ASKAP Commissioning Update, April 2019

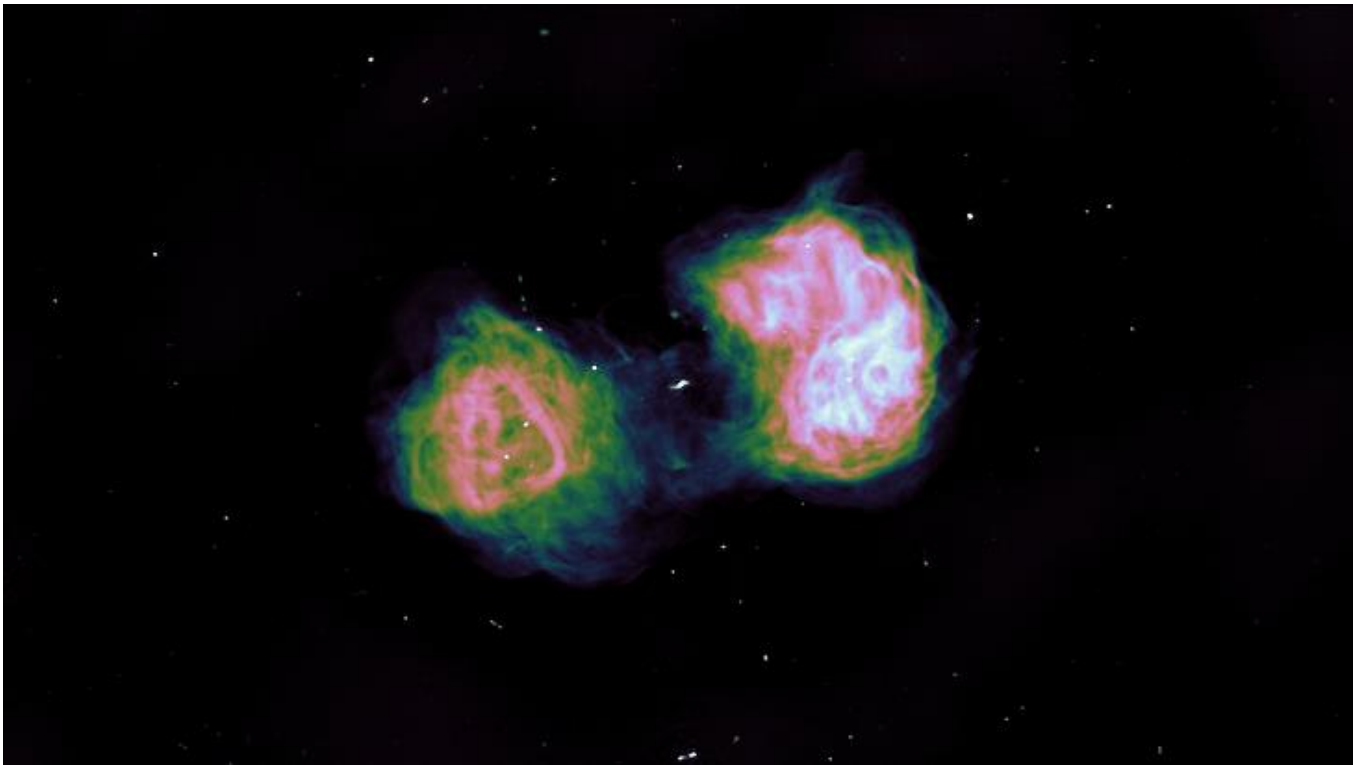
In this issue, we present the first single-beam image made with the full ASKAP array and introduce a set of milestones on the path to beginning survey operations.

ASKAP test observations

Now that all key systems and components have been deployed, ASKAP is entering its final commissioning and testing phase. Over the next few months our goal is to verify that we can deliver science-ready data products to the public ASKAP data archive (CASDA). This will be done using a set of test observations that have been requested by each survey science team.

The test observations represent targets and observing modes similar to what will be used for pilot surveys.

In addition to these science test observations, the commissioning team is running several experiments designed to measure system performance in ways of interest to all users. To link these two domains and provide a clear measure of progress, we have identified a series of milestones on the path to beginning full survey operations. We reported the first of these in the last issue of this newsletter – obtaining "first light" fringes across all antennas in the array. In this issue we present the second milestone, an image of a well-known source using all available antennas in single-beam mode.



This image was made from a single beam observation of NGC 1316 (Fornax A), one of the brightest radio galaxies. It displays the classic "double lobed" shape that we believe arises from oppositely-directed jets of material being ejected from the accretion disk around a central super-massive black hole. This image highlights ASKAP's ability to detect details in extended, diffuse emission. The telescope observed NGC1316 for 10 hours at a centre frequency of 944 MHz with 288 MHz of bandwidth. Situated at the Murchison Radioastronomy Observatory, ASKAP has almost no RFI in this band and very little flagging was required.

This image was made by Emil Lenc using CASA. The bandpass was calibrated using an observation of PKS B1934-638, but no other calibration method has been used. The data were de-convolved using a combination of Hogbom CLEAN and the maximum entropy method. No Taylor terms were used, but some W-terms were required due to the large primary beam size (nearly 2 degrees in diameter). This image contains all of ASKAP's longest and shortest baselines, making the synthesised beam size 12"x10". The noise in the background of the image has an RMS of 25 uJy/beam, which is close to the thermal expectation for robust zero weighting.

New single beam image of Fornax A

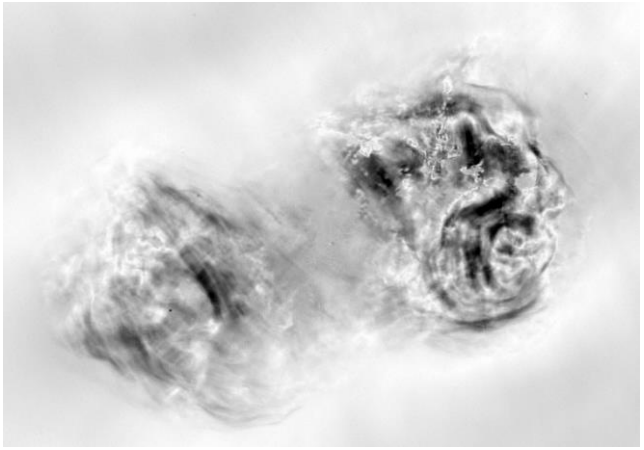
Starting with a single beam is an easy way to check the phase stability of the array and our ability to calibrate and image the large number of baselines now available.

The very first target observed with the full array was the calibrator source PKS B1934-638. Images of the field around this source have since been used to investigate the dynamic range of the telescope, but we realised that it would be beneficial to observe a field with extended emission as well. Observations of a large field containing Fornax A had been requested by the science teams and we decided that Fornax A itself would make a good target for a dedicated single-beam observation.

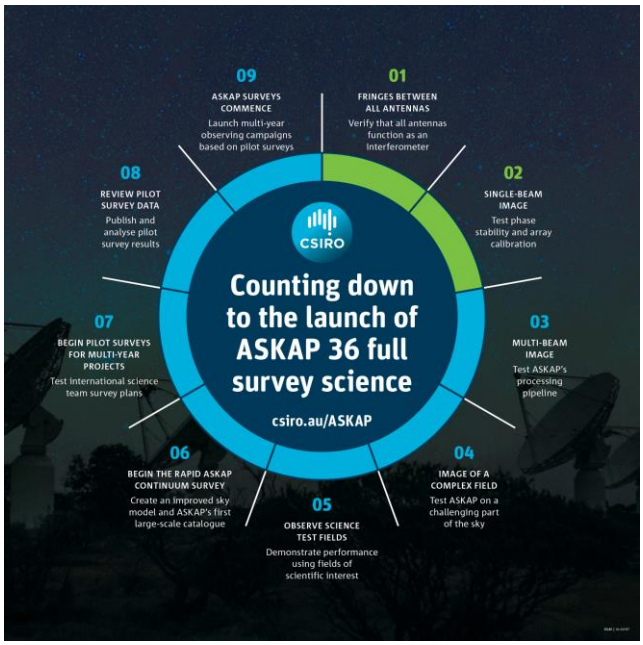
With online averaging to 1 MHz frequency resolution and only a single beam, the visibility data from our 10 hr observation of Fornax A is small enough to be processed using standard tools on a personal computer, providing a useful cross-check of the high-speed imaging pipeline.

Fornax A linear polarisation map

With X-Y phase alignment now performed automatically at beam formation using the ASKAP on-dish calibration system, all data provide useful polarisation information. Craig Anderson, the POSSUM survey representative on the commissioning team, processed the Fornax A data and quickly produced the image below, showing the intensity of linearly polarised emission. This compares very well to published data from the Very Large Array.



Fornax A linearly polarised intensity, made with Hogbom clean and no RM synthesis, Q and U combined in quadrature



Future milestones

The infographic above describes a series of milestones leading to the commencement of the surveys for which ASKAP was designed.

At each milestone we will highlight a particular image, data product or science outcome that demonstrates ASKAP's capabilities. Announcements will be made in this newsletter and on the ASKAP news website.

ASKAP's major survey projects are large, long-term endeavours that will take years to complete. However, we expect that many exciting results will be published while these surveys are underway.

Milestone 3: GAMA23 multi-beam field

For the third milestone, we will be releasing a multi-beam mosaic of the GAMA23 field at a centre frequency of 888 MHz. The observations have already been completed and we are currently refining the imaging parameters before uploading the data to CASDA. Everyone will have access to the images, source catalogues and the calibrated visibility data (with 1 MHz spectral resolution).

Processing the GAMA23 data has required multiple iterations to improve the imaging parameters and arrive at sensible defaults for data from the full array.

CONTACT US

t 1300 363 400
+61 3 9545 2176
e csiroenquiries@csiro.au
w www.csiro.au

FOR FURTHER INFORMATION

CSIRO Astronomy and Space Science
Aidan Hotan
t +61 8 6436 8543
e aidan.hotan@csiro.au
w www.csiro.au/askap