

Noto Station Status Report

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Abstract

The year 2011 for the Noto station has been one of great renovation and of important improvements for its observational capabilities. In particular we are able to mention four key projects that were completed or under way.

1. Repairs of Azimuthal Axis of Rotation

In recent years, there has been a tangible and sensible decrease of the mechanical performance of the antenna, mainly due to mechanical wear of components of the system, in particular related to the system of the azimuth rotation axis of the telescope and all subparts that compose it: rail track, base metal plates, wheels, reducer gears, and especially the grout. The slow action of wear and tear of time and weather has gradually deteriorated the state of these components and their assembly, affecting not only the antenna observational parameters (pointing accuracy, tracking speed and accuracy, camber angle of the wheels, and the proper angle of the rotation axes (affecting the geo antenna point)), but also the stiffness of the antenna, so that in March 2010 a structural failure of a wheel bearing stopped the antenna activity and caused the necessity of completely repairing the azimuth rotation axis. During 2011 the station activities have been focused on the organization of this repair work; in particular the search for funding—about 700K Euro fully funded by the Ministry of Research (of which INAF is part), the execution of preparatory paperwork and project design, drafting the implementation of the projects, and the actual activity. This last phase took about 13 weeks; it was completely performed by a highly qualified Italian company, Galbiati Srl, and it can be described in three main parts:

- 1) a. Dismantling of the mechanical parts and anchorages to the main azimuth bearing (see Figure 1);
 - b. plucking up of the rail track, metal plates and grout that capture and support the rail;
 - c. performing of reference measurements;
- 2) Installation and grouting of the support plates, including the maturation phase of the grout (28 days) (see Figure 2);
- 3) a. Installation of new mechanical parts such as rails, bolts and gears (see Figure 3).
 - b. Performing of new reference measurements.

The work was completed with the phases of protection and painting of the antenna base, cleaning of reflective surfaces (especially primary optics) and the alignment of the telescope and pointing systems reprogramming (see Figure 4). Radio telescope parameters have been restored like the original ones by project, in particular for the correction of the camber angle of the wheels (average $9'$ over $2^\circ 52'$), and the orthogonal offset recovery (about $10''$) of both elevation and azimuth axis.



Figure 1. a) Rail track removal



b) Grout removal, metal plates visible



Figure 2. a) Continuous metal plate installation and b) grouting phase

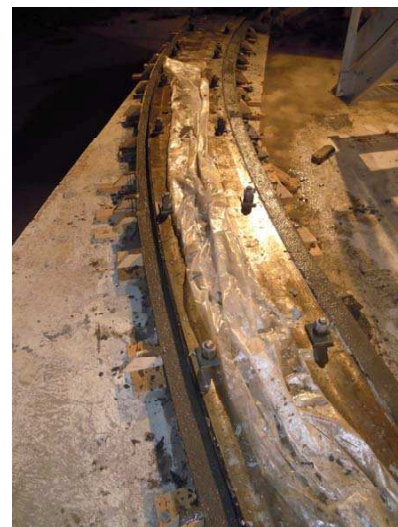




Figure 3. a) New wheels



b) Wheel, support and reducer gear coupling



Figure 4. It's the end of the work!!!

2. Fiber Optics Connection

A fiber optics link for e-VLBI activities has been financed by GARR (Italian Academic and Research Network) and it is now ready to start with a 1 Gbps data rate starting in March 2012, and 10 Gbps probably starting in September 2012.

3. Frequency Agility

A frequency agility system is now in the design phase. This system will install a set of receivers in the antenna secondary focus, so that the receivers will automatically be available within a few minutes. The primary focus will receive a revised version of the SXL receiver that was developed some years ago but was never used due to the difficult mechanical operations required to implement it for regular observing. This project has been funded, and the activities will start in summer 2012.

4. DBBC2010 for VLBI2010 Observations

The Noto station will participate in VLBI observing with the legacy antenna. This will require the adoption of a wide band receiver and a dedicated back-end. The first will be assembled as soon as the feed becomes available, following the VLBI2010 Committee recommendations, while the back-end will be upgraded during 2012. This requires the installation of four additional IFs in the existing DBBC system, as well as a number of additional boards, which will make the system compatible with the required specifications. In particular the FILA10G network board will be adopted to support the high output data rate. A Mark 6 recorder will be supported at 32 Gbps. At the same time the DBBC3 Project has been financed by Radionet and will formally start in July 2012. Such a new back-end will provide the entire two polarization 14 GHz band coverage in full digital fashion, including support for the data process and multiple 100G network capability.