Svetloe Radio Astronomical Observatory

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Abstract

This report summarizes information on recent activities at the Svetloe Radio Astronomical Observatory in 2011. During the previous year a number of changes were carried out at the observatory to improve some technical parameters and upgrade some units to the required status. The report also provides an overview of current geodetic VLBI activities and gives an outlook for the next year.

1. General Information

Svetloe Radio Astronomical Observatory (Figure 1) was founded by the Institute of Applied Astronomy (IAA) as the first station of the Russian VLBI network QUASAR [1].

The sponsoring organization of the project is the Russian Academy of Sciences (RAS). The Svetloe Radio Astronomical Observatory is situated near Svetloe village in the Priozersky district of the Leningrad region (Table 1). The geographic location of the observatory is shown on the IAA RAS Web site: *http://www.ipa.nw.ru/PAGE/rusipa.htm*. The basic instruments of the observatory are a 32-m radio telescope equipped with special technical systems for VLBI observations, GPS/GLONASS/Galileo receivers, and an SLR system installed in 2011.

Figure 1. Svetloe observatory.

Table 1. Svetloe Observatory location and address.

Longitude	29°47′
Latitude	60°32′
Svetloe Observatory	
Leningrad region, Priozerski district	
188833 Russia	
rahimov@osvtl.spb.ru	

2. Technical Staff

Ismail Rahimov — observatory chief,
Tatiana Andreeva — main operator,
Andrey Mikhailov — FS, pointing system control.

3. Technical and Scientific Information

Table 2. Technical parameters of the radio telescope.

Year of construction	2000
Mount	AZEL
Azimuth range	$\pm 270^\circ$ (from south)
Elevation range	from -5° to 95°
Maximum azimuth	
- velocity	$1.5\ ^\circ/\mathrm{s}$
- tracking velocity	$1.5\ '/\mathrm{s}$
- acceleration	$0.2\ ^\circ/s^2$
Maximum elevation	
- velocity	$0.8\ ^\circ/\mathrm{s}$
- tracking velocity	$1.0\ '/\mathrm{s}$
- acceleration	$0.2\ ^\circ/s^2$
Pointing accuracy	better than $10''$
Configuration	Cassegrain (with asymmetrical subreflector)
Main reflector diameter	32 m
Subreflector diameter	4 m
Focal length	11.4 m
Main reflector shape	quasi-paraboloid
Subreflector shape	quasi-hyperboloid
Main reflector surface accuracy	$\pm$ 0.5 mm
Frequency range	1.4–22 GHz
Axis offset	-3.0 ± 1.5 mm

The electrical part of the gear and pointing system of the radio telescope was upgraded in 2008 — 2010. A new DAS R1002M designed at the IAA [2, 3] has been used in all kinds of VLBI observational programs since October 2011. The DAS R1002M is suited to work with Mark 5B and Mark 5B+ recording systems.

4. Co-location of VLBI, GPS/GLONASS and SLR System

The Topcon GPS/GLONASS/Galileo receiver with meteo station WXT-510 was tested and put into operation (Figure 2).

Figure 2. Topcon GPS/GLONASS/Galileo receiver at Svetloe observatory.

The SLR system "Sazhen-TM" (Figure 3) was mounted in October 2011. The "Sazhen-TM" SLR system was manufactured by Open Joint-stock Research-and-Production Corporation "Precision Systems and Instruments". The technical parameters of the system are presented in Table 3.

Figure 3. "Sazhen-TM" SLR system at Svetloe observatory.

5. Current Status and Activities

The Svetloe observatory participates in IVS and domestic VLBI observational programs. During 2011 Svetloe station participated in 27 diurnal IVS-R1, IVS-R4, IVS-T2, and EURO sessions and in 17 IVS Intensive sessions.

Svetloe participated in 49 diurnal sessions in the frame of the domestic Ru-E program for determination of all Earth orientation parameters, and in 5 one-hour Ru-U sessions for obtaining Universal Time using e-VLBI data transfer.

Table 3. Technical parameters of the SLR system "Sazhen-TM".

Ranging distance, day	400-6000 km
Ranging distance, night	400-23000 km
Aperture	25 cm
Wavelength	532 nm
Beam divergence	12″
Laser pulse frequency	300 Hz
Pulse energy	2.5 mJ
Mass	170 kg
Normal points precision	1 cm
Angular precision	1-2″

6. Outlook

Our plans for the coming year are the following:

- To participate in IVS observations
- To carry out domestic observational programs for obtaining Universal Time with e-VLBI data transfer and Earth orientation parameters once a week
- To carry out SLR observations of geodetic and navigation satellites
- To participate in EVN and RADIOASTRON observational sessions
- To continue geodetic monitoring of the antenna parameters.

References

[1] Finkelstein A., Ipatov A., Smolentsev S. The Network "Quasar": 2008-2011 // "Measuring the future", Proc. of the Fifth IVS General Meeting, A. Finkelstein, D. Behrend (eds.), St. Petersburg, "Nauka", 2008. pp. 39–46.

[2] Grenkov S. A., Nosov E. V., Fedotov L. V., Koltsov N. E. A Digital Radio Interferometric Signal Conversion System // Instruments and Experimental Techniques, 2010. Vol. 53, No. 5. pp. 675–681.

[3] Nosov E. Next-Generation DAS for the Russian VLBI-Network. // 20th EVGA Meeting. MPIfR, Bonn. 2011. pp. 41–43.