

ATNF ATUC Memorandum

To: ATUC
From: Jim Lovell
Date: 2005 June 3
Subject: Tidbinbilla report

1. 70m Observing statistics for Jan to July 2005.

Currently there are 8 active proposals and observations have been completed for 2 of these. Three proposals are for zero-spacing maps to support ATCA observations. A status summary of proposals is available on the ATNF web pages and is regularly updated.

Between January and July 2005, a total of 441 hours was allocated to radio astronomy activities on the 70m. Of this, 280 hours was allocated for Host Country (ATNF) use, the remainder being used for a water megamaser survey lead by Lincoln Greenhill, and for NASA-scheduled VLBI experiments. The 280 hours of Host Country time was used as follows:

- VLBI (LBA): 40 h
- Spectroscopy: 240 h

2. 70m Antenna Maintenance.

From July 18 until January 2006, the 70m will undergo maintenance on the azimuth bearing and the antenna controller hardware will be upgraded. No observations will be possible during this time. Tidbinbilla proposals submitted for the 2005APRS deadline will remain active for 18 months rather than the usual 12 to compensate.

3. Tidbinbilla Support.

In order to spread the support load it has been proposed that a few Tidbinbilla DAs be appointed to help carry out service observations and other support work. As an initial step, Erik Muller will be spending some time on Tidbinbilla support this year.

4. Development.

The most limited resource at Tidbinbilla is observing time, granted to us by NASA. Therefore development work is aimed at getting the most science out of the available time by improving observing efficiency. In the past, this work has included increasing the instantaneously accessible bandwidth to allow more spectral lines to be observed simultaneously and improving the observing software to reduce overheads.

There are two main development tasks currently underway. The first is an implementation of on-the-fly (OTF) mapping. This will improve the efficiency of mapping and antenna pointing measurements over the current point-by-point method. The second is an upgrade to the 12mm system on the 70m from one to two channels. The upgrade will allow dual polarisation observations, improving sensitivity by a factor of $\sqrt{2}$ and halving the integration time required to reach a given sensitivity limit.

- **OTF Mapping.**

As reported at the last ATUC meeting, attempts to implement OTF mapping have proved unsuccessful to date due to limitations in DSN software. The software updates that will be necessary as a result of the 70m upgrade may allow OTF mapping to be achieved. We are also looking into alternative methods that may allow OTF mapping and do not require the DSN software.

Meanwhile, tests of gridded mapping have recently been carried out. Observations of a 5x5 grid in support of Cormac Purcell's proposal T014 have been combined with ATCA data and have demonstrated that mapping is possible in this mode. The procedure for reducing this type of data has been

documented and will be made available to users.

- **12mm dual polarisation upgrade.**

With the help of Graham Moorey, the upgrade of the 12mm system from single to dual channel is progressing well. A schematic of the second signal path has been prepared and the necessary components required are being obtained. Installation and testing will be carried out during the 70m downtime and it is expected that dual polarisation observations will be possible when it returns to service in January.

5. **34m beam-waveguide antenna DSS34.**

For many years NASA have been allocating observing time on the 34m antenna DSS45 as well as the 70m. DSS45 is restricted to the 3 and 13cm bands only and therefore there has been no interest in using this antenna as a single dish. Also less time is allocated than on the 70m (about 60h per year). However it has been used for some continuum VLBI observations.

Earlier this year a co-axial 8.4 and 32 GHz system was installed on the 34m beam-waveguide (BWG) antenna DSS34. The main purpose of this new system is spacecraft tracking but it may also be of some limited use to radio astronomy. Also the design of the antenna permits the installation of many more receiver systems and room has been set aside for radio astronomy. With the upgrade of the ATCA and Mopra to 7mm systems, a similar capability at Tidbinbilla will be important for LBA observations in this band. (It is worth noting that the DSS34 is designed to work up to frequencies of 100 GHz with the inner 26m diameter illuminated). Therefore a request has been made for the DSN to switch radio astronomy allocations from DSS45 to DSS34.

A further advantage of this switch is that the antenna controller on DSS34 is of the same type to be installed on the 70m. Therefore the 70m downtime can be used to update and test observing software, including OTF mapping, on DSS34.

At this stage, given the need for test time and the likely limited scientific usefulness of the 32 GHz system, there are currently no plans to offer the 34m to users. This issue will be revisited after the 70m downtime when ATUC may wish to consider whether users would like access and if the installation of additional receivers is desirable.

Specifications of the 32 GHz system on DSS34 are as follows:

- Frequency range: 31800 to 32300 MHz
- Dual polarisation (RCP and LCP)
- 60% aperture efficiency
- Beam FWHM = 61"
- Tsys above atmosphere = 23 K. Typical Tsys with atmosphere = 30 K.
- SEFD = 160 Jy. (Compare to an expected sensitivity of 5 ATCA antennas at 32 GHz of 150 Jy).

6. **Miscellaneous**

A new web-based sensitivity calculator is now available to help in proposal preparation. It can be found on the Tidbinbilla page on the ATNF site <http://www.atnf.csiro.au/observers/tidbinbilla>.