“Quasar” VLBI Network: Past, Present, and Future

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1. Extended Abstract

The “Quasar” VLBI Network is a unique Russian astronomical instrument created in the Institute of Applied Astronomy. The Network consists of three observatories: Svetloe in Leningrad Region, Badary in Eastern Siberia, and Zelenchukskaya in the North Caucasus attached to the Data Processing Center in St.Petersburg. Svetloe observatory was first put into operation in 1999, followed by Zelenchukskaya in 2002 and finally Badary in 2005. Each observatory equipped with at least three co-located instruments of different techniques: VLBI, SLR, combined GNSS receivers and DORIS system [1]. The main instrument in each of three observatories is a 32-m radio telescope (RT-32), which provides a completely automatic process of observing the radio sources and satellites in radiometric or radio interferometric mode. RT-32 radio telescopes equipped with a highly sensitive receivers provides signal amplification in 1.35 cm, 3.5 cm, 6 cm, 13 cm and 18-21 cm frequency bands in both circular polarizations. The baselines of radio interferometer vary from 2000 to 4400 km. All observatories have been linked by optical fiber lines and equipped with the identical hydrogen Time Standards, Water Vapor Radiometers and meteorological stations which are used when carrying out all types of observations.

Modernization of “Quasar” VLBI Network started in 2012. The aim of modernization was to create a Radio Interferometer of new generation for improving the accuracy, reliability and efficiency of providing the Earth rotation parameters data to consumers in the Russia and abroad. The Radio Interferometer of new generation is designed to operate as a part of “Quasar” and international VLBI Networks. Currently this new Radio Interferometer successfully operates and consists of two multi-band fast rotating Antenna Systems with a mirror diameter of 13.2-m (RT-13) installed at the Zelenchukskaya and Badary observatories in 2015. Installation works in Svetloe observatory is scheduled to be completed in 2018.

One of the fundamental problems solved by the "Quasar" VLBI network is a high-precision monitoring of the Earth's rotation irregularity. The data obtained by "Quasar" are used for implementation of a number of space projects, including support of the operation of global navigation satellite systems GLONASS. Radio telescopes of the “Quasar” VLBI network meet all the international standards and work as part of the global radio interferometric networks. Observatories actively participate in both international (IVS, EVN) and domestic observation programs since 2006.

2. References