

## ASKAP Commissioning Update #6 February-March 2014

Welcome to the sixth edition of the ASKAP Commissioning Update. This is a regular and informal e-mail report on the progress of ASKAP commissioning including new results and challenges, bugs, releases of new software and availability of test data.

If this edition has been forwarded to you, please sign up to the exploder by sending an e-mail to '[askap-commissioning-request@atnf.csiro.au](mailto:askap-commissioning-request@atnf.csiro.au)' with the message text: 'subscribe'. We hope you enjoy receiving this regular update on the progress of ASKAP commissioning. Do not hesitate to contact us if you have any questions about the project.

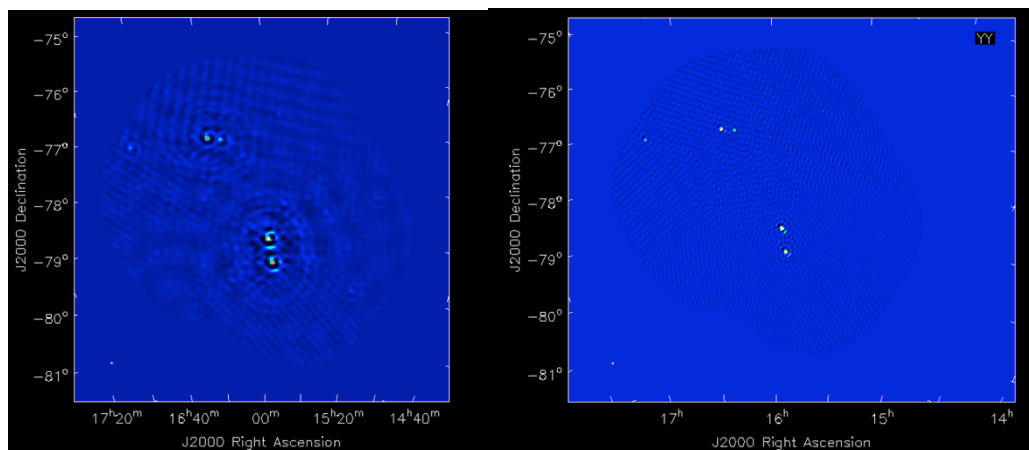
*Ant Schinckel*  
ASKAP Project Director

*Lisa Harvey-Smith*  
ASKAP Project Scientist

### The ASKAP Supercomputer Goes Live!

The ASKAP Central Processor Cray supercomputer housed at the Pawsey centre in Perth went live in January. The ASKAPsoft data processing software has been installed and the computer is now used routinely by the ASKAP commissioning team.

One of its first jobs was the calibration and imaging of commissioning data from two sub-arrays of BETA leading to these images of a calibrator field using antennas 1,3,6 (left) and 8,9,15 (right). Images made by Maxim Voronkov.



## ASKAP Commissioning Status

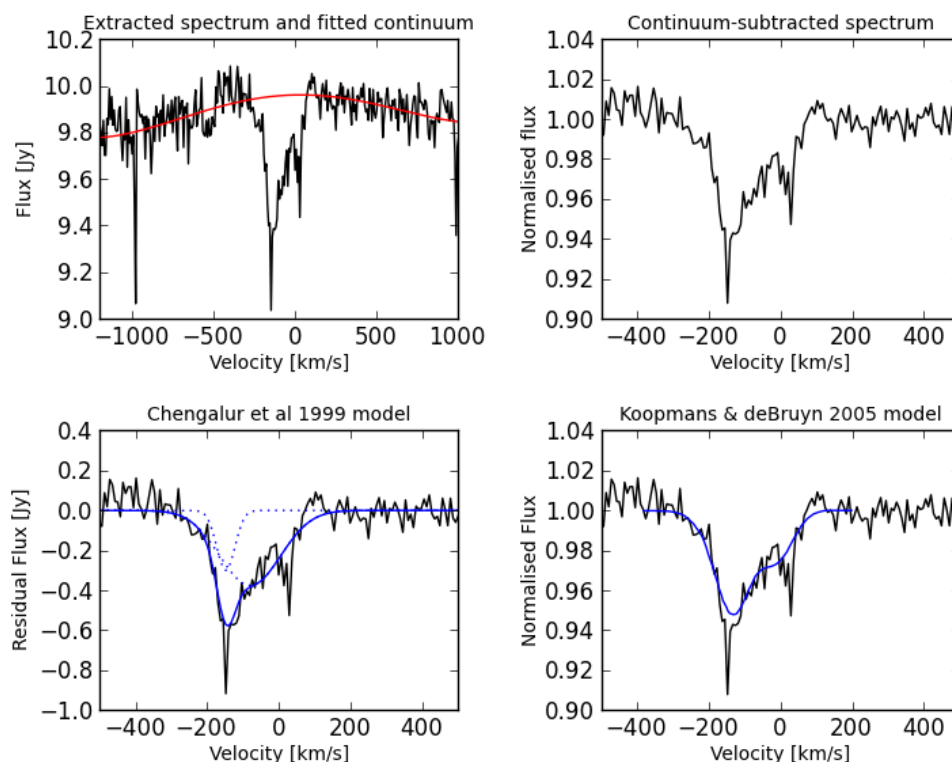
### *Correlator reconfigured for BETA*

Until early February the Boolardy Engineering Test Array (BETA) correlator was configured to give two simultaneous 3-element arrays. In March we reconfigured the system to form a single six-antenna correlator, thus beginning the BETA commissioning phase of the project. The job of re-cabling 384 optical links from the beamformers to the correlator shelves went surprisingly smoothly!

The commissioning team has successfully verified the output of the correlator, which marks the end of basic hardware testing for BETA. The team is now carrying out the first astronomical observations using BETA as a 15-baseline array.

### *Spectral Line Image Cube Released*

The first result from BETA commissioning was from an approximately 6-hour observation of PKS 1830-211, a gravitationally lensed galaxy at a redshift of  $z=0.89$ . The absorption spectrum is displayed in the figure below, and compared with observations from other telescopes.



*ASKAP Boolardy Engineering Test Array spectrum of PKS 1830-211, compared with observations from other telescopes. Image made by Matt Whiting.*

The BETA spectral line image cube is available to download here:  
<http://www.atnf.csiro.au/projects/askap/data/BETA/1830cube.fits.gz>

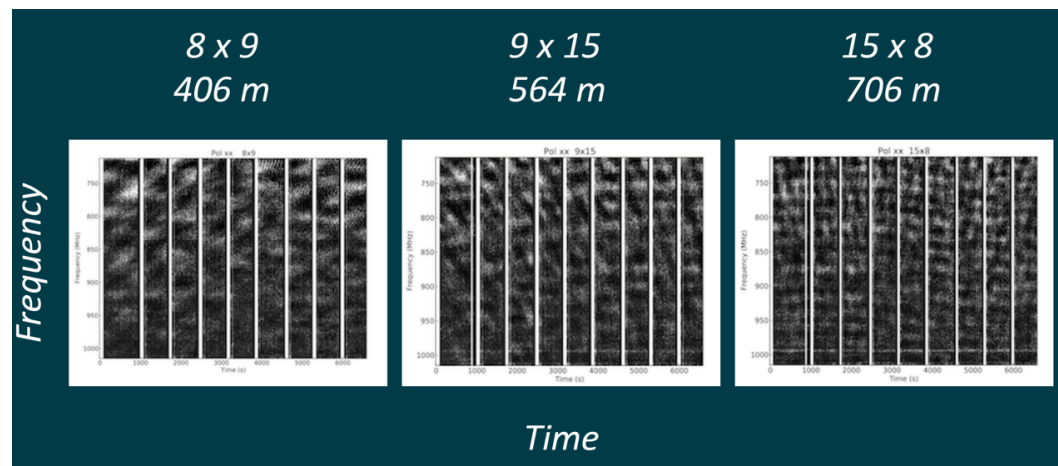
Information about the experiment is available here:  
<http://www.atnf.csiro.au/projects/askap/data/BETA/README>

Meanwhile, members of the ASKAP Commissioning and Early Science (ACES) team are gaining experience with the ASKAP Central Processor at the iVEC Pawsey Centre and writing visualization software for BETA, to ensure that commissioning scientists have access to visibility data in real-time for monitoring purposes.

### *Other Commissioning Experiments*

The ACES team is investigating the effect of having several (potentially bright) sources in the primary beam of the telescope. The figure below (made by Dave McConnell) shows results from observations of the calibrator B1934-638 in XX polarisation. We see an interference pattern traceable to three bright sources in the adjacent sky (69.5, 92 and 102 arc minutes from 1934-638).

This confirms that the nine beams are reasonably stable and it provides an explanation for features in the bandpass that had been noticed during commissioning observations. Both polarisations products look very similar. The next step will be to characterise the response of the PAF to the sun during daytime operation, which will inform the survey strategy for major ASKAP science surveys.



*Observations of the calibrator B1934-638 in XX polarisation using antennas 8, 9 and 15 of ASKAP's Boolardy Engineering Test Array. Bright sources in the primary beam contribute to the 'striping' seen here.*

### **CSIRO hosts the 8<sup>th</sup> CALIM workshop**

The 8th SKA Calibration and Imaging Workshop was held in Kiama, NSW, from 2–7 March. Maxim Voronkov from CASS chaired the organising committee. About 45 participants from around the world attended, with nine from CASS, seven from other Australian institutions; other major delegations included visitors from South Africa, the Netherlands and UK.

Updates were given on ASKAP, the LEDA experiments and the SKA design progress. Technical topics included pipelines, PAFs, beamforming, imaging, primary beams, compressed sensing, data compression, calibration and the ionosphere.



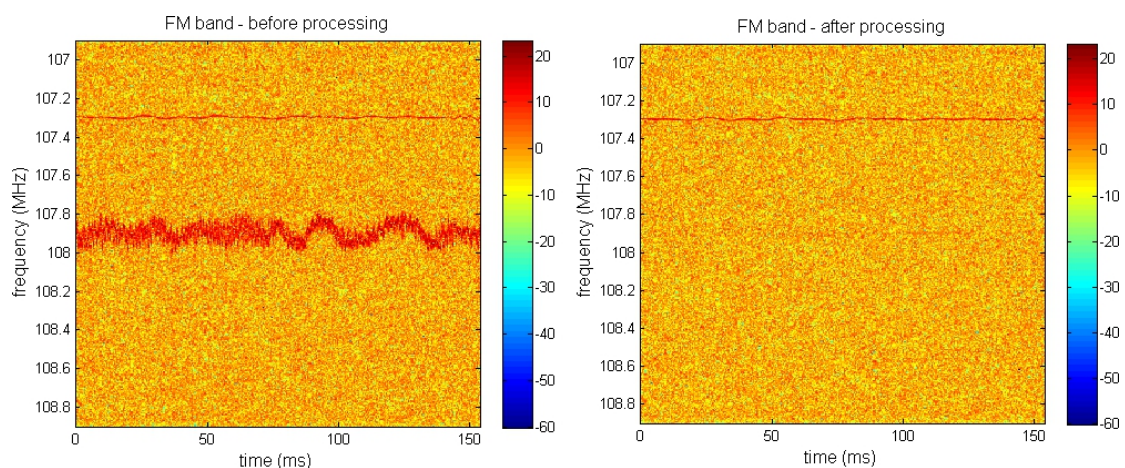
Maxim Voronkov speaking at the 8<sup>th</sup> CALIM workshop

The focus of the talks was quite broad, ranging from pure theoretical results, to tutorials on new algorithms real-world measurements of implementations of different algorithms on a range of hardware. Most talks were streamed live and are available to watch on YouTube. You can see the summary talk (starting at 3min) here: [https://www.youtube.com/watch?v=ZhMb5l\\_iTjk](https://www.youtube.com/watch?v=ZhMb5l_iTjk)

## RFI Mitigation with Phased Array Feeds

Gregory Hellboug has joined the ASKAP team as a CSIRO OCE postdoctoral fellow. Greg's work will focus on designing and testing new algorithms to actively mitigate RFI from moving interferers such as satellites using phased array feeds.

Three weeks ago, a new 3.7m reference antenna was installed as part of an experimental setup at Parkes to test new techniques for actively mitigating satellite signals using the phased array feed on the 12-m patriot antenna. Greg hit the ground running and his algorithm was cancelling FM signals on the first day of the project! Watch this space for some exciting results.



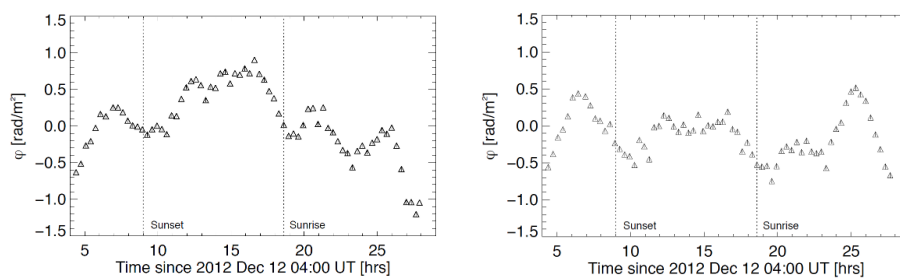
Early test results from RFI mitigation tests using phased array feeds, showing successful mitigation of FM band signals at Parkes.



### Tony Willis visiting from DRAO

Tony Willis is visiting CSIRO for 3 weeks as a Distinguished Visitor. He is working with Ian Heywood to simulate the polarization and pointing responses of ASKAP using the MeqTrees software.

With the POSSUM (Polarization Sky Survey of the Universe's Magnetism) science survey team, Tony is also investigating methods to implement ionospheric calibrations for ASKAP. Once a suitable method is tested and verified, the ASKAP computing team aims to incorporate this into the ASKAP data processing pipeline.



*A 24-hr observation of PKS1903-80 made with the ATCA in December 2012. Left: deviation from the mean of the observed Faraday Rotation Measure (RM) as a function of time without any ionospheric correction. There is clearly a systematic trend with the RM decreasing (the more negative the RM the larger it is) from day to night and then later an increase from night to day. The second plot shows the RM after application of a correction for the ionosphere using the software being developed for ASKAP. There is a significant decrease in large-scale RM variations. Data reduction was carried out by Shane O'Sullivan.*