

## **ATNF ATUC MEMORANDUM**

**To:** ATUC  
**From:** Warwick Wilson  
**Date:** 19 October 2006  
**Subject:** Technology development report

### **Mopra mm-wave system**

The combination of the new MMIC-based mm-wave receiver and the new wideband spectrometer (MOPS) has introduced a new and exciting era for Mopra observers.

Frequency coverage is now approximately 16 to 27GHz and 77 to 116GHz. An 8GHz bandwidth can be observed, with approximately 32,000 channels across the band. Alternatively, one can select up to 16 zoom bands within the 8GHz, with each zoom band covering 138MHz with 4096 channels.

The system has been working very well, although some issues concerning the calibration of MOPS data are yet to be fully resolved.

### **7mm ATCA Upgrade**

The spare ATNF mm-wave receiver was outfitted with a prototype 7mm insert and installed on antenna 6 in August. The main aim of this exercise was to obtain a measure of G/T at 32GHz to test our ability to meet the specification required by NASA for spacecraft tracking. With a measured receiver temperature of around 30K at 32GHz, the G/T of antenna 6 was found to be slightly better than the value required of each antenna to meet the specification for the array. In view of the fact that antenna 6 has perforated outer panels and its surface accuracy and optical alignment is known to be inferior to the other five antennas, there is good reason to be confident that the final array G/T specification can be achieved.

Measurements on the prototype 7mm receiver indicate excellent performance over a 30 to 50GHz band, with measured receiver temperatures of less than 35K and LNA gain of greater than 45dB over the entire band. The project is on schedule for the installation of the complete 7mm upgrade by May 2007.

### **MNRF2001 – ATCA Broadband Upgrade (CABB)**

Manufacture of the first prototype of the final CABB signal processor board has been completed and initial tests are proceeding. These indicate that there are no major errors in the design, which is an excellent result for such a complex board. The next step will be to test the complex signal processing firmware in the board. A second board will now be completed so that a full test of inter-board data paths can be carried out.

Initial tests of the data transfer system have been completed, with successful transmission of 40Gb/s data from a CABB sampler, via a four-colour wavelength division multiplexed optical data path over 4Km of fibre. This represents the full data rate for one of the four IF signals from an antenna. A full test of a prototype data path, from the IF conversion system to the digital filter bank, is planned for November.

### **Pulsar Digital Filterbank for Parkes**

This project builds on the experience gained in the development of digital filterbanks for the CABB project. The aim is to develop a 1GHz bandwidth, multi-channel spectrometer/polarimeter with sufficient time resolution to resolve the fastest ms pulsars.

The pulsar digital filterbank will make use of a number of the components designed for CABB. These include the sampler, the RTM interface board and the signal processor board. These units are now being manufactured and integrated. Installation of the PSRDFB at Parkes is now likely to occur in January.

### **Parkes 13mm receiver**

Work is proceeding to plan on the construction of a new 13mm receiver for Parkes, covering the frequency band 16 to 26 GHz. The mechanical design of the receiver package is complete and the fabrication of parts for the dewar and cold hardware is under way. This includes the dewar tub, top plate, bottom plate and cold straps. Manufacture of the receiver frame is complete. The receiver is due to be completed and installed at Parkes in November 2007.

### **Parkes 21cm multibeam receiver refurbishment**

The second and last stage of refurbishment of the 21cm Parkes multibeam receiver will begin in November 2006, two years after the first stage was completed, and almost ten years after its initial installation. The remaining original LNAs will be replaced with units produced at ATNF. New and more powerful cryodyne refrigerators will also be installed.

Re-installation is scheduled for April 2007, although a delay of a few weeks in removing the receiver may impact this.

### **ATCA cm-wave receiver upgrade**

A project has been activated to upgrade the ATCA 20/13cm and 6/3cm receivers to make full use of the wide bandwidths offered by CABB. New broadband LNAs will be developed for the 1 to 3GHz and 4 to 10GHz bands, and a new conversion system for the 20/13cm receiver will be built. In addition, the 20/13cm polarisers will be modified to improve the polarisation properties of the 13cm band. The new polarisers and conversion systems will be installed in time for the switchover to CABB in mid-2008. Depending on progress made in the design of the wideband LNAs, the final broadbanding of the receivers may not be completed before mid-2009.

### **eVLBI**

Following the installation and commissioning of the 1Gbps links between ATNF sites, the first real-time eVLBI test between ATNF antennas, i.e. without disk buffering, was successfully carried out in August. The Swinburne software correlator was ported to a machine at Marsfield for these tests, since the 1 Gbps link to Swinburne was delayed. This demonstrated the flexibility and portability of the Swinburne software correlator.

LBA correlator operations have been formally outsourced to Swinburne from 1 October 2006. Swinburne will manage all disk and S2 correlations, and the transition to full disk operations.