ASKAP Update, February 2020

In this issue, we discuss progress on pilot survey observations and plans for development of telescope features this year.

Pilot survey observations

During the end-of-year holiday period, ASKAP continued to observe pilot survey fields requested by our survey science teams. Good progress was made on VAST, DINGO and GASKAP pilots, using most of the disk space that was commissioned late last year. All the survey teams should now have a good fraction of their pilot data either in processing or ready for quality control and analysis. The total number of observed (but not necessarily processed) hours is shown below:

- EMU: 100/100
- CRAFT: 72/100
- WALLABY: 64/100
- VAST: 100/100
- POSSUM: 100/100
- GASKAP: 30/100
- FLASH: 46/100
- DINGO: 48/100
- LIGO: 52/100

Processing of the WALLABY Hydra fields is close to complete, following successful upload of Eridanus test field observations to the data archive. These are the first full-scale spectral line cubes, the largest data products that ASKAP has produced. The data archive provides a cut-out service that can be used to extract spectra of individual sources, but this has not been widely tested within the community. It will be interesting to see how scientific workflows develop when direct download of the data is not feasible for most users. Feedback from the community will be taken into consideration when planning future development of the archive itself.

RACS progress

Since the Rapid ASKAP Continuum Survey will be ASKAP's first all-sky data release, great care is being taken to assess the quality of the data and document any unusual features in the images and catalogues.

The flux scale has come under intense scrutiny over the past few months, particularly in understanding how the integrated fluxes of sources compare to previous surveys. Peak flux in the mosaicked images generally compares well with previous surveys, within ~2%. Integrated flux depends on accurate knowledge of the telescope's point spread function, and we have seen that this can vary significantly across ASKAP's wide field of view. Future software upgrades will focus on providing PSF information as a function of direction and frequency, to ensure that integrated fluxes can be accurately calculated from the image products.

SWAG-X progress

The Survey With ASKAP of GAMA-09 + X-ray evolved from an agreement between Astronomy Australia Limited (AAL) and eROSITA-DE. It involves ASKAP observations of the eFEDS test fields to provide multi-wavelength data as an observatory project, of wide benefit to the international community. ASKAP's existing survey teams were consulted to determine the observing strategy, which involves 6 tiles across two bands. Test observations at 888 MHz in continuum mode were completed last year and have now been processed. These will be released via the science data archive after quality control, hopefully within the next month. Spectral line data has also been taken at this wavelength and further observations are planned at 1296 MHz to cover the neutral hydrogen line.

ASKAP system development

The pilot survey process is revealing many ways in which the efficiency of the telescope could be improved. Everything from the reliability of key subsystems and overhead in configuration changes to the way we track our end-to-end workflow will be improved according to experience throughout the year. We will also implement new features to get the most out of future survey data.

ASKAP-X and split band mode

Alongside the many improvements required to deliver high survey efficiency, we have decided to work towards a new feature this year. One of the most requested features is the capability to split the telescope's observing band into two or more independently tuned sections, which can

be used to observe around satellite interference or capture spectral lines separated by more than the instantaneous bandwidth. We plan to implement split-band mode and use this goal as additional motivation to consolidate configuration management and streamline array initialisation in preparation for further automation in future.

A workshop on configuration management was held at the end of January. We developed a plan that includes moving the location of some regularly changing configuration parameters from the facility database into the scheduling block template and creating a new service to merge configuration information from different sources and present a unified interface for configuration access.

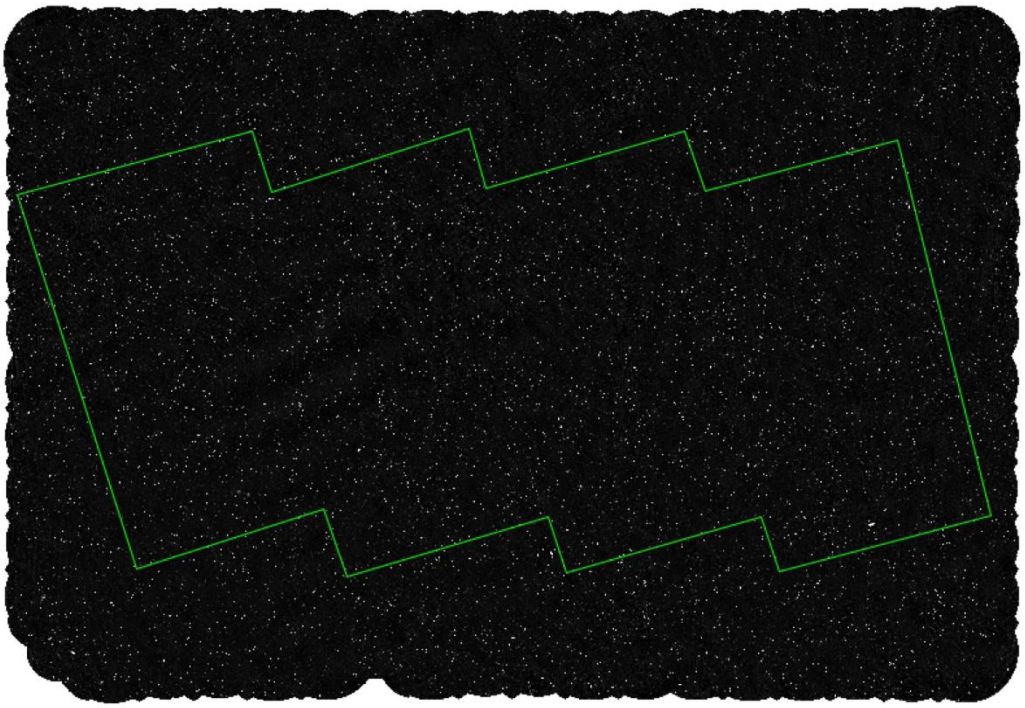
Engineers involved in ASKAP-X are also improving the reliability of auxiliary data capture tasks, used for determining and updating beam weights for ASKAP's phased array feeds and obtaining diagnostic information. The reliability of the PAF control systems and power supplies will continue to be improved as we gain more operational experience with common failure modes.

Work is being done to improve the propagation of errors associated with data capture on the supercomputer, which forms a crucial part of ASKAP's signal chain but exists outside the normal control system domain.

CASDA workflows

ASKAP's science data archive is the main interface for science users and is a key aspect of the telescope. During pilot surveys we have identified a few ways in which the archive could be better integrated with the data processing pipeline and these will be addressed during the next few months.

One of the main issues during pilot surveys is the need to reprocess some fraction of the scheduling blocks. Ideally, we would like to deposit all outputs from the processing pipeline to CASDA and use the archive to provide information necessary for the science teams to perform quality control. However, we have seen that it is not easy to remove or replace data products if the quality control process finds problems. This is because data uploads are immediately integrated with CASDA's global catalogue. After discussion with the CASDA developers we determined that the simplest change would be to delay this integration until data have been released. This means that rejected data products can be replaced cleanly, without impacting the global catalogue.



Preliminary mosaicked image of the 888 MHz SWAG-X continuum data, with eROSITA eFEDS coverage marked in green

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