

## Simeiz VLBI Station—New Status

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### Abstract

We summarize briefly the status of our 22-m radio telescope as an IVS Network Station. In 2007 RT-22 was equipped with a modern Mark 5A VLBI recording system by the National Academy of Sciences of Ukraine. That makes it possible to continue astrophysical and fundamental geodetic VLBI observations.

### 1. General Information



Figure 1. The Simeiz VLBI station.

The Simeiz VLBI Station (also known as CRIMEA in the geodetic community), operated by Radio Astronomy Laboratory of Crimean Astrophysical Observatory of the Ministry of Education and Sciences of Ukraine, is situated on the coast of the Black Sea near the village of Simeiz, 20 km west of Yalta in the Ukraine.

The RT-22 radio telescope has a steerable parabolic mirror of diameter 22 m and focal length 9525 mm. The surface has rms accuracy of 0.25 mm and effective area  $210 m^2$  independent of elevation angle. The antenna has an azimuth-elevation mounting with axis offset  $-1.8 \pm 0.2$  mm. The maximal slewing rate is  $1.5^\circ/\text{sec}$ . The telescope control system provides a pointing accuracy of  $10''$ .

The foundation pit of the telescope is 9 meters deep and contains 3 meters of crushed stones and 6 meters of concrete. The height of the elevation axis above the foundation is 14.998 meters. The telescope is located 80 meters from the edge of the Black sea.

The parameters of the 22 meter radio telescope are presented in Table 1.

Table 1. The antenna parameters of the Simeiz station.

Diameter D, m	22
Surface tolerance, mm (root mean square)	0.25
Wavelength limit, mm	2
Feed System	Cassegrain system or primary focus
Focal length F, m	9.525
Focal ratio F/D	0.43
Effective focal length for Cassegrain system, m	134.5
Mounting	Azimuth-Elevation
Pointing accuracy, arc sec.	10
Maximum rotation rate, degree/sec	1.5
Maximum tracking rate, arcsec/sec	150
Working range in Azimuth, degrees (0 is South)	$-270 \pm 270$
in Elevation, degrees	0 - 85

The control system of the radio telescope allows the antenna to be pointed and allows the observed source to be tracked in two regimes: autonomous and automatic. All modes of the radio telescope operation—antenna motion, radiometer readings, and data recording—are controlled by the special host computer in automatic regime.

The 2 and 8 GHz receivers and the phase and the amplitude calibration units are installed in the primary focus of the antenna. Table 2 shows the parameters of the 2 and 8 GHz receivers.

Table 2. The receiver parameters of the Simeiz antenna.

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

The LNA was developed and manufactured by Joint-Stock “Mirrad” with the assistance of the Crimean Astrophysical Observatory and the Main Astronomical Observatory NASU.

The LNAs are uncooled. The feed illuminates the main dish of the antenna over the angle  $140^\circ$  at the level -10 db.

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

SEFDs were measured as 1100 (X) and 1400 (S) Jy at zenith, which essentially does not differ from the values achieved with the former cooled amplifier.

The weight on the focus legs was reduced from 300 to 3 kg. This significantly eases the process of putting up receivers.

A new pointing model was made with the upgraded receivers.

## 2. Current Status and Activities

The interdepartmental center for collective use of the RT-22 radio telescope was created within the framework of the Scientific-Research Institute “Crimean Astrophysical Observatory” of the Ukrainian Ministry of Education.

Organizational members of the Center are the Scientific-Research Institute “Crimean Astrophysical Observatory” (Director of SRI “CrAO”—A. M. Rostopchina-Shakhovska), the Main Astronomical Observatory of National Academy of Sciences of Ukraine (Director of MAO—Academician NASU Ya. S. Yatskiy) and the Institute of Radio Astronomy of National Academy of Sciences of Ukraine (Director of IR—Academician NASU L. N. Litvinenko).

The purpose of this Center is an intensification and coordination of the main scientific research in the fields of astrophysics, astrometry, and geodynamics; more complete and effective development and use of instrument possibilities and scientific potential of the national property of Ukraine RT-22 as one of the best radio astronomy instruments of millimeter range; and the effective integration and coordination of facilities and capabilities of the SRI “CrAO”, MAO, and IR.

The main objectives of the Center are: development of new methods of scientific research in radio astronomy; to provide a place for the scientific organizations of Ukraine and other countries to carry out research and development with the scientific state-of-the-art equipment under the auspices of the staff of organizations and participants of the Center; organization and implementation of fundamental, applied scientific research; realization of innovative and educational activity, and foreign relations.

Scientific establishments and organizations that need the scientific equipment of the Center to carry out research in either of two observing periods ending January 15 and June 15 should submit a written application for hours, terms, and types of research to the Center. The observation council considers annual plans for the distribution of observation time and introduces them for consideration to the Center administration.

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Contact information is provided at the URL: <http://www.crao.crimea.ua/rt22/main.htm>

In 2007 RT-22 was equipped with a modern Mark 5A VLBI recording system by NAS Ukraine. That will allow the continuation of astrophysical and fundamental geodetic VLBI observations. On November 22, 2007 Mark 5A was made operational, and the first session (EUROPE-90) was carried out.

Table 3. The current projects.

Very Long Baseline Interferometry	Astrophysics, geodetics, astrometry and radar projects with the international networks. Facilities for VLBI observations at frequencies 612 MHz and 1.6, 2.3, 5.0, 8.4, and 22 GHz are available. These observations are supported by the hydrogen frequency standard with the stability $10^{-14}$ in the interval 1-24 hours and recording systems Mark 5A and NRTV.
Multi-wavelength monitoring of AGN	Regular monitoring is carried out at frequencies 22.2 and 36.8 GHz.
Molecular line observations at mm wavelength	Observations in molecular lines of maser sources, star forming regions, and other objects have been intensively carried out since 1978 in the range of 1.6 to 115 GHz.
Solar and stellar activity investigations	Station carries out the observations at 8.6, 10.7, 13.3, 15.4, 22.2, and 36 GHz. Stokes parameters of polarization I (intensity) and V (circular polarization) are measured.

During 2007 the Simeiz station regularly participated in various radio astronomy programs including VLBI and single-dish observations of quasars and planets.

### 3. Future Plans

Our plans for the coming year are the following: to put into operation the Mark 5B+ VLBI recording system and to obtain a new H-maser.

### 4. Acknowledgments

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