# Badary Radio Astronomical Observatory 2013 IVS Annual Report

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**Abstract** This report provides information about the Badary network station: general information, facilities, staff, present status, activities during 2013, 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. 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). 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.

**Table 1** Badary Observatory location and address.

| | |
|---|---|
| Longitude | 102°14′ |
| Latitude | 51°46′ |
| Republic Buryatia | |
| 671021, Russia | |
| oper@badary.ipa.stbur.ru | |

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**Fig. 1** Badary observatory.

## 2 Technical Staff

**Table 2** Staff related to VLBI operations at Badary.

| | |
|---|---|
| Valery Olifirov | observatory chief |
| Roman Sergeev | chief engineer, FS, pointing system control |
| Roman Kuptsov | engineer |
| Andrey Mikhailov | FS, pointing system control |

## 3 Component Description

### 3.1 Technical and Scientific Information

Characteristics of the radio telescope are presented in Table 3.

**Table 3** Technical parameters of the radio telescope.

| Year of construction | 2005 |
|---|---|
| Mount | AZEL |
| Azimuth range | $\pm 270^\circ$ (from south) |
| Elevation range | from $-5^\circ$ to $95^\circ$ |
| Maximum azimuth | |
| - velocity | $0.83\ ^\circ/s$ |
| - tracking velocity | $2.5\ '/s$ |
| - acceleration | $12.0\ '/s^2$ |
| Maximum elevation | |
| - velocity | $0.5\ ^\circ/s$ |
| - tracking velocity | $0.8\ '/s$ |
| - acceleration | $12.0\ '/s^2$ |
| 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 | $3.7 \pm 2.0$ mm |

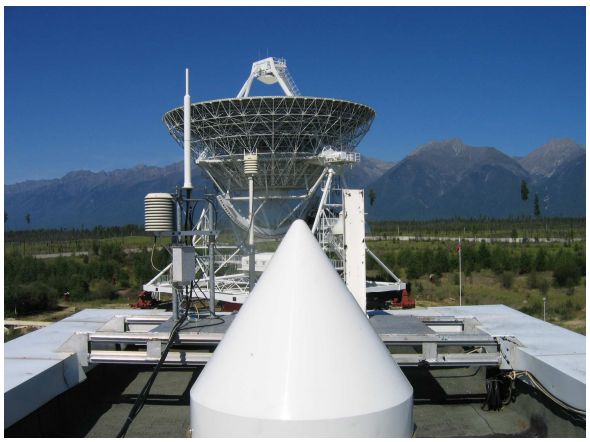

**Fig. 2** Javad GPS/GLONASS/Galileo receiver and beacon "DORIS" at the Badary observatory.

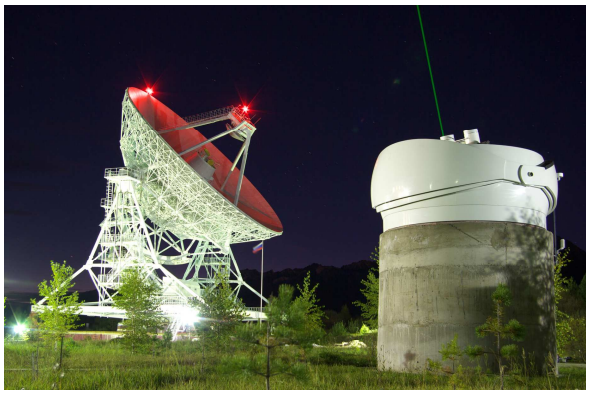

**Fig. 3** "Sazhen-TM" SLR system at Badary observatory observed 1278 passes of Lageos, GLONASS et al. and obtained 11430 normal dots.

### 3.2 Co-location of VLBI, GPS/GLONASS, DORIS, and SLR System

Badary observatory is equipped with the Javad GPS/GLONASS/Galileo receiver, The SLR system "Sazhen-TM" (Figure 3), beacon "DORIS", and automatic meteorological station WXT-510 are in operation (Figure 2).

## 4 Current Status and Activities during 2013

Badary observatory participates in IVS and domestic VLBI observing programs. During 2013, Badary station participated in 31 diurnal IVS sessions — IVS-R4, IVS-T2, and EURO.

Badary participated in 48 diurnal sessions in the frame of the domestic Ru-E program for determination of all Earth orientation parameters and in 191 one-hour Ru-U sessions for obtaining Universal Time using e-VLBI data transfer. Since April 2013 we have used e-VLBI data transfer for Badary observation data for Ru-E sessions.

Finally, an antenna tower for the 13.2-m dish was built.

**Fig. 4** Autumn 2013, building in progress.

**Fig. 5** Antenna tower for 13.2-m dish.

**Fig. 6** Main reflector 13.2-m and antenna tower.

## 5 Future Plans

Our plans for the coming year are the following:

- To participate in IVS observations including CONT14 IVS campaign,
- To carry out domestic observing programs for obtaining Universal Time daily and for obtaining Earth orientation parameters with e-VLBI data transfer weekly,
- To carry out SLR observations of geodetic and navigation satellites,
- To participate in EVN and RADIOASTRON observing sessions,
- To continue geodetic monitoring of the RT-32 parameters,
- To install a WVR, and
- To finish VLBI2010 antenna installation in 2014.

## 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.