SLR Station Riga 1884, Status Report

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Abstract

This poster presents a summary of the hardware, software and operational upgrades carried out at the SLR station Riga (ILRS code 1884) from 2018 up to October 2022.
Several hardware components and software have been replaced or updated. During this period, the barometric sensors were calibrated.
In particular the receiver unit was fully rebuilt and a second Hybrid Photodiode (HPD) photodetector channel added. The SLR telescope drives and control system, optical channel switching system, laser beam divergence and receiver FOV controls were upgraded.
The telescope visual guiding channel was rebuilt with the introduction of an Andor iXon Ultra 888 EMCCD camera and associated components. Apart of the tracking visual guidance, also allows to carry out photometric observations. At this moment, experimental photometric sampling rates up to 10 Hz have been carried out. Sampling rates up to 100 Hz could be achieved in the future.
The local geodetic ties have been expanded and re-measured, replacing the official 1996 solution. This result allowed us to redertermine the SLR system delay, replacing the 2016 results.
The observational statistics for the period 1997-2018 are shown on the poster.

1. Introduction.

Since 2013 the SLR station Riga presents periodically, in the frame of the ILRS International Workshop on Laser Ranging, a status report poster with the most important upgrades and results since the preceding poster presentation. This status report poster covers the period 2018-2022.

2. Hardware and Software Upgrades since 2018.

- A new SLR detector unit was installed, including a second channel with a PicoQuant HPD photodetector. The new deteector unit is doubly termostated, with electronic interference protection and is operated remotely.
- New computer-controlled optical channel switching system, laser beam divergence control and receiver FOV control
- The telescope drive and control units have been replaced with COTS components.
- Upgraded dual-use visual guiding channel, with the Andor iXon Ultra 888 EMCCD camera, Optomask and a computer-controlled filter wheel for photometry. We have started photometric observation, currently up to 10 Hz sampling rate. This sampling rate could be increased up to ~100Hz with sensor masking technique and binning.

- A new upgraded local ties network determination, replacing the 1996 solution (see reference). The 2016 SLR system delay parameter was redetermined using the new local ties monuments as external targets (see Fig. 1 and reference).
- New prediction, Event Timer Control and Filtering software's, covering both ILRS and space debris targets. The telescope pointing software has been upgraded.
- A new time and frequency distribution unit Pendulum FDA-301 is in operation.
- The Time Selector/Amplitude to Time Interval Converter (TS/ATIC) is in operation from September 2019.
- The local Vaisala WTX501 & PTU300 barometric sensors were calibrated against the GFZ-Potsdam GE DPI Druck141 reference barometer.

3. **Hardware and Software Upgrades currently in development:**

- Testing a new event timer, under development at the Institute of Electronics and Computer Science, with parameter stabilization and additional capabilities.
- Back calibration of the Paulin VMB 2 station aneroid barometer (used 1987-2007) against the calibrated Vaisala local meteorological Station.
- Improved telescope/receiver unit thermal protection for daylight tracking.

4. Notable Points, 2018-2022

- The Station operation was affected during 2020-2021 due to COVID restrictions.
- During the 2021-2022 period, because of the telescope drive replacement and the rebuilding of several SLR blocks, observations were stopped. The SLR observations were restarted in August 2022. (see Fig 2)
- A new single night passes observation record for the Riga SLR station: 54 passes (2020/01/02-2020/01/03).
- The permanent hourly resolution sky clarity monitoring in operation since January 1st 2018.
- Space Debris photometric observations are being carried out (started spring 2022).

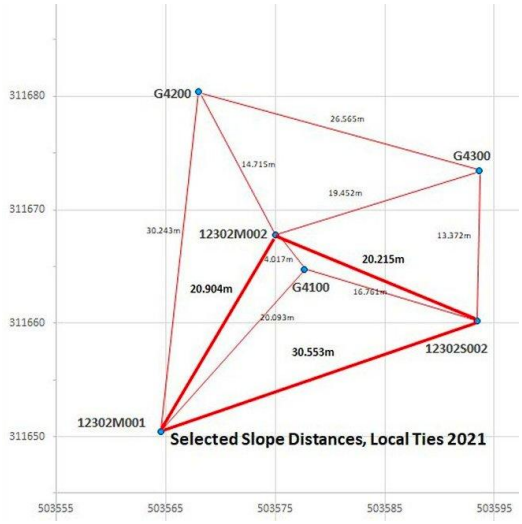

Fig 1. New local ties configuration, old local ties configuration in bold lines

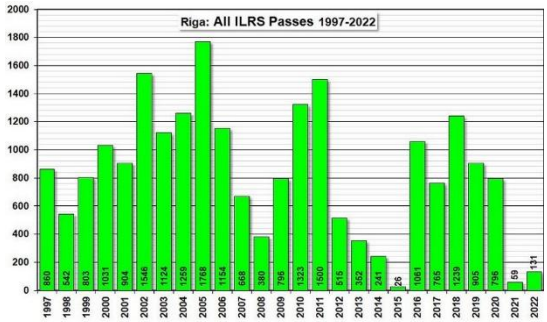

Fig 2. Riga 1997-2022 passes.

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