAP's flagging routines will be modified to completely flag any such channel. Even so, most beams do image very well and we hope to release results on CASDA soon.

RACS processing refinements

Analysis of the first RACS processing pass identified a need to include additional clean scales for regions containing significant extended emission, such as the Galactic plane. The ASKAP's pipeline has also been updated to include a new pre-flagging stage that identifies instrumental errors such as loss of signal from one antenna using simple statistical analysis. This has been shown to significantly improve image quality on other test fields and should have a positive effect on RACS as well.

After some experimentation, a second full processing run has been launched with updated parameters. Meanwhile, several of the ASKAP science teams have been working on quality control of the unreleased RACS data.

RACS data access policy drafted

RACS has generated significant interest from the astronomical community and we have had many queries about access to the data. While we intend to make the full survey public, we must first check for systematic errors and identify issues impacting data quality. The public data release will include images, catalogues and 1 MHz

calibrated visibilities for each of the roughly 900 fields observed, as well as large-scale mosaicked maps in HiPS format and eventually a full source catalogue. Some of these data products will be released sooner than others.

To assist with the quality control process, we are granting early access to science teams who are willing to validate an aspect of the survey's data quality. VAST are already assisting with flux and astrometry verification and POSSUM intend to assist with polarisation calibration. Other teams interested in joining the effort should refer to the RACS data access policy that [will be available online](#) when released, and contact David.McConnell@csiro.au in the meantime.

New ASKAP project structure

Although the ASKAP construction project has concluded, we recognise that there are still many things that could be done to improve the telescope and deliver additional capabilities. To support these activities, we are about to launch a new three-year project with the goal of improving the reliability of ASKAP's core modes and implementing new modes that will unlock additional capabilities.

This new project will operate using the Scaled Agile Framework (SAFe), combining the efforts of several teams across various engineering domains. Priorities will be set based on science requirements, with requests and feedback flowing through the ASKAP project scientist who will act as product manager for the project.

For the first few iterations, work will focus on improving the stability and reliability of core systems (reducing the amount of data flagged due to system-level issues) and producing science data products that meet international standards and science team requirements.

Additional goals include reducing operational overheads. New features that have been identified as high-priority include splitting the observing band into discrete windows to avoid satellite RFI. Although new features will not be available for pilot surveys, we will provide regular updates on the progress of this new project through these newsletters and the monthly science forum.

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