

Hartebeesthoek (Hh) Station Report - TOG Meeting - June 2015

26 m telescope

The 26 m telescope remains fully operational with the full complement of receivers including the new K-band cryogenic receiver with which fringes to RadioAstron have now been achieved.

Although the new encoder for the subreflector tilt was installed in 2013, the replacement controller to make use of this higher precision readout has only recently been installed and will be commissioned now that 2015 session II has been completed.

15 m telescope

The 15 m antenna is equipped with a cryogenic S/X receiver and is used mainly to support the majority of routine geodetic VLBI sessions, thereby freeing up more observing time on the 26 m antenna. This antenna has also proved to be very useful for doppler tracking spacecraft.

VGOS telescope

The bid evaluation process for a new 12-13m class VGOS capable antenna is in progress, with the contract likely to be awarded in early August 2015. Preliminary site preparation at a new spot to the NE of the current compound has been completed.

EVN Session III - Oct/Nov 2014

This session was reasonably busy with 17 experiments scheduled, of which 10 were user experiments, comprising some 82.3% of the 79 hours (50 hours C-band, 21 hours L-band and 8 hours X-band) of recording time and some 87% of the 29.44 Tbytes of recorded data. The average filling factor of the disk-packs used was around 89%.

Only 11 minutes of data (ie. ~0.2%) from two experiments were lost, due in part to operator error and the remainder due to a wind stow. There was the usual significant RFI at L-band during the session.

EVN Session I - Feb/Mar 2015

This session was very quiet with only 13 experiments scheduled, of which 9 were user experiments, comprising some 86% of the 72.2 hours (7 hours L-band, 18 hours C-band and 47.2 hours M-band) of recording time and some 77% of the 9.21 Tbytes of recorded data. The average filling factor of the disk-packs used was only around 52%.

No data was lost during the session but there was the usual significant RFI at L-band.

EVN Session II - May/Jun 2015

This session was very busy with 19 experiments scheduled, of which 15 were user experiments, comprising some 95% of the 146.7 hours (44.5 hours X-band, 76.3 hours C-band and 25.9 hours L-band) of recording time and over 98% of the 49.38 Tbytes of recorded data. The average filling factor of the disk-packs used was around 77% mainly because only 2 large packs were used.

Only 12 minutes of data (<0.2%) was lost during the session due to a local scheduling mistake. However there was significant RFI at both X-band and L-band.

e-VLBI / Connectivity

Over the period November 2015 to June 2015 Hartebeesthoek participated in 8 e-VLBI sessions, 2 at C-band and 6 at L-band (the first 2 of which included dynamic triggering tests) comprising roughly 115 hours of user data. The dedicated layer-2 1.2 Gbps 'light-path' connection direct to JIVE was used without incident, except for one session where a local double backbone break caused a 1 hour interruption, though it continues to exhibit some packet loss – which is still under investigation. The L-band receiver was also partially warmed up during one session.

Out of Session experiments

Additionally the Hartebeesthoek 26 m supported a total of 7 out-of-session Radioastron imaging observations, 2 as part of the EVN and 5 short sessions together with the HSA. The 15 m continued to be used extensively (for 125 hours) in support of Doppler tracking of the VEX and MEX spacecraft over this period.

Hartebeesthoek, as part the RadioAstron survey program, participated in some 151 segments (typically 40 minutes to 1 hour in duration) over this period with the majority involving switching from C-band to either L-band or K-band on-the-fly mid-segment.

Frequency Standards

The HartRAO 26 m continued to operate on our T4Science iMaser-3000 (iMaser-72) during this period. Our EFOS-C (EFOS-28) maser is also operational and is used as the frequency standard for the 15 m VLBI terminal thus allowing us to offset them in frequency if required. Our original EFOS-A maser (EFOS-6) remains operational (though marginal) and we also have a Vremya VCH-314 two-channel precision frequency comparator to allow intercomparison of the three masers.

Mark5(B/B+/C) Recorders

Our three Mark5B/B+ recorders enable us to record all three of VLBI backends (two on the 26m and one on the 15m) simultaneously. In addition one Mark5C recorder (on loan from the University of Tasmania to support collaboration with the AuScope array) provides a further off-line electronic data shipment capability and has recently been used to record 2Gbps VDIF data from a FiLa10G. We have the parts necessary to upgrade one Mark5B+ into a Mark5C in future should that prove necessary. In addition, we intend to convert the JIVE Harrobox on site into a mini FlexBuff for test purposes.

Mark5 Terminal

The original Mark5 acquisition rack has been retired from active duty and continues accumulating a collection of faults which would need rectification before it could be reliably used for observations again. We no longer have a working spare video converter - the unit we have lacks a functional synthesizer/divider module (and probably has several other faults).

DBBC Terminals

The two DBBC2 units (HB1 and HB2) continue to be used in DDC mode as the primary VLBI terminals on the 15 m and 26 m antenna respectively, with full Field System support and their firmware has recently been upgraded to V105/V105E allowing 2 Gbps operation. Both are also equipped with an internal FiLa10G which have now been cabled on the VSI-2 outputs. The PFB

mode on HB2 though calibrated has not seen any use over this period as we await FS support.

Disks

A total of 5 new 32TB disk packs were acquired in early 2015 (late in our 2014/15 financial year) in response to the call for an additional purchase of capacity to ease the current shortage of recording media. We expect to be able to purchase further disks (for 2015/16) towards year end.

Spares

Currently available VLBI-related (new) spare parts at HartRAO are:

- A spare 2 m VSI-H interface cable.
- A Conduant 10GigE mezzanine board intended for use in upgrading a Mark5B+ into a Mark5C.

Used parts from recent upgrades or harvested from obsolete equipment at Haystack are:

- A used Mark5A I/O board with its related external interface.
- Various used boards from a Mark4 formatter (after conversion to a VSI4 sampler unit).
- A used Mark4 IF Distributor unit master control board.
- Several used Mark4 "MAT" ASCII transceiver boards (all faulty).
- Assorted used Mark4 Video Converter unit sub-modules (some faulty).

Development of other African Antennas for VLBI

The AVN project (2 input / 2 Core2 board) DBBC2 intended for use in Ghana is undergoing checkout at Hartebeesthoek together with a new Mark5B+ recorder bought for use with it.