

The IVS Technology Development Center at the Onsala Space Observatory

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Abstract

We briefly describe the technical development during 2007 that is related to geodetic VLBI. The work focussed mainly on a new S/X receiver, a new time lab, and the radiometers.

1. The New Dual Polarization S/X Receiver for the 20 m Telescope

The new dual polarization S/X-receiver [1] was installed in the summer of 2007 on the 20 m telescope. In the fall additional filters were installed for right circular polarization, since spurious phase cal signals were detected during several experiments in the low X-band channels. The left circular polarization will be equipped in early 2008 with better filters, too. It is not yet possible to read the temperature and the pressure of the cooling system for the HEMT amplifiers directly with the Field System. Work is in progress to make this possible during 2008.

2. The New Time Lab at the Observatory

In the spring of 2007 a second maser was installed at the observatory in collaboration with SP Technical Research Institute of Sweden. The aim of the project is to establish a time lab at Onsala with two masers, a cesium clock, and equipment for GPS time measurements that contributes to the generation of UTC at BIPM. Another part of the project is the development of accurate time synchronization using the high speed optical fiber connection at Onsala. Figure 1 shows time differences with respect to GPS time as measured with the TAC at the observatory, for the old maser HM01 (Kvarz CHI75), installed in March 1997, and the new maser HM02 (Kvarz CHI-75A), installed in April 2007. Figure 2 shows the two masers and the racks with GPS time receivers and other equipment in the temperature and humidity stabilized time lab.

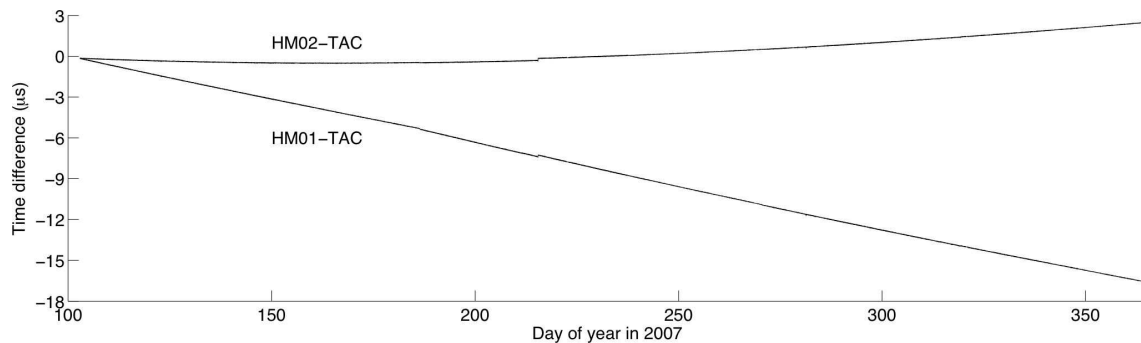


Figure 1. Time differences of the two masers HM01 and HM02 with respect to the GPS-TAC.



Figure 2. Time lab at Onsala: a) Rack with, for example, GPS TAC, several 5 MHz distributions, pulse distribution unit, b) HM01: Kvarz CHI-75 installed in March 1997, c) HM02 Kvarz CHI-75A installed in April 2007, d) Rack with, for example, GPS time receivers, AOG (Auxilliary Output Generator) for UTC generation, and space for the Cesium clock (to be installed during 2008).

3. The Microwave Radiometers at Onsala

Both microwave radiometers, Astrid [2] and Konrad [3], were in maintenance during 2007. The unstable power supply and the hot load in the 31.4 GHz channel of Astrid were repaired, and Astrid has worked again since November. The problems with the azimuth and elevation drives of Konrad have not been solved yet. We expect that the ongoing repair work will be successful and that Konrad will be working again in early 2008.

4. A Superconducting Gravimeter at Onsala

During 2007 we started a project to install a superconducting gravimeter at the observatory. This project involves the construction of a new gravimeter house that will host the superconducting gravimeter and additionally a platform for absolute gravimeter measurements. The location of this new building was chosen based on a stability survey of the bedrock at the observatory with a ground penetrating radar. Construction work will start in early 2008, and we expect the gravimeter to be installed in mid-2008. Work is ongoing to develop and install sensor systems to monitor environmental parameters such as ground water level, sea level, and wind forces.

5. Participation in a VLBI2010 Feed Project

In late 2007 we discussed the possibility of participating in a VLBI2010 feed project in collaboration with the antenna group at Chalmers University of Technology the Norwegian Mapping Authority, the Goddard Space Flight Center, and other potentially interested groups. The project will aim at the design and construction of a prototype for a dual linearly polarized feed horn covering 2-15 GHz that should work in a cooled environment. We hope that this project will be started in early 2008.

6. Outlook and Future Plans

We will work on an improvement of the new S/X receiver, in particular to suppress spurious phase cal signals in the right circular polarization but also to improve the left circular polarization. We will also develop the capability of reading important parameters of the receiver directly with the FS.

The time lab will be equipped with a Cesium clock during 2008, and in collaboration with SP, time synchronization via optical fiber will be developed.

We will focus on an upgrade of the azimuth and elevation drives of the Konrad radiometer, and we expect to have them in place and properly working again in early 2008.

The superconducting gravimeter will be installed during 2008, and we will develop and install various sensors to monitor environmental parameters.

We plan to be a partner in a possible VLBI2010 feed project, especially given the cryogenic expertise that is available at our observatory.

References

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