Zelenchukskaya Radio Astronomical Observatory

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Abstract

This report summarizes information about Zelenchukskaya Radio Astronomical Observatory activities in 2012. Last year a number of changes took place in the observatory to improve some technical characteristics and to upgrade some units to the required status. The report provides an overview of current geodetic VLBI activities and gives an outlook for the future.

1. General Information

The Zelenchukskaya Radio Astronomical Observatory (Figure 1) was created 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 Zelenchukskaya Radio Astronomical Observatory is situated in Karachaevo-Cherkesskaya Republic (the North Caucasus) about 70 km south of Cherkessk, near Zelenchukskaya village (Table 1). The geographic location of the observatory is shown on the IAA RAS Website: *http://www.ipa.nw.ru/PAGE/rusipa.htm*. The main instruments of the observatory are the 32-m radio telescope equipped with special technical systems for VLBI observations, the SLR system, and the GPS/GLONASS/Galileo receivers.

Figure 1. Zelenchukskaya observatory.

Table 1. The Zelenchukskaya Observatory location and address.

Longitude	$41°34'$
Latitude	$43°47'$
Karachaevo-Cherkesskaya Republic	
369140, Russia	
ipazel@mail.svkchr.ru	

2. Technical Staff

Andrei Dyakov — the head of the observatory,
Dmitry Dzuba — FS, pointing system control specialist, and
Anatoly Mishurinsky — front end and receiver support specialist.

3. Technical and Scientific Information

Table 2. Technical parameters of the radio telescope.

Year of construction	2003
Mount	AZEL
Azimuth range	$\pm 270°$ (from south)
Elevation range	from $-5°$ to $95°$
Maximum azimuth *	
- velocity	0.83 °/s
- tracking velocity	2.5 $'$/s
- acceleration	12.0 $'/s^2$
Maximum elevation *	
- velocity	0.5 °/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 *	3.6 ± 2.0 mm

* These values were changed to optimize the performance of the antenna system. The axis offset was measured in summer 2012 by geodesist Andrey Shamov.

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

The Javad GPS/GLONASS/Galileo receiver with meteo station WXT-510 is in operation (Figure 2). The SLR system "Sazhen-TM" (Figure 3) of the Zelenchukskaya observatory joined ILRS in March 2012. The technical characteristics of the system are presented in Table 3.

Figure 2. Javad GPS/GLONASS/Galileo receiver at the Zelenchukskaya observatory.

Figure 3. "Sazhen-TM" SLR system at the Zelenchukskaya 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

The Zelenchukskaya observatory participates in IVS and domestic VLBI observational programs. In 2012, Zelenchukskaya station observed in 27 diurnal IVS sessions — IVS-R4, IVS-T2, and EURO.

Zelenchukskaya participated in 47 diurnal sessions of the Ru-E program and in 171 one-hour Ru-U sessions using e-VLBI data transfer. Since July 2012, observations for the Ru-U program have been performed daily.

6. Outlook

We have the following plans for the coming year:

- To participate in IVS observations
- To carry out domestic Ru-U and Ru-E observational programs with e-VLBI data transfer
- 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
- To build a foundation and to conduct survey operations for VLBI2010 antenna installation in 2014 (Figures 4 and 5).

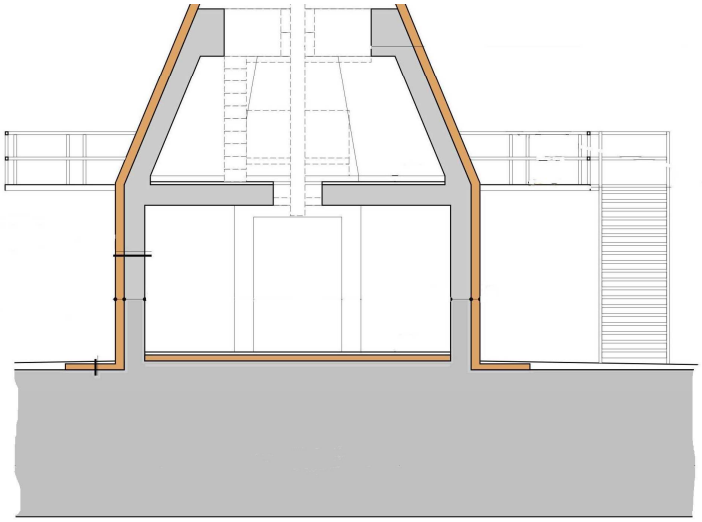

Figure 4. Foundation for RT-13, planned to be built in 2013.

Figure 5. RT-13 is planned to be installed in 2014.

References

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