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 [1]. 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 [3] Web site. 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 Leika SR 520 (geodetic) and a GPS/GLONASS K161 receiver (for synchronization of the time keeping system), a data acquisition system R1001 [2], Mark 5B and S2 recording terminals, and 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 $0.2^\circ/s^2$
Maximum elevation - velocity - tracking velocity - acceleration	 0.8°/s $1.0'$/s $0.2^\circ/s^2$
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. Co-location with GPS

A permanent GPS receiver Leica SR520 was installed at Badary during April 2005. The accuracy of the local geodetic network (LGN) is about 2 mm. The LGN includes ten reference points presented in Fig. 2. 304 and 306–309 are ground markers. 301 and 312 are located on the roof of the laboratory building and are intended for the installation of GPS/GLONASS and DORIS antennas. 310 is the intersection of the radio telescope axes, and 311 is an intermediate marker on the azimuthal platform of the radio telescope.

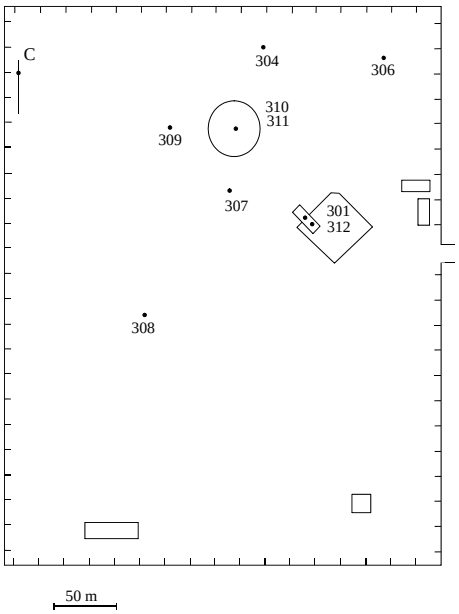

Figure 2. Local geodetic network at Badary Observatory.

5. Participation in IVS Observing Programs

During 2008 the Badary IVS station participated in 42 IVS sessions as shown in Table 3: 7 IVS-R1, 34 IVS-R4 and 1 IVS-T2.

6. Outlook

Our plans for the coming year are the following:

- Participation in 60 IVS observing sessions: IVS-R1, IVS-R4, IVS-T2, IVS-R&D and EURO.
- Participation in 24 domestic observational sessions for obtaining Earth orientation parameters.
- Surveying the local geodetic network.

Table 3. List of IVS sessions observed at BdRAO in 2008.

Month	IVS-R1	IVS-R4	T2
January	1	2	
February	1	1	
March		3	
April	1	5	
May	1	4	
June	2	2	
July	1	2	
August		2	
September		4	
October		2	
November		4	1
December		3	
Total	7	34	1

References

[1] Finkelstein A., Ipatov A., Smolentsev S. Radio Astronomy Observatories Svetloe, Zelenchukskaya and Badary of VLBI Network QUASAR. In: IVS 2004 General Meeting Proceedings, eds. N. R. Vandenberg, K. D. Baver, NASA/CP-2004-212255, 2004. pp. 161–165.

[2] Fedotov L., Ivanov D., Ipatov A., Ipatova I., Lavrov A., Kosobokov M., Mikhailov A. Institute of Applied Astronomy Technology Development Center. In: IVS 2006 Annual Report, eds. D. Behrend, K. D. Baver, NASA/TP-2007-214151, 2007. pp. 255–258.

[3] http://www.ipa.nw.ru/PAGE/koi8-r/DEPOBSERV/rus.