ATNF ATUC MEMORANDUM

To: ATUC

From: Jim Lovell

Date: 4 June 2004

Subject: Tidbinbilla Report

1. 70-m Time Allocation

Period	Service Spectroscopy	VLBI	Greenhill et al Megamaser Survey (DSN Proposal)	Other (time lost or testing)	Total
2003	221 (3.3%)	81 (1.2%)	331 (4.9%)	98 (1.4%)	731h (11%)
2004 to date	126 (3.5%)	43 (1.1%)	51 (1.4%)	18 (0.5%)	239h (6.6%)

- 12 active proposals
- Service spectroscopy observations are a factor of 2 to 3 oversubscribed

2. Development Work
Currently the 12mm system is restricted to a single polarisation with a maximum bandwidth of 64 MHz per IF (up to 2 IFs). The 18 to 26 GHz band is restricted by fixed 600 MHz filters at the input to the downconverter. There are three filters at present which cover 19.91-20.51 GHz, 21.78-22.38 GHz, and 23.61-24.21 GHz. Up to three more filters could be obtained and installed if requested by observers.

Work is under way to improve the efficiency of the observations by changing software to reduce the overheads between scans from ~50% to ~20%.

It was hoped that by now a second downconverter would have been sent from JPL and installed, permitting dual polarisation observing. There have been delays at JPL in testing and the expected arrival date is now late 2004. More 600 MHz bandpass filters will be needed to for the second polarisation. Filters are currently available to permit dual polarisation observations in the 21.78-22.38 GHz, and 23.61-24.21 GHz bands.

New bandpass filters have been purchased to increase the instantaneous available bandwidth 70 MHz to 280 MHz. This allows more transitions to be observed simultaneously

<u>Mapping/Scanning</u>
ATNF has investigated the possibility of implementing a scanning mode on the 70-m. This would significantly reduce the observing overheads compared to point-by-point observing modes. Test observations indicate that scanning in Az, El, xEl, RA, Dec and xDec is possible.

New antenna control software will need to be written and tested. At the next milestone the system will be able to scan a region of sky while collecting data from the correlator. This milestone has slipped to early June due to other commitments. The feasibility of a spectral-line scanning/mapping mode will be reassessed after this milestone.

Total power mapping is a more difficult problem. There are a couple of issues. First, internal gain variations require a Noise-Adding Radiometer (NAR) at 12mm. For this we need a small (~1K) noise diode and a means of modulating it. Neither is available at the moment but a NAR is on JPL's development plan for DSN radio astronomy. Second, sky subtraction is an important issue. The 70-m is equipped with a 12mm off-axis feed and, when the second downconverter is installed (hopefully this winter) we will be able to take total power data from the on and off-axis feeds simultaneously. Questions still to be answered include: how well the shape of the off-axis beam matches the on-axis?; Is it possible to map extended continuum sources when the off-axis beam is also seeing the source? It is likely that the final system will be able to make good continuum flux density measurements of compact sources in the future but unlikely to be able to do a good job on extended objects.

3. Resources
   ATNF provides 0.5 FTE for radio astronomy observations at Tidbinbilla. This limits the level of support somewhat below the amount of available 70-m time and provides for a modest amount of development work. More resources will be required if all available time is to be used and if the level of development work is increased.

   ATNF allocate a budget of $6000 per year for support of Service Spectroscopy. This provides support for visiting observers, small hardware upgrades and some computing supplies.

4. Future Possibilities
   ATUC should be aware that the possibility exists to upgrade and install new equipment and obtain access to other antennas at Tidbinbilla.

   There is space on the 70-m antenna for additional receivers. For example a 6cm or 2cm (12 - 15 GHz) system. The present 18cm system is limited to 1.60 – 1.70 GHz and LCP only. An upgrade to dual polarisation and a wider bandwidth would make this system more useful.

   The 34-m beam-waveguide antenna is the newest large antenna to be built at Tidbinbilla. Currently we do not have access to it for radio astronomy but this could be negotiated with JPL. A 32 GHz system is soon to be installed on the antenna for spacecraft tracking (31.86 – 32.08 GHz, LCP, Tsys ~24K, 3 Jy/K). The antenna will also operate at wavelengths as short as 3mm. The possibility exists to use existing receivers or install new ones.