Badary Radio Astronomical Observatory

Sergey Smolentsev, Valery Olifirov

Abstract

This report provides information about the Badary network station: general information, facilities, staff, present status, and outlook.

1. General Information

The Badary Radio Astronomical Observatory (Figure 1) was founded by the Institute of Applied Astronomy (IAA) as one of three stations of the Russian VLBI network QUASAR [1]. The sponsoring organization of the project is the Russian Academy of Sciences (RAS). The Badary Radio Astronomical Observatory is situated in the Republic Buryatia (East Siberia) about 130 km east of Baikal Lake (see 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, a DORIS antenna, and an SLR system installed in 2011.

Figure 1. Badary observatory.

Table 1. Badary Observatory location and address.

Longitude	$102°14'$
Latitude	$51°46'$

Badary Observatory
Republic Buryatia
671021, Russia
oper@badary.ipa.stbur.ru

2. Technical Staff

Vladimir Shpilevsky — observatory chief,
Nicolay Mutovin — FS, pointing system control,
Roman Sergeev — main engineer,
Roman Kuptsov — main engineer.

3. Technical and Scientific Information

Characteristics of the radio telescope are presented in Table 2. 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.

Table 2. Technical parameters of the radio telescope.

Year of construction	2005
Mount	AZEL
Azimuth range	±270° (from south)
Elevation range	from −5° to 95°
Maximum azimuth - velocity - tracking velocity - acceleration	 1.5 °/s 1.5 ′/s 0.2 $°/s^2$
Maximum elevation - velocity - tracking velocity - acceleration	 0.8 °/s 1.0 ′/s 0.2 $°/s^2$
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	± 0.5 mm
Frequency range	1.4–22 GHz
Axis offset	2.5 ± 0.5 mm

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

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

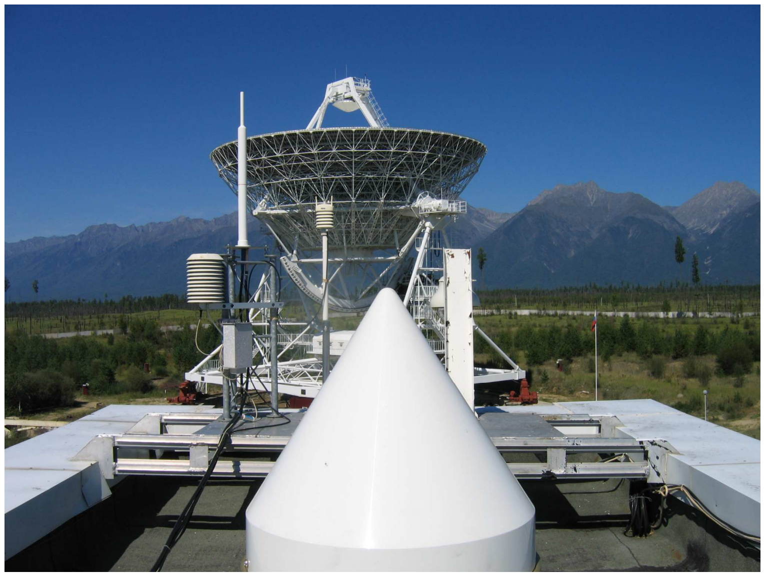

Figure 2. Topcon GPS/GLONASS/Galileo receiver at the Badary observatory.

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

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

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″

5. Current Status and Activities

Badary observatory participates in IVS and domestic VLBI observational programs. During 2011 Badary station participated in 44 diurnal IVS sessions — IVS-R1, IVS-R4, IVS-T2, EURO, and IVS-CONT11.

Badary participated in 49 diurnal sessions in the frame of the domestic Ru-E program for determination of all Earth orientation parameters, and in 55 one-hour Ru-U sessions for obtaining Universal Time using e-VLBI data transfer.

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

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