ASKAP update for August 2021

In this issue we report on new firmware with improved correlator stability, progress on VAST pilot survey phase II observations, and the recent call for revised survey science proposals.

Improved correlator stability

After extensive testing and investigation over the last few months, the digital firmware team have implemented several changes to address the issue of correlator "dropouts" in ASKAP data. Several likely causes of data stream stalls were identified (although pinpointing a specific cause for individual events has proven difficult) and improvements were packaged into a test build that we have been running on the array for over a week.

ASKAP's control system monitoring database logs instances of detectable correlator alignment problems, but there is another class of "ghost" dropout that has only been visible in the astronomy data. The latest firmware addresses probable causes for both classes, with changes to the data stream alignment mechanism and corner-turn buffer management logic.

Figure 1: Colour-coded monitoring data from ASKAP's control system showing fewer unexpected alignment failures (red blocks) after the test firmware deployment. Date increases to the right for one month, ending on the 9th of August. The new firmware was deployed at the yellow line. Red lines at full height are intentional resets or system downtime.

Monitoring shows significantly fewer alignment failures since the latest firmware was deployed. This means that future observations should experience fewer dropouts impacting groups of fine frequency channels. Inspection of raw data diagnostics post-observation suggests that the frequency of lower-level ghost dropouts has also decreased. Following the successful test period, the new firmware build will be finalised and deployed as a full release for future science operations. This should ensure that pilot surveys phase II data are less susceptible to random loss of frequency channels, greatly improving the quality of spectral line data products. We appreciate the efforts of the firmware team in tracking down these subtle issues and developing solutions!

VAST pilot survey phase II underway

The Variables and Slow Transients (VAST) survey science team were the first to demonstrate readiness for pilot survey phase II observations by releasing all phase I data and passing their quality gate.

Over the past few weeks, we have completed two closely spaced VAST observing epochs, at two different observing frequencies. The low-band epoch consisted of 113 fields and the high-band contained 91 fields, each observed for 12 minutes. A single epoch takes about 3 or 4 days to observe, depending on scheduling constraints. Several more epochs are planned on roughly monthly cadence.

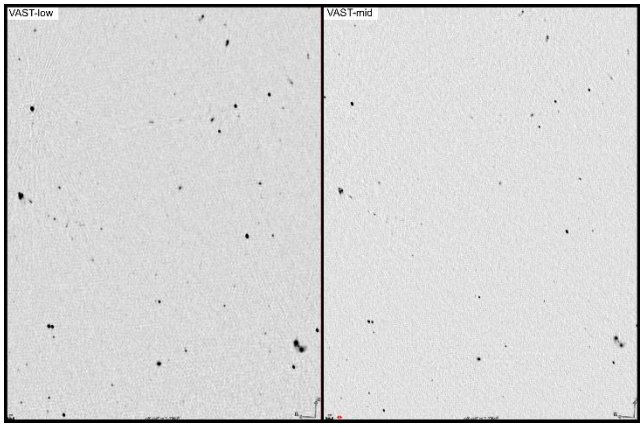

Figure 2: Comparison of a VAST pilot survey phase II field observed at 888 and 1296 MHz. Image provided by Emil Lenc.

The VAST team have collaborated closely with the RACS team (since their current survey modes are very similar) and were able to demonstrate an extremely efficient processing pipeline during the phase II observations. Data processing began almost as soon as the fields were observed, and results were uploaded to CASDA within about a day of the observations completing. All observed fields are now awaiting validation and release.

Early indications suggest that nearly all the observations produced high-quality images. The VAST team will now begin eagerly searching for any transient sources!

This encouraging result demonstrates that ASKAP's processing pipeline can produce prompt, consistent outputs when a well-established processing strategy is employed. Ongoing ASKAPsoft pipeline updates continue to improve job reliability on the Galaxy supercomputer, further increasing overall processing efficiency.

Pilot survey phase II updates and status

The VAST team are now using holographic primary beam measurements in the mosaicking stage, which has improved the flux scale accuracy significantly.

The EMU team has also adopted holography primary beam correction. Their first quality gate observations have been processed and approved for CASDA upload. When these are validated and released, we will be ready to begin observing the associated science fields.

Like most teams, VAST are intending to create higher-level mosaics as value-added data products to recover sensitivity across field boundaries. This is not feasible for operational processing since we do not have disk space to cache the required data and must upload each field to CASDA as processing completes.

VAST uses continuum-averaged ingest mode, which keeps data sizes manageable from the outset. It will be challenging to achieve similar processing efficiency in full spectral resolution mode. The upgraded Pawsey Setonix system should help with this and we will gain more experience with spectral line observations during pilot surveys phase II.

Call for revised survey science proposals

ASKAP's survey science teams were established after an application process in 2009. Since then, the observatory has been working with these teams to ensure we can deliver science-ready data products suitable for the various science cases represented.

Although ASKAP's survey speed and wide field of view are still at the cutting edge of radio astronomy capability, many things have changed in the scientific landscape over the past decade. As we prepare to embark on the full surveys next year, it is timely to review the science cases, proposed survey strategies and their implications for telescope operations.

It should be noted that we are not accepting applications for entirely new surveys or guest science projects at this time, only seeking to refine the existing plans.

One recent concern (perhaps exacerbated by the pilot survey process) has been a shift towards independent observing modes to optimise the outcomes for each SST. ASKAP's initial allocation of 5 years observing time for the first surveys assumed that most observations would be commensal – providing data for all teams from the same survey. Diverging observational constraints therefore increase the total survey time significantly.

Review of ASKAP Survey Science Proposals

CSIRO Space & Astronomy has commissioned a Review of ASKAP Survey Science Proposals (RASSP) – an external panel charged with assessing updated science cases and proposed survey strategies. The goal of this review will be to recommend an actionable strategy that can deliver survey data to all teams on the original 5-year timeline.

While observations are expected to proceed well beyond this initial period, having a well-defined time window is considered important for the purposes of reviewing progress and planning for future telescope upgrades.

Each of the SSTs has been asked to prepare a revised science case and detailed description of their proposed survey strategy as input to the review. Terms of reference were circulated recently, and the revised proposals are due on the 11th of November 2021. The review panel will meet around the end of 2021, with the intention of providing recommendations in time to commence survey operations in March 2022.

Although it is likely that we will not have fully concluded pilot surveys phase II before the revised proposals are due, we will endeavour to provide as much feedback from the latest observations as possible. Phase I has already provided a wealth of experience that can be used to inform the revised proposals.

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