ATNF ATUC MEMORANDUM

To: ATUC

From: Tasso Tzioumis

Date: 25 November 2005

Subject: VLBI report - LBA Operations & eVLBI

1) Operations

In the past 6 months there was only 1 VLBI session, 1-6 November 2005. No major technical problems were reported from any observatory, although some observations were affected by high winds at many telescopes. The high winds also resulted in some loss of power at Hobart.

The next VLBI observing session is scheduled for 9-17 March 2006.

Starting in the OCT2005 observing semester, the disk-based VLBI recording system has been officially offered as a National Facility observing mode. Correlation will be done on the Swinburne software correlator. Available time is restricted primarily by the expense and availability of disk units.

There are problems with an H-maser at Narrabri, the H-maser at Ceduna and the H-maser at Mopra. All these will need refurbishing and arrangements are in progress to bring a team from Russia to refurbish the H-masers. This may not be possible by the March 2006 VLBI run but alternative arrangements will be made to support these observations.

2) VLBI tests

a) Real-time fringe testing

Real-time fringe testing using the disk systems has now been implemented at all antennas. Fringe tests are routinely performed for every LBA observational setup. This has greatly increased the reliability and robustness of the LBA network.

b) mm-VLBI fringes

At the end of August the first mm-VLBI tests in Australia were performed between Narrabri and Mopra. Fringes were detected very quickly using the real-time fringe testing machinery on the Swinburne software correlator. These tests used the old SIS receiver at Mopra and it is planned to repeat the tests with the new mm receiver.

c) NZ VLBI tests

Some test observations between Australia and NZ were done in May, July and November. The antenna in NZ is only 6m diameter, operating at 1650 MHz. The NZ VLBI hardware was extensively tested at Hobart and Parkes and performed well in all these tests. Fringes were eventually found using the Swinburne software correlator after integrating for a few minutes. This demonstrated the feasibility of VLBI to NZ but also highlighted the fact that a more sensitive antenna is needed.

d) Spacecraft Navigation

After the Huygens success last January, interest in spacecraft navigation using VLBI has been maintained. Tests are planned with the Japanese and

discussions have been held with NASA at JPL. NASA is interested in developing better tracking facilities in the southern hemisphere. We have agreed to start low-level feasibility tests, which may lead to substantial future collaborations.

3) eVLBI Project

a) Fast network connections

The broadband links to the telescopes were funded by CSIRO in mid-July. The funding formula provides for equal sharing of the ~$2M cost between CSIRO IT and ATNF over the next 15 years, and it will cost ATNF about $150k per year. This project would lead to 1 Gbps links in 2006 and facilitate 10 Gbps links in a few years.

Work on the "last-mile" fibre connections to the antennas has begun. The Parkes work has been delayed by wet weather but is expected to be completed early in January. The Mopra and Narrabri connections are in progress and should be in place before the end of the year, with testing and commissioning in January.

Contracts for lighting-up the fibre "backbone" had some delays, but now a contract is in place with Cisco. The target date for completion is 30 January 2006 and work has already commenced.

Overall, it appears that the network should become operational around February 2006. Tests are planned near the VLBI session in March.

b) Disk-based recording

New computer systems for VLBI recording have been acquired for all antennas. These have been thoroughly tested and commissioned at most antennas in time for the November 2005 VLBI session. The same systems will be used for connections to the fast network when it becomes available.

Tests are continuing to achieve 512 Mbps rates for a single DAS. This will enable 512 Mbps operation at all LBA antennas and 1 Gbps operation at the ATNF antennas. There are some problems with timing and connectors, and a new system is under design.

c) Software correlators

Software correlators are under development by the Swinburne University of Technology using their supercomputer cluster and a Cray computer at UWA. Such correlators will be the only VLBI correlators for the disk-based system and for high data rates, until the new CABB correlator at Narrabri comes online in about 3 years.

The original XF software correlator has been operational at Swinburne for about two years. A new FX software correlator has been implemented recently and this can perform very close to real time! An FX software correlator has also been tested on the Cray supercomputer at WA, using FPGAs and the Opteron processors.

In the November 2006 VLBI session test observations were simultaneously recorded on S2 tapes and disks. These will be correlated on the LBA S2 correlator, the FX software correlator on the Swinburne cluster and the correlator on the Cray supercomputer, to provide an inter-comparison test for all systems.

d) 4th e-VLBI workshop

The 4th international e-VLBI workshop was held at Marsfield 12-15 July 2005. About 50 people attended, 20 from overseas. It was a successful workshop and in particular it facilitated cross-links with the networking community. The workshop was followed by a 3-day tour of the ATNF observatories and the participants were very enthusiastic. The proceedings of this workshop are available on (http://www.atnf.csiro.au/vlbi/evlbi2005/).