

22-m radiotelescope at Simeiz: upgrading of the receivers

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Abstract

This report gives an overview about the geodetic VLBI activities at the Simeiz station. It also summarizes the technical parameters and upgrades done to improve the reliability of the receivers.

1. New LNAs of S/X Receivers

The 2 and 8 GHz uncooled Low Noise Amplifier of VLBI radiometers were introduced into operation on 22-m radio telescope Laboratory of Radio Astronomy of Crimean Astrophysical Observatory (Nesterov and Volvach, 2000).

The LNA was developed and manufactured by Joint-Stock “Mirrad” with assistance of the Crimean Astrophysical Observatory and the Main Astronomical Observatory NASU. Figure 1 shows the block scheme of the low noise 2/8 GHz receivers and Table 1 shows the receiver parameters. The amplifiers, the phase and the amplitude calibration units have been installed in the primary focus of the antenna (see Figure 2).

The LNAs are not cooled. The feed illuminates the main dish of the antenna over the angle 140° at the level -10 db.

Table 1. Receiver performance of the Simeiz antenna.

Band	Frequency, GHz	T _{sys} , K	T _{receiver} , K	T _{feed} , K	T _{mainlobe} , K	T _{sidelobes} , K
S	2.1 - 2.5	100	40	25	7	28
X	8.18 - 8.68	80	50	5	10	15

All measurements of the noise of system radiotelescope-radiometer were made by Mark IIIA and Field System. System Equivalent Flux Density (SEFD) was measured using radio sources with know flux densities: Cas-A, Virgo-A, Cygnus-A, Taurus-A.

SEFD were measured as 1100(X) and 1400(S) Jy at zenith that practically does not differ from its values with former cooled amplifier.

The weight on the legs carrying the primary focus cabin is reduced from 300 to 30 kg. The process of mounting the equipment is significantly lightened.

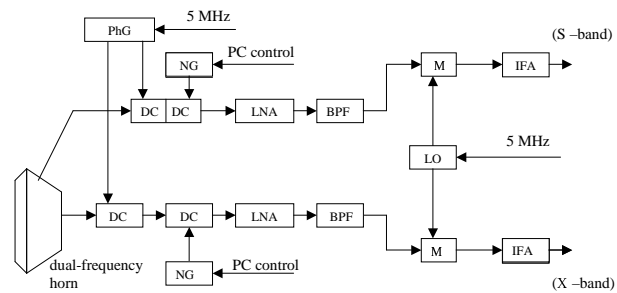
The antenna pointing calibration was made with the upgrading receivers.

The installation of the new low noise amplifiers is the first stage on the upgrading of the S/X receiver of Simeiz station.

2. Observations and Data Analysis

In 2002 the Simeiz station had continued the regular VLBI observations of extragalactic sources under the International VLBI Service for Geodesy and Astrometry programs (Petrov et al., 2001) and single dish observations of sources at 2/8 GHz (Nesterov and Volvach, 2001).

Simeiz took part in geodetic VLBI experiment, namely Europe and terrestrial reference frame (TRF) observations.



PhG – Phase Calibration Generator
 DC – Directional Coupler
 LNA – Low Noise Amplifier
 NG – Noise Generator
 BPF – Band-Pass Filter
 IFA- IF Amplifier
 LO- Local Oscillator
 M- Mixer

Figure 1. The block scheme of 2/8 GHz receivers.

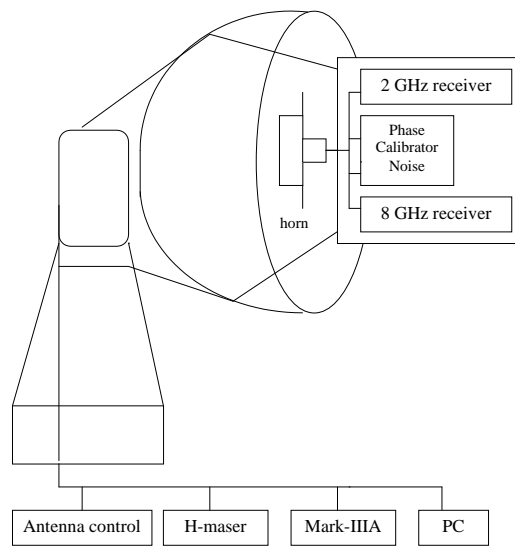


Figure 2. The Simeiz antenna.

3. Outlook

The fundamental geodynamics area “Simeiz-Katsively” is situated on the coast of the Black Sea (Nesterov and Volvach, 2002). The Main Astronomical Observatory of the National Academy of Sciences of Ukraine, the Crimean Astrophysical Observatory and other Ukrainian institutions are planning the observational project “Monitoring the geodynamical and meteorological phenomena in the Crimea region by VLBI, GPS, and SLR techniques.” The cooperating institutions have two permanent GPS stations, two SLR stations and one VLBI station located in this area. The project plans to establish four additional permanent GPS stations and to use a SLR system in Evpatoria.

The main objectives of the project are:

- to upgrade the VLBI and SLR systems in Crimea;
- to conduct continuous determination of the positions of the VLBI, GPS and SLR stations;
- to determine highly accurate local ties between the VLBI, GPS and SLR stations;
- to develop software for reducing the data collected in a regional center;
- to monitor both slow and rapid changes of position of permanent and rover GPS stations in hazardous zones in Crimea that are active seismically or subject to landslides.

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