Onsala Station Report

R&D activity

The Onsala station has started to design a tri-band receiver to support simultaneous VLBI observations at 22, 44 and 88 GHz, single-band observations at <=128 Gbps with an 8L8H-DBBC3 backend, and local single-dish maser observations with a beam switch and a new spectral line backend.

A new HP signal generator has been used for LO1 in the L and C-band IF system since 2024 February. The local network hardware has been upgraded to get two 100 Gbps fiber links to Europe.

The broadband VLBI system of 2L2H-DBBC3+Flexbuff has been further improved. The latest firmware DDC U v127 and E v127 have been installed to get 8-bit quantization data in the standard binary-offset VDIF format. The local recording tests have also been performed to verify the configuration. Furthermore, the latest version of JIVE5ab with the support of multi-CPU-core and multi-thread recording has been installed. We did 32 Gbps recording tests with four CPU cores for about one day. The recording went flawlessly. After the software upgrade, the backend allows us to run 16/32 Gbps observations at C, K, Q and W bands.

Following the guidelines provided by Giuseppe Maccaferri (IFA-INAF), we have properly configured our FS and Flexbuff to support e-VLBI observations with DBBC3 backend. The formatter tests at 4 Gbps between JIVE and Onsala also went smoothly.

We also did some recording tests of 8-bit quantization data with the firmware DDC E v126. During the PRECISE experiment PR327A, we also got our DBBC3 backend to run the observations in parallel. Fringes to both DBBC3 and DBBC2 backends were found by Aard Keimpema with the updated SFXC and version 2.0 vex file. Theoretically, 8-bit quantization will improve baseline sensitivity by a factor of ~10 per cent. This is the only solution for the existing telescopes to improve baseline sensitivities at L band because of strong RFI and limited bandwidth.

EVN Session 2/2024

The session was operated by Jun Yang. As usual, Onsala 20 and 25 m telescope participated in all the EVN observations. Fringes to Onsala were found during all the FTP fringe tests. At C band, the LNA for RCP signal did not work properly. Our research engineers have also tried to fix it, while problematic components are likely inside the cryogenic box. The problem caused very weak fringes and incredibly high Tsys in all RCP subbands for all the C-band experiments. Because there were no high-speed winds, the 25-m telescopes participated in all the L and C-band observations without significant loss. At S band, the 20-m telescope has a quite old receiver with poor optics. Because of the receiver limitation, fringes were weak. But this is as expected.

Currently, we plan to take down the C-band receiver and fix it in the Lab after the e-VLBI session of June 18-19.

EVN Session 1/2024

Mugundhan Vijayaraghavan and Jun Yang took care of the operation of VLBI observations. There were nice fringes to both telescopes in all the NME experiments. Because of high-speed winds, Onsala had to stow the 25-m telescopes for some time during the four experiments: RG014 (4 h loss), EC090A (100% loss), EL071A (3 h loss) and GW023C (2 h loss). Furthermore, the Onsala 20-m telescope missed half-hour observations because of a power outage in EL065E.

Amplitude calibration

We kept checking the amplitude calibration of the 25m and 20m telescopes. The point models have been maintained with a very good accuracy. The ONOFF observations are performed frequently before the observations to verify system performance. As the PIs of some user experiments (RSY09, EY043A), Jun Yang also reduced and checked the calibration. The 25m telescope shows accurate calibration. Because of strong winds, the amplitude calibration might become poor during the observations at 5 and 6.7 GHz. Moreover, significant data might be flagged out because of many transient off-source (10-20 s) events during scans.

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