ASKAP update for October 2021

In this issue we report on the MRO control system server upgrade, Pilot Survey Phase II progress, and validation of SWAG-X observatory project data.

MRO computing system upgrade

During the first three weeks in October, the computing hardware that supports ASKAP's control system was upgraded. This included moving from several independent servers to a new high-availability hardware platform capable of supporting multiple virtual machines. The change of architecture carried a degree of risk due to the large number of simultaneous connections required to support ASKAP's extensive hardware network.

During the first week, existing databases and key files were transferred to the new virtual machines and the latest ASKAP software packages were built and deployed. In the second week, extensive testing took place to verify that all upgraded services were performing normally. This highlighted one unexpected issue with network packets arriving out of order upon the first download of ACM data on a few antennas. Continued investigation of this issue extended the upgrade to a third week, during which we conducted full scale observational tests. The packet ordering issue causes the first cycle of an ACM download to be dropped, but this has little impact on multi-cycle observations of the kind conducted for beamforming. We have therefore resumed normal operations.

Investigations into packet ordering will continue, with a chance that an alternative network adaptor configuration may eliminate the problem entirely. Any necessary changes will be rolled out alongside the regular weekly testing and release cycle to avoid additional downtime.

The correlator data capture servers were also upgraded with new dedicated hardware. The operating system now in use is a newer version of Debian Linux. These changes should keep the telescope running smoothly for several more years, taking us through the bulk of our first large-scale survey period.

Pilot Survey Phase II progress report

Our ability to process existing data was only impacted for a short time (when key databases were migrated) during the upgrade described above. We therefore continued to make good progress, with most teams having received pipeline outputs from at least a few of their quality gate observations. Each Survey Science Team will thoroughly examine these outputs to ensure that they are suitable for the intended science goals.

EMU and WALLABY are working together to refine joint continuum imaging strategies. Previous studies of a WALLABY field with a bright source highlighted a few ways to reduce deconvolution artefacts by using, for example, more self-cal loops. This experience is being merged with EMU's default processing strategy and will hopefully lead to an optimal set of parameters for both teams.

DINGO has noticed that the spectral noise in their Phase II quality gate observation is slightly higher than Phase I outputs, despite a smaller flagging percentage overall. The difference could be due to changes in the interleaving strategy aimed at reducing observing and processing overheads, but more investigation is required.

The first GASKAP-OH full-scale data set is being uploaded to CASDA, demonstrating ASKAP's highest spectral resolution zoom mode in ASKAP's highest frequency band.

GASKAP-HI are awaiting disk space to proceed with their first Phase II quality gate observations while investigating options for processing Phase II science data.

POSSUM, in collaboration with the ASKAP operations team, are in the final stages of testing ASKAP's off-axis

polarisation leakage calibration system and should be ready to begin quality gates soon.

FLASH have finalised a DOI for their Phase I data collection and are now preparing for Phase II quality gates.

VAST, EMU and CRAFT have received Phase II science data, with 4 epochs of the VAST transient search regions complete and available in CASDA.

Holography footprint library

To provide holographic beam measurements for Phase II data processing, we recently conducted several mapping observations for associated footprints. These used three different reference sources for comparison across two different frequency bands.

The new beam maps should allow further processing of the 3-way commensal test field and will determine whether holography primary beam correction is viable for spectral line observations. They are also critical for off-axis polarisation leakage correction.

SWAG-X validation update

After a successful set of re-observations, we now have good data for all the SWAG-X fields across both bands (see Figure 1). SWAG-X DR1 reaches half the nominal depth but covers the full survey area. Both continuum and spectral line data products will be made available.

As part of the quality control process, we have developed new continuum validation code that builds on experience gained during the Rapid ASKAP Continuum Survey. RACS DR1 now provides the most extensive reference catalogue for all ASKAP observations. We can quickly cross-match the main pipeline's selavy component catalogue against the CASDA RACS DR1 catalogue to get an idea of overall continuum image quality.

This work forms part of an ongoing effort to build more checkpoints and quality control into the pipeline itself. These checks will be conducted at key points including determination of the bandpass solution, flagging of the science field, and so on. By detecting problems that could lead to data rejection as early as possible, we hope to conserve precious disk space and CPU cycles.

We have also run several of the SST validation scripts on the SWAG-X outputs. In some cases, these were designed to work with footprints and interleaving schemes different to those used in SWAG-X, leading to unexpected validation products. We will work with the SSTs to better

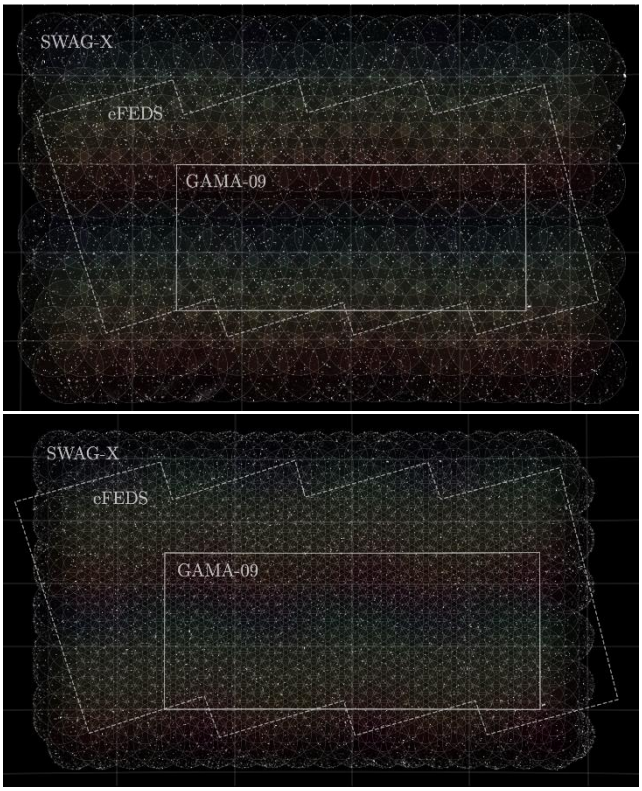

Figure 1: SWAG-X full field images at 888 MHz (upper) and 1296 MHz (lower). Regions covered by GAMA-09 and the eFEDS X-ray observations are highlighted. Images: Vanessa Moss.

link the observing parameters with the validation process in future. For the SWAG-X data release, we will determine which quality reports are an accurate representation of the data and ensure that only these are released on CASDA. SWAG-X observations now span a large time range, with the earliest data in this set having been observed in November 2019, and the most recent in September 2021. There has been a noticeable improvement in data quality over this time, including the removal of spectral ripple due to the on-dish calibration system, and fewer correlator dropouts on average. Some quality issues remain, including small amounts of RFI, and a few beams with less sensitivity than expected.

RACS mid-band progress

Processing of RACS mid-band data continues, making use of CPU cycles between pipeline runs for Phase II quality gate fields. 95% of the survey area has been imaged, with overall quality looking good and more uniform than the first low-band epoch, thanks to improvements in both the observing and processing strategies.

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