ASKAP update for February 2023

This month we report on survey data processing and validation, ongoing efforts to migrate processing to Setonix, and development activities.

ASKAP full survey operations status

Survey observations remain paused except for time-critical components, while we process the existing data backlog using the Galaxy supercomputer. We are continuing efforts to bring the ASKAP processing pipeline into operation on the new supercomputer Setonix. The necessary software containers and modules are being tested and iteratively rebuilt to ensure that all necessary tools are available to the processing pipeline. Once initial checks pass, the pipeline itself will be tested at progressively increasing scales and across all modes. We have some concerns about the performance of ASKAP's dedicated disk buffer under increased load on Setonix, but additional testing should reveal whether this has any impact on operational efficiency.

SST	Observed	Processing	Awaiting Validation	Released	Rejected
EMU	41	1	8	25	7
WALLABY	10	6	4	0	0
POSSUM	51	7	44	0	0
VAST	348	0	0	318	30
FLASH	9	4	3	0	2

Table 1: Status of scheduling blocks observed since the start of the full survey trial. The first column shows the total number of fields observed per survey, the second column shows the number currently progressing through various stages of processing, the third column shows the number that have been deposited into CASDA, and the final two columns show the number released to the public or rejected. POSSUM products are derived from both EMU and WALLABY observations.

As soon as we have verified essential processing functionality on Setonix and reduced the backlog to a point where new data can flow through the system promptly, we will attempt to resume survey operations for the SSPs that took part in the trial run last November. Setonix will then become the primary processing platform, which should allow sustained survey operations.

Meanwhile, we continue to observe fortnightly epochs for one component of VAST's dedicated transient survey campaign. These observations are processed automatically on Galaxy around other large-scale jobs with minimal human intervention. After multiple epochs, the workflow is well understood and we generally experience a high rate of success, with good-quality data products available for validation in CASDA shortly after the observations conclude. Some blocks fail due to various corner cases in the workflow, but we continue to learn from this experience and make the system more robust.

Supporting additional survey modes

Additional SSPs will be brought into the observing pool once their technical requirements are met, starting with new test observations for GASKAP-OH. Improvements have been made to YANDAsoft that should address velocity correction issues encountered during GASKAP-OH pilot survey processing. These changes will be available to test via the main processing pipeline soon.

We have also made significant improvements to the performance of YANDAsoft's spectral line joint deconvolution code. A few additional features such as traditional visibility weighting and (u,v)-based continuum subtraction still need to be finalised and tested before a full workflow is available, but we have been able to make jointly deconvolved images across all ASKAP beams for a few spectral channels taken from GASKAP-HI pilot survey data. Although the results are similar to those obtained by GASKAP-HI using WSCLEAN, some differences arise when non-natural weighting is used. Once these are understood, we will process a full spectral cube as a final test while proceeding with pipeline integration for this mode. Note that we are not planning to offer joint deconvolution in other modes (such as for continuum observations split across different scheduling blocks) as part of this update. Our priority is to address the GASKAP-HI requirements and then assess other possibilities as part of a future upgrade plan.

Data validation progress

A few of the SSPs have started to validate their full survey data products, with many EMU and VAST scheduling blocks now fully released and ready for general science use (see Table 1). Several EMU and VAST blocks were rejected by the validation teams due to unusually high artefact levels and astrometric offsets. The cause appears to be a combination of an issue with bandpass calibration matching and sub-optimal weather conditions over part of the holiday period. The bandpass matching code has been improved so that aspect of the problem should not happen again. Rejected scheduling blocks are automatically queued for re-observation to ensure that the full sky coverage required for each survey is obtained.

We will continue to monitor the data rejection rate over time to ensure that the telescope is being used as efficiently as possible, and to assess the impact of environmental conditions on data quality. We expect to reduce the rejection rate as we learn more about the telescope, refine its workflow and implement new processing features such as sky-model calibration.

We remind the Survey Science Teams that prompt validation of scheduling blocks (within one month of deposit into CASDA) is a condition of continued survey operations for the associated team, so the observatory can act on feedback to address data quality concerns.

Updates to ASKAP's holography workflow

We have introduced new features into the ASKAP beam weights archive that support creation of special weights for holography – the process by which we measure the shape of beams used for science observations. When deployed and fully integrated, the new features will allow holography observations to be tracked alongside other beam weights and improve our capacity to select the best matching beam map for use during image mosaicking.

We have also updated the holography processing workflow using python Prefect 2. Processing is automatically triggered by the ASKAP CP-manager when an observation completes and can be tracked in real-time via a web-based interface. Holography observations are automatically scheduled whenever a new set of beam weights are created, every few months. This accounts for any variations in the measurement-based beam formation process and ensures that primary beam correction is always done using our best estimate of the beam shape.

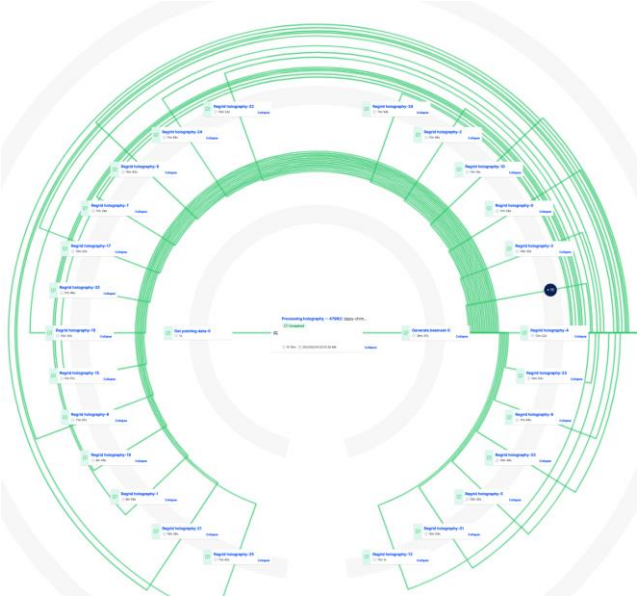

Figure 1: Visualisation of holography processing workflow, showing the task execution pattern.

CRACO commissioning progress

The CRAFT coherent-mode system is entering a new round of testing, with a release candidate correlator firmware build and associated software updates scheduled for on-sky trials this month. Alongside adding commensal coherent fast transient search capability, the new firmware should improve the overall stability of the correlator and reduce the number of spectral dropouts. We have tested several CRACO firmware iterations over the last few months, and continuum mode imaging outputs now seem indistinguishable from the current production firmware. We will need to verify spectral line modes before any final decision is made, since these are where channel dropouts have most impact. If possible, we would like to switch the default telescope firmware to a version that contains CRACO functionality before resuming survey operations, to minimise the potential for future disruption. The new system should be roughly 5 times more sensitive to fast radio bursts than the previous incoherent detector.

CASDA maintenance

The ASKAP science data archive CASDA will be offline for a few hours on the 21st of February, between 14:00 and 24:00 AEDT. During this time, several small updates will be deployed.

For further information

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