

Hartebeesthoek (Hh) Station Report - TOG Meeting - March 2018

26 m telescope

The 26 m telescope remains fully operational with its full complement of receivers.

A replacement controller of the subreflector focus based on a linear encoder is in the final stages of development and will be installed shortly. Thereafter we will embark on a campaign to establish whether active focussing can improve the K-band performance. K-band observations continue to suggest that the pointing model may need further refinement, and the main antenna shaft encoders are also showing serious signs of ageing and will need replacement soon.

We have suitable components available to implement continuous calibration at L-band, but are still investigating what would be needed for other receivers.

Beam pattern measurements have unfortunately stalled due to lack of manpower.

15 m telescope

The 15 m telescope remains in a fully operational state and is equipped with a dual-polarisation cryogenic co-axial S/X receiver, used mainly to support routine geodetic VLBI observations, thereby freeing up more observing time on the 26 m antenna.

Continuous calibration was implemented at S- and X-band on this antenna in early 2016, but the X-band implementation failed requiring a re-design. This has now been re-implemented but requires testing and final integration.

VGOS telescope

The construction phase of the new 13.2 m VGOS capable antenna is now fully complete and commissioning of the various subsystems is mostly done. The final acceptance testing process has been delayed by a bolt-failure on one of the elevation bearings, but should be completed in the next month or two. An application for funding to equip the antenna with a suitable wideband receiver, VGOS-capable backend etc. has been submitted and we are awaiting the outcome.

EVN Session II – Jun/Jul 2017

This session was extremely busy for us with 24 experiments scheduled, of which 22 were user experiments, comprising some 95% of the 117.91 hours (70.66 hours L-band and 47.25 hours C-band) of recording time and over 96% of the 45.92 Tbytes of recorded data. The entire session was recorded on our Flexbuf with the subsequent electronic shipment to JIVE going very smoothly over the e-VLBI lightpath.

Only 1 minute of data was lost during the session due to an operator error. There was also the usual significant RFI at L-band.

EVN Session III – Oct/Nov 2017

This session was also busy with 18 experiments scheduled, of which 14 were user experiments, comprising some 91% of the 134.75 hours (31.25 hours S/X-band, 33.9 hours C-band, 9.75 hours

K-band and 59.85 hours L-band) of recording time and over 94% of the 42.07 Tbytes of recorded data. The entire session was recorded on Flexbuf with electronic shipment to JIVE.

About 1 hour and 45 minutes of data was lost during the session, mainly due to repeated encoder faults in both hour angle and declination, but also due to a wind stow and a power failure. There was also the usual significant RFI at L-band.

EVN Session I – Feb/Mar 2018

This session, which is ongoing as of the date of this report, is relatively busy with 22 experiments scheduled, of which 18 are user experiments. Full statistics will be reported at the next meeting.

e-VLBI / Connectivity

Over the period May 2017 to February 2018 Hartebeesthoek participated in 13 e-VLBI sessions, of which 8 were at C-band (4 of them Target-of-Opportunity), 3 were at L-band and 2 were at K-band (both Target-of-Opportunity) comprising roughly 125.5 hours of user data (of which 37.66 hours were ToO). The dedicated layer-2 'light-path' connection direct to JIVE was used without incident throughout. All of the sessions were run directly from the FiLa10G in the DBBC2.

Out of Session experiments

Additionally the Hartebeesthoek 26 m supported a total of 6 out-of-session RadioAstron imaging observations of which 4 were formally as part of the EVN.

Hartebeesthoek, as part the RadioAstron survey program, also participated in some 132 segments (ranging from 20 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 Hartebeesthoek 26 m continued to operate on our T4Science iMaser-3000 (iMaser-72) during this period. Our backup EFOS-C (EFOS-28) maser remains operational (though there are issues with its heater control circuitry) and is used as the main frequency standard for the 15 m VLBI system thus allowing us to offset the two telescopes in frequency when required. Our original EFOS-A maser (EFOS-6) is still running but is no longer considered reliable. A Vremya VCH-314 two-channel precision frequency comparator is available to allow intercomparison of the three masers.

Mark5(B/B+/C) & Flexbuf Recorders

Since February 2017 our 128 TB Flexbuf system has been adopted as the primary recorder (in VDIF format) for EVN use and continues to be able to hold two sessions' worth of data at current recording rates. We also have two Mark5B+ recorders set up to record the two VLBI backends (on the 26m and 15m in Mark5B format) independently. In addition a Mark5C recorder (on long-term loan from the University of Tasmania in support of collaboration with the AuScope array) and an older Mark5B recorder provide an off-line electronic data shipment capability. The former can also be used to record 2 or 4 Gbps VDIF data from either telescope via the built-in FiLa10G's. We have the parts necessary to upgrade one of the Mark5B+'s into a second Mark5C in future should that prove necessary.

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, now running firmware versions v105_1 and v105E_2 allowing up to 2 Gbps operation. Both are also equipped with an internal FiLa10G cabled in pass-through mode, allowing for simultaneous use of the Mark5B+ recorders. PFB firmware v16 is also available for testing purposes. Both units are equipped with SSD internal disks which would facilitate a Window/Linux dual-boot capability.

Software

Field System: FS 9.11.19 running on FS Linux 8 (Debian 5.0.x "lenny"), kernel 2.6.26-2-i386
DBBC versions: DDC v105_1/v105E_2 & PFB v16 running on Windows XP; FiLa10G v3.3.2
Mark5B+ version: jive5ab 2.8.2-jet running on Debian 4.0 "etch", kernel 2.6.18-6-i386
Mark5C version: jive5ab 2.8.2-jet running on Debian 7.x "wheezy", kernel 3.2.0-4-amd64
Flexbuf version: jive5ab 2.8.1 running on Debian 8.x "jessie", kernel 3.16.0-4-amd64

Disks

No further disk packs have been purchased over this period. We will look at using the 2017/8 and 2018/9 allocations to upgrade the local Flexbuf with 10 TB disks and use the existing 4 TB disks to upgrade some older SATA packs which have smaller disks.

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.

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