ASKAP update for March 2025

This month we report on survey progress, sky model development, PAF prototype progress and further investigations into the impact of the Sun on ASKAP data.

Survey science progress update

We made steady progress on EMU this month with 20 observations deposited and only one rejected. We also deposited 6 new WALLABY observations and released 4 previous observations with no rejections. 16 POSSUM data deposits were released from both EMU and WALLABY observations. Another VAST epoch pushed the number of fields observed for this transient survey above 5000, with less than 1% rejection rate. We also released the first 7 GASKAP-HI full survey observations which over the past few months have been used to refine the intensive processing strategy required to meet this survey's science goals. A productive discussion between GASKAP-HI and the ASKAP Operations team last week identified a path towards conducting future observations based on experience with the initial set of fields, with the intent to add GASKAP-HI to the observing pool as soon as possible and ideally before the end of the month.

SST	Deposited	Awaiting Validation	Released	Rejected
EMU	384	11	293	83
WALLABY	102	5	61	40
POSSUM	485	24	324	142
VAST	5133	273	4820	42
FLASH	280	1	157	122
GASKAP-HI	12	3	8	1
GASKAP-OH	1	1	0	0
DINGO	24	2	19	3

Table 1: Survey progress as of 13-03-2025

DINGO's deep field location will not be above the horizon at night until later in the year. The DINGO team have voiced concerns about the data quality of previous observations, which were challenging to calibrate and show continuum artifacts after stacking several epochs. We will investigate further to determine whether anything can be improved in advance of the next DINGO observing window. FLASH remained in the observing pool but received only one observation due to the constraint of not observing during tropospheric ducting events.

At the recent spectral line working group it was noted that we are still observing with a version of the ASKAP digital firmware that is more prone to dropping occasional frequency channels. This is due to the presence of a more problematic 24 MHz discontinuity unintentionally introduced into the latest firmware version alongside the intended improvements to data flow through the system. Although the issue causing the 24 MHz discontinuity has reportedly been identified and resolved, the firmware build containing the fix does not pass our standard data quality checks for other reasons related to beam autocorrelation inconsistency and therefore cannot be used in operations. We will conduct further testing in the coming weeks to better understand the problems with the latest build.

Global sky model development

The RACS team are working on ways to correct the absolute astrometry of the combined RACS_low3 catalogue so this can be used as the foundation for a global sky model covering all of ASKAP's frequency bands. Finding a suitable astrometric reference that covers the required area at radio wavelengths is challenging, but the team have demonstrated good results using the unWISE catalogue. Infrared data provides the necessary sky coverage and source counts, if we can reliably crossmatch infrared and radio sources.

These experiments are highlighting some of the low-level systematic effects in ASKAP's astrometry as we see some tension between matching the overlapping parts of individual PAF beams to each other or to the reference sky catalogue.

The Global Sky Model will be used to phase reference future ASKAP observations and will therefore act as the fundamental astrometry reference for the telescope.

PAF prototype development

The project to develop a single prototype of a next generation Phased Array Feed for ASKAP is getting underway. The project team is planning a trip to Inyarrimanha Ilgari Bundara, our Murchison Radio-astronomy Observatory, to inspect existing mechanical support structures on the antennas. This will inform the design of the new prototype, since it must be compatible with the existing feed legs. Some of the key improvements we would like to demonstrate using the prototype include better sensitivity (by a factor of 2 to 3) and improved thermal stability, to address one of the main causes of gain variation in the current units. If the future prototype performs well, we will investigate whether it is feasible to upgrade the entire array.

Understanding the Sun's influence

One of the most significant scheduling constraints imposed upon ASKAP is the need to observe spectral line imaging surveys at nighttime. This is due to the presence of long-period ripples in the image and frequency domains which are caused by strong radio emission from the Sun well outside the field of view. During commissioning and Pilot Surveys, we identified zones of avoidance (constraints on angular separation from the Sun and angles that avoid direct illumination of the PAF surface past the edge of the dish) that mitigated these effects. Full survey observations utilise the same zones of avoidance, but interference from the Sun is still present.

On the 13th of March, ATNF hosted a discussion aimed at further understanding the Sun and its impact on ASKAP with a series of talks on solar physics and the Sun's observable radio emission. It was pointed out that solar activity can impact broad emission at large angular scales as well as more compact emission from flares. Subsequent discussion focused on possible mitigation strategies which we will continue to investigate.

ATNF Users Committee

The next meeting of the ATNF Users Committee (ATUC) will occur in Marsfield on the 10th of April. If you have any suggestions or feedback, please ensure it is passed to your ATUC representative before this time or via the ATUC submission form listed on the ATUC website. In addition to the closed committee meeting on the 10th, there will be an open session on the 9th of April in which ATNF staff give updates. This time, there will also be an additional Science Day on April 8th, dedicated to exploring new opportunities and highlighting the Australia Telescope Compact Array's unique capabilities in the SKA era.

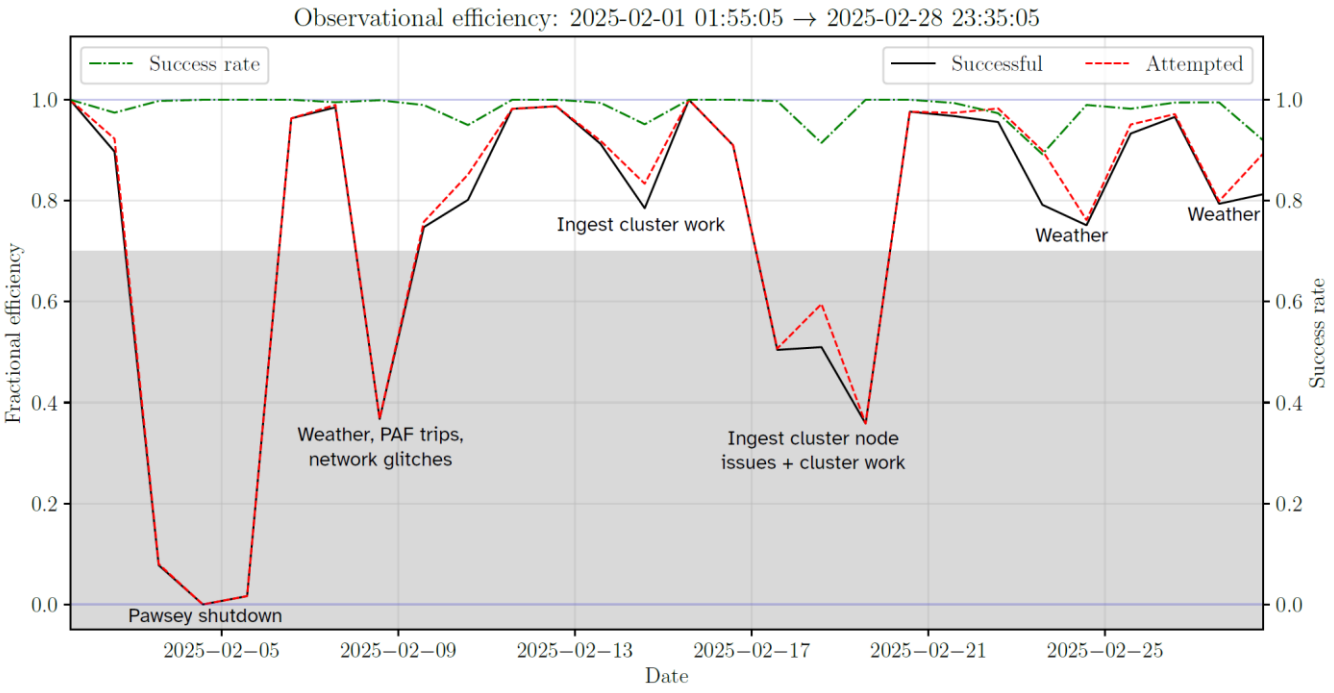

Figure 1: This plot shows the observing efficiency during February 2025 achieved by the autonomous scheduler SAURON, compared to our Key Performance Indicator of > 70% time on sky (the non-shaded region). In this case, significant interruptions have been manually labelled, with the goal of more automatically capturing these interruptions and their impact in future. Figure made by Vanessa Moss.

For further information

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