

IAA VLBI Analysis Center Report

Alexey Kudelkin, Sergei Kurdubov, Svetlana Mironova, Elena Skurikhina, Renata Urunova

Abstract This report presents an overview of the IAA VLBI Analysis Center activities in 2021 and 2022 as well as future plans.

1 General Information

The IAA IVS Analysis Center (IAA AC) operates at the Institute of Applied Astronomy of the Russian Academy of Sciences, St. Petersburg, Russia. The IAA AC contributes to IVS products, such as daily SINEX files, TRF and CRF solutions, and rapid and long-term series of EOP obtained from the IVS observational sessions. The IAA AC generates NGS files from vgosDb files for their use with the QUASAR and OCCAM/GROSS software packages. Besides the IVS VLBI data, the IAA AC deals with the data treatment of domestic observations produced by both the RT-32 radio telescopes (SVETLOE, ZELENCHK, and BADARY) and the RT-13 VGOS radio telescopes (ZELRT13V, BADRT13V, and SVERT13V).

2 Staff

- Dr. Sergey Kurdubov: development of the QUASAR and analysis software.
- Dr. Elena Skurikhina: team coordination, VLBI data processing, development of the

IAA RAS

IAA Analysis Center

IVS 2021+2022 Biennial Report

OCCAM/GROSS and QUASAR software packages.

- Svetlana Mironova (until March 2022): development of the QUASAR software, VLBI data processing, global solution and DSNX file calculation, data combination with SINCOM software.
- PhD Student Alexey Kudelkin: studies in the field of the stochastic data modeling, development of new techniques for scheduling VLBI observations.
- SPbGU student Renata Urunova: VLBI data processing, development of the QUASAR software.

3 Activities during the Past Years

During 2021 and 2022, the IAA AC analyzed data of the IVS (legacy S/X and VGOS) and domestic VLBI observations, submitted to the ITRF2020, and made some investigations.

3.1 Routine Analysis

In 2021 and 2022, the IAA AC continued to generate daily SINEX (DSNX) files from analysis of IVS-R1 and IVS-R4 sessions using the QUASAR software. DSNX files were submitted to the IVS for combination with results of other analysis centers. The IAA AC did not submit DSNX files in the second half of 2022 due to a necessary upgrade of the QUASAR software.

The IAA AC operationally processed the 24-hour and Intensive VLBI sessions using the OCCAM/GROSS software and submitted the results

to the IERS and the IVS on a regular basis. The processing of the Intensive sessions is fully automated.

3.2 Analysis of Domestic Sessions

The IAA Analysis Center processes all observational data of domestic VLBI programs RI, R, and test sessions.

Table 1 presents the main types of the Russian domestic sessions. We use the standard IVS designations for the stations: Sv (Svetloe), Zc (Zelenchukskaya), and Bd (Badary) for RT-32 and Bv (Badary), Zv (Zelenchukskaya), and Sw (Svetloe) for RT-13. Test sessions named RX at S/X/Ka bands were performed, as a rule, once a day with a duration of 0.5 hours on the baseline Bv–Zv.

Table 1 Statistics for sessions for the years 2021 and 2022.

Program	Number of sessions used	rms [μ s]	bias [μ s]
2021			
RI	365	65.2	−13.0
R	1380	25.7	+22.8
2022			
RI	364	64.9	−30.4
R	1623	23.8	+14.5

Observational data from all these sessions are transmitted to the correlators using e-vlbi data transfer. The processing of the RI sessions is fully automated. The calculated UT1–UTC time series is available at <ftp://quasar.ipa.nw.ru/pub/EOS/IAA/eopi-ru.dat>.

In 2021 and 2022, we observed 728 RI sessions using the QUASAR legacy S/X network (usually on the baseline Badary–Zelenchukskaya with Svetloe replacing one of the stations if needed), and 3,003 sessions were observed using the QUASAR VGOS three-station network. The RI sessions were the most rapid with a latency of about 2.5 hours. The latency for the R sessions was about 6 hours.

SVERT13V was commissioned on 24/11/2020.

The program X is an experimental series at S/X/Ka bands. It is of 0.5-hour or 1-hour duration.

4 Current Status

The IAA AC processes the data of all kinds of VLBI geodetic observation sessions. We use the QUASAR and the OCCAM/GROSS software packages for VLBI data analysis. All observation models in these packages are compliant with the IERS Conventions (2010). Both packages use NGS files as input data. The QUASAR and the OCCAM/GROSS software packages are supported and developed further. The QUASAR software was modified to adhere to the ITRF2020 requirements.

5 Future Plans

- To continue submitting all types of IVS product contributions.
- To continue investigations of EOP, station coordinates, and tropospheric parameter time series.
- To improve algorithms and software for processing VLBI observations.

References

1. E. Skurikhina et al, “IAA VLBI Analysis Center 2017–2018 Biennial Report”, in International VLBI Service for Geodesy and Astrometry 2017+2018 Biennial Report, edited by K. L. Armstrong, K. D. Baver, and D. Behrend, NASA/TP-2020-219041, pages 211–214, 2020.