Noto Station Status Report

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Abstract

The Noto VLBI station was fully operational in 2012, and the upgrade projects could be restarted, involving mainly the receiver area. Another important improvement was the activation of the 1 Gbps network.

1. Frequency Agility

A frequency agility system is in the design phase. The system will install a set of receivers in the antenna secondary focus so that the receivers will automatically become operative within a few minutes. The primary focus will receive a revised version of the SXLP receiver that was developed some years ago but was never used due to the difficult mechanical operations required to implement it. This frequency agility project has been funded, and the activities started in summer 2012. The C, K, Q, and W receivers will be placed in the secondary focus in fixed position to make it possible to switch between them in a very short time. The W band will be covered by a revised version of a receiver acquired from IRAM. This solution is particularly convenient because it can be implemented as part of the vertex room reconstruction. The receiver will require specialized installation because it is filled with liquid helium in order to cool it down to the 4K stage, and the helium must remain in its tank while the antenna moves through a 0 to 90 degree range of elevation. Noto could join the millimeter VLBI network as soon as it becomes operational.

2. Fiber Optics Connection

A fiber optics link for e-VLBI activities has been activated by the GARR (Italian Academic and Research Network), and it is now operating at a 1 Gbps data rate since March 2012. An upgrade increasing the connection rate up to 10 Gbps is planned to become available in the next few months. The new connection permitted Noto to participate in the e-VLBI EVN observations and greatly reduced the need to send disk packs to the correlators for the IVS sessions.

3. VLBI2010 at the Station

The Noto station will participate in VLBI sessions with the legacy antenna until it is possible to install a VLBI2010 12-m antenna. Operations in this technology require adoption of a broadband receiver and a dedicated backend. The first is under construction with a prototype feed. This receiver covers the range 2-14 GHz and, apart from the first amplification stages, is fully digital. Indeed no analog down-conversion is included for the entire band covered up to 14 GHz. In order to adapt the feed to the 32-m antenna optics, an additional tertiary mirror is planned, to be installed on the antenna surface during the observation periods. The final destination for this receiver is a 12-m fast slewing VLBI2010 compliant antenna.

The DBBC2 backend in Noto was partly upgraded to DBBC2010. This requires the installation of a total number of eight 1 GHz bandwidth IFs to provide a total number of boards able to support

eight wideband PFB (Polyphase Filter Bank) elements, for a minimum total aggregate output data rate of 32 Gbps. A FILA10G Ethernet interface, which is already operational at several EVN stations, is required to produce 32 Gbps output; producing more than 32 Gbps output requires additional interfaces. Such a board will be installed in Noto in 2013, with the completion of the DBBC2010 upgrade.

The DBBC3 project financed by Radionet started in July 2012. This project will produce the newest front-backend system compliant with EVN32Gbps and VLBI2010. The new system will provide the entire dual polarization VLBI2010 14 GHz broadband coverage in full digital fashion, including the support for data processing and multiple 40G network capability. It will also include burst modes and a buffer/recording system, which is an alternative to other VLBI high data rate recorders and which is able to support external disk-packs at 32-64-128 Gbps. A DBBC3 schematic block view is shown in Figure 1.

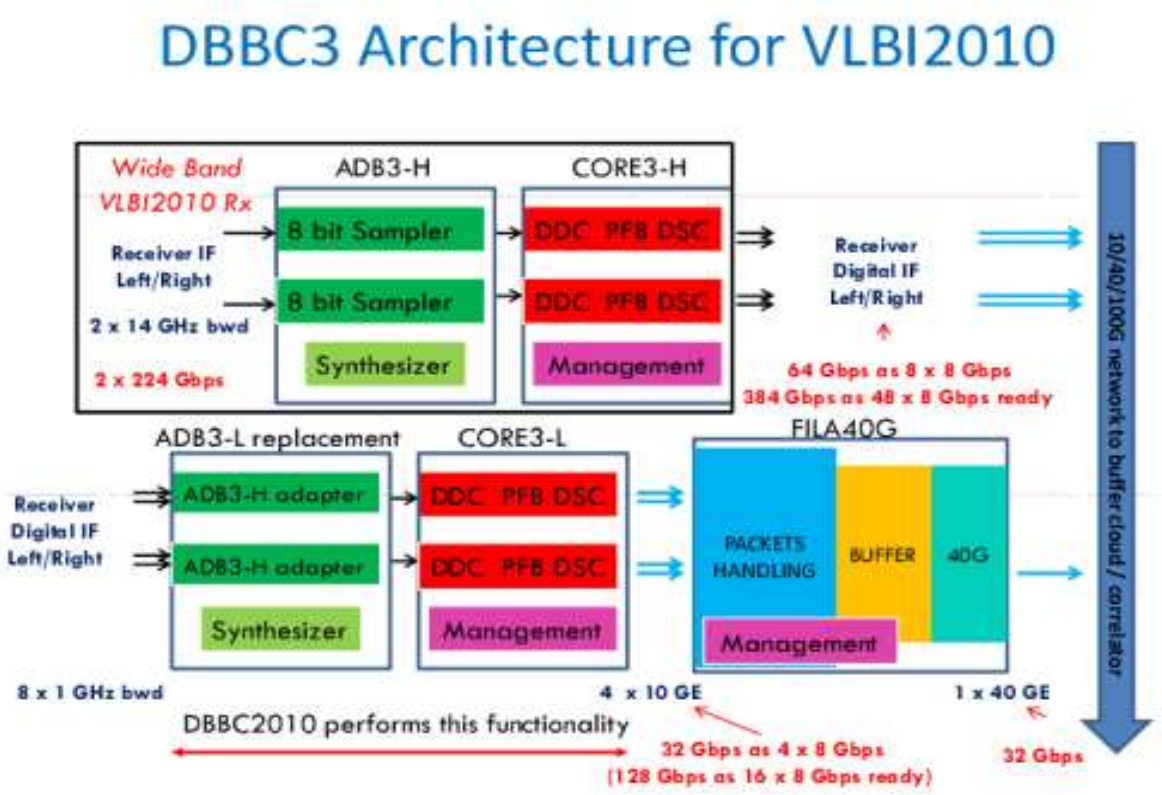

Figure 1. DBBC3 schematic block view.

4. Observations

Noto was scheduled for one 24-hour session per month, starting from February 2012, when the antenna was again operational after the azimuth track replacement. The scheduled experiments have been: EUROPE-116, CRF67, EUR117, EUR118, T2084, EUR119, T2085, CRF70, T2086,

EUR120, and CRF71. Due to the high number of inoperative, old analog baseband converters, the efficiency was not as desired. A great effort was made to reactivate the maximum possible number of such units, but the actual solution to the problem will come with the operational introduction of the upgraded DBBC backend, in the first half of 2013.