

ATNF ATUC Memorandum

To: ATUC
From: Warwick Wilson
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Subject: Current Projects - Technology Development Report

5.1 Current projects

MNRF1997 – 3/12mm systems

Construction of the new Mopra MMIC-based 3/12mm receiver is proceeding, with installation scheduled in September. Extensive testing of the new 85-115GHz LNAs and modified RF/LO chains indicates that a considerable improvement compared to the ATCA 3mm systems will be achieved. Good performance up to 115GHz is expected. The fabrication of a set of spare components for the ATCA and Mopra 3/12mm receivers will be completed by July.

A set of 16MHz filters will be installed in the second frequency channels on the ATCA in June. This will allow dual frequency observations at 16MHz bandwidth, a feature requested particularly for measurements at 3mm.

MNRF2001 – ATCA Broadband Upgrade (CABB)

A design for the LO/conversion system in the antenna has been chosen and work towards the construction of a prototype is proceeding. This will be a simple single conversion scheme, selecting a 2GHz band from a 4 to 12GHz RF/IF signal. The LO, in the range from 8 to 14GHz, will be distributed on fibre from the central site in a similar system to that used for the mm LO reference signal.

The prototype sampler PCB has been tested and found to operate at the required sampling rate. Some problems were encountered due to the fact that the multiplexer chips did not perform to specifications, a fact acknowledged by the manufacturers. A second prototype, using the latest, improved, chips is now being designed and will be sent to fabrication in early June.

The broad outline design of the prototype photonic data transmission system is complete and prototyping is under way. A DWDM system will be implemented, using 10Gb/s data paths on four colours and four fibres to achieve the required 128Gb/s data transmission rate from each antenna.

The design of the prototype DFB PCB has been further delayed, mainly due to problems with the auto-router, which proved to be not up to the task. In the end, all routing was completed by hand – an arduous and time-consuming task. The PCB has now been sent out for manufacture. Testing is expected to begin in July. It is likely that the layout task for future iterations of this PCB will be out-sourced.

FPGA based FFT cores have been developed and successfully tested.

The problems in completing the CABB prototype DFB hardware have resulted in further delays in the installation of the Mopra 8GHz Spectrometer. The current aim is to have the first 2GHz sub-band of the spectrometer operating at Mopra when the MMIC-based 3/12mm receiver is installed in September. Final installation of the full 8GHz spectrometer is expected in May 06.

MNRF2001 – MMIC Development

InP MMICs

Designs for the final InP fabrication run in the EU Faraday project collaboration were submitted in April 2005. Circuits to be included on this run include production quantities of the 7mm LNAs and mixers and 1-3GHz and 4-12GHz LNAs for a possible upgrade of the ATCA cm receivers. Cooled tests on a packaged 7mm LNA MMIC revealed excellent performance over the band 30 to 50GHz.

Integrated Receivers

The RF-CMOS integrated receiver MMIC design, containing RF test structures, was submitted for fabrication in April. Wafers are expected to be returned in July.

6GHz Multibeam Receiver for Parkes

Most of the large mechanical components for the dewar have now been delivered. The exception is the feed assembly, which is currently being fabricated in the ICT antenna workshop.

RF and thermal tests have been completed on a single cooled feed/coupler/polariser assembly with excellent results. Antenna range tests of the cooled feed will proceed next week, after which the first Jodrell Bank LNAs will be added for a complete test of the RF path.

The down converters for the initial single frequency system have been delivered from Jodrell Bank.

Work is proceeding to schedule for the planned installation at Parkes in October.

Pulsar Digital Filterbank

The prototype 256MHz bandwidth pulsar digital filterbank is undergoing final tests at Marsfield. It is due to be installed at Parkes in mid-June. It will provide a higher time resolution on ms pulsars than is currently available with the wideband pulsar correlator. The final 1GHz bandwidth system is due for completion in November.

SKA Site Testing

The RFI Long-term test program at Mileura has been proceeding since January. An initial calibration script has been written and a basic comparison has been made of the RFI environments at Marsfield, Narrabri and Mileura.

The international measurement team has delayed their planned arrival until August. Measurements made by this team will be crosschecked with the Australian measurements to ensure compatibility.