

4th December 2009 – Bonn, Germany

Report on VLBI Operations for Jodrell Bank Observatory

1. May 2009 Session

The May 2009 EVN session comprised 6 experiments at 5cm, 13 at 18cm and 8 at 6cm. Four of the 18cm and 3 of the 6cm experiments were joint MERLIN/EVN experiments. About half-way through this session, during 18cm observations with the Lovell telescope, the antenna suffered another damaged tyre and was taken out of service for the rest of the session. The Mk2 telescope was substituted for the remaining 18cm and 6cm experiments originally scheduled for the Lovell telescope. In all experiments where Cambridge was also scheduled and where there was sufficient unused bandwidth on our VLBA recorder, we recorded signals from the Knockin antenna also. This process, which is possible because the MERLIN L-band link is limited in bandwidth, enables data from an extra MERLIN antenna to be recorded on the same physical disk pack as the Cambridge data and thereby provides a complete set of EVN baselines for minimal extra workload. There were 5 experiments for which this was done, 2 at 18cm and 3 at 6cm. At 5cm, 57h of observations were scheduled on both the Mk2 telescope and Cambridge telescopes. There were no failures with Cambridge but 46m (1.3%) of Mk2 data was lost due to recorder problems. At 18cm, 45h34m of observations were performed by the Lovell telescope prior to its failure and another 70h56m performed by its replacement, the Mk2. This substitution meant that 1h11m (2.6%) of data were lost for the Lovell. Also at 18cm, Cambridge performed 38.5h of observations and Knockin a further 12h, with no loss of data. At 6cm, there were 56.5h of observations performed with the Mk2 telescope (also replacing the Lovell) with no loss of data. Cambridge performed an additional 22h and Knockin an additional 17h of observations at 6cm. Both telescopes suffered only 10m of lost data due to recorder problems. In conclusion, a total of 376h of telescope time was scheduled (approximately 184h on Mk2, 46h on Lovell, 117h on Cambridge and 29h on Knockin), with a data loss at the telescope of 2h17m (0.6%), i.e. a success rate of 99.4%. The majority of lost time was due to the Lovell tyre failure and minor recorder problems.

2. October 2009 Session

The October 2009 EVN session was an intensive one comprising 26 experiments: 7 at 6cm, 3 at 1.3cm, 8 at 5cm and 8 at 18/21cm. One 6cm and two 18/21cm experiments were joint MERLIN/VLBI observations. The primary technical problems during this session involved the Cambridge telescope. Prior to commencement of the session, the L-band link signal for Cambridge was highly variable, most likely due to automatic gain control trying to account for obscuration on the Cambridge-Madingley link path. Although this is a known problem associated with trees in the link path, the degree of signal variation was considered excessive and the decision to replace Cambridge with the MERLIN Darnhall telescope was taken. Although observations were performed with Cambridge at 1.3cm, the telescope also suffered a serious drive failure during the session. This, and the continued unreliability of the L-band link signal, meant that the majority of the scheduled Cambridge time used the Darnhall antenna instead. As is now usual, in all experiments where Cambridge/Darnhall were scheduled and where there was sufficient unused bandwidth on our VLBA recorder, we recorded signals from the Knockin antenna also. This was done for all 6cm experiments and two of the 18/21cm experiments (totalling 9 experiments). At 6cm, 62h of observations were scheduled on the Lovell telescope, 16h on the Mk2 and 78h on both Darnhall and Knockin. There was a minor loss of data (2.5%) on the Mk2 due to a failure of the HSL telescope control link. At 1.3cm, 66h were scheduled on the Mk2 and 18h on Cambridge. There was no reported loss of data. At 5cm, Cambridge observed for 1h for the fringe check experiment before it suffered a motor failure and was replaced by Darnhall. Subsequently, the Mk2 was scheduled for 79h and Darnhall 78h of observations. Both Mk2 and Darnhall suffered 7h7m (9%) of lost data due to high winds during experiment eb039d. At 18/21cm the Lovell was scheduled for 91h, Darnhall for 57h and Knockin for 34h. Only Darnhall lost data at 18/21cm, amounting to 22h16m (39%), including all of experiment em078, due to a major power supply failure at the telescope site. In conclusion, a total of 659h of telescope time was scheduled (153h on the Lovell, 161h on the Mk2, 19h on Cambridge, 214h on Darnhall and 112h on Knockin) with a total data loss at the telescope of 36h54m (5.6%), i.e. a success rate of 94.4%. The two most significant sources of lost time were high winds and the power failure at Darnhall.

3. Technical Developments

We have consolidated the 'three-plus-one' e-VLBI system where up to three MERLIN antennas are simultaneously recorded on our VLBA DAR, along with a JBO home station on the MkIV DAR. We have also further tested the phase referencing technique whereby the Lovell telescope misses some phase reference scans. The Lovell data is recorded on the MkIV DAR and the Mk2 telescope on the VLBA DAR, and the phase from the Mk2 are subsequently applied to the Lovell telescope. We are now offering both these modes as standard observing systems. A document is in preparation in order to offer these capabilities to the users. The dual-NIC/ethernet bonding developed by Paul Boven has been implemented, providing a full 1Gbps of data from the home telescopes. This required a motherboard upgrade on one of the Mk5 recorders, so we also upgraded the Streamstor software to SDK8.2, allowing use of 8TB SATA disks. We have found these packs to be easier to assemble than the old ones. e-MERLIN testing has moved successfully to three stations, but the price of that is reduced availability of MERLIN outstations for VLBI. We have signal splitters in place to maintain Darnhall and Knockin, but have corrosion repairs yet to do on Knockin.

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