Badary Radio Astronomical Observatory

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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 (BdRAO) 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 Burytia Republic (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 (see Fig. 1) and technical systems for making VLBI observations.

Figure 1. Badary Observatory.

Table 1. Badary Observatory location and address.

Longitude	102°14′
Latitude	51°46′
Badary Observatory Republic Burytia 671021, Russia sergeev@ipa.nw.ru	

2. Technical and Scientific Information

The Badary station equipment includes the following main components: a 32-m radio telescope equipped with low noise receivers, a frequency and time keeping system with H-masers CH1-80 and CH1-80M, a local geodetic network, a GPS receiver Leiga SR 520 (geodetic) and a GPS/GLONASS K161 receiver (for synchronization of the time keeping system), a data acquisition system R1001, a Mark 5B recording terminal, and an automatic meteorological station WXT510 (Vaisala). Characteristics of the radio telescope are presented in Table 2.

The Badary Observatory was connected with main line optical fiber glass.

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 sub-reflector)
Main reflector diameter	32 m
Sub-reflector diameter	4 m
Focal length	11.4 m
Main reflector shape	quasi-paraboloid
Sub-reflector shape	quasi-hyperboloid
Surface tolerance of main reflector	±0.5 mm
Frequency capability	1.4–22 GHz
Axis offset	2.5 mm ±0.5 mm

3. Technical Staff

Roman Sergeev — Observatory chief,
Nicolay Mutovin — FS, pointing system controls,
Alexander Seryh — front end and receiver support.

4. Current Status and Activities

Badary observatory participates in IVS and Russian Domestic VLBI observations.

During 2009 the Badary IVS station participated in 61 IVS sessions as shown in Table 3: 13 – IVS-R1, 40 – IVS-R4, 2 – IVS-T2, 4 – EURO, 1 – IVS-R&D, 1 – IYA09.

Table 3. List of IVS sessions observed at Bd RAO in 2009.

Month	IVS-R1	IVS-R4	IVS-T2	EURO	IVS-R&D	IYA09
January		4		1		
February	1	4			1	
March	1	4		1		
April	2	4	1			
May	1	4		1		
June	2	4				
July	2	5				
August		2	1			
September		3		1		
October	2	2				
November	2	1				1
December		3				
Total	13	40	2	4	1	1

During 2009 Badary participated in VLBI observations of the QUASAR network: in 20 Ru-E sessions (24-hour sessions for EOP monitoring) and 28 Ru-U sessions (4 1-hour sessions for UT1 measurement); 17 of these were provided in e-VLBI mode. In April 2009 the first e-VLBI session was successfully carried out. Since September 2009 Ru-U sessions for UT1 have been held in e-VLBI mode.

The Badary observatory has a permanent GPS receiver Leica SR520. The accuracy of the local geodetic network (LGN) is about 2 mm.

A DORIS antenna was installed at Badary in September 2009.

5. Future Plans

Our plans for the coming year are the following:

- Participation in 42 IVS observing sessions: IVS-R1, IVS-R4, IVS-T2, and EURO.
- Participation in weekly domestic observational sessions for obtaining Earth orientation parameters and in weekly 1-hour e-VLBI sessions for UT1 determination.
- Surveying the local geodetic network.
- GPS Javad receiver installation.
- Preparation for laser ranging system installation.
- Participation in EVN observations.