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SESSION Session 4: Automation and autonomous station operations

TYPE Poster

TITLE Satellite laser ranging station "Lviv-1831" in Lviv, Ukraine. Status report.

ABSTRACT

Satellite laser ranging station "Lviv-1831" was founded in 1998. As of August 2002 it was registered in ILRS with SOD number 18318501, DOMES 12368S001. Also, it participates in observations held within the network of UCEOP, Ukrainian Center for Earth Orientation Parameters. The equipment is hosted in special building in Bryukhovychi village, on the site of suburban station of Astronomical Observatory of Ivan Franko National University of Lviv. In 2009 this research facility is registered as National Property of Ukraine.

The SLR station includes: telescope TPL-1M with 1000 mm diameter of main mirror; laser-pulse transmitter SL-212 with secondary max energy of 130 mJ and pulse width 150 ps; receiving/detection system, the unique development of Latvian Institute of Electronics, providing the precision of picoseconds; time and frequency standards and meteorological instrumentation.

The station corresponds to the third generation of SLR according to the international classification.

The SLR station measures ranges to the special-purpose satellites in orbits varying from 800 km to the 25000 km in altitude with sub-centimeter accuracy.

Unfortunately, the station has suffered several major hardware failures, including damaging of laser cooling subsystem. The recovery has taken several years, and the control of cooling system was enforced by Atmega8-based controller with DS1820 sensors. Also, the frequency standard and mechanical modulator were replaced or upgraded. We have re-coated and realigned the main and secondary mirrors of TPL-1M in 2013. Also, we have installed the interference filter (Edmund Optics, 532nm CWL, 1nm bandwidth) into optical path to improve the S/N ratio, and developed the thermostabilization control unit for it. Along with recovery, photoelectric modules Hamamatsu H6780-

20 have been purchased, the new shutter was designed and implemented with Atmega8 controller to protect from scattered light.

Yet many things to be done. The guidance system does not meet the requirements of ILRS, both mechanics and control subsystems are obsolete. As "Comtis" event timer is getting older, the failures persist. We are on the way of upgrade, however, the system can be operated even in current state, so we are looking forward renewing regular observations.

Besides for SLR we use laser "Ekspla SL-212" to conduct research in optics. For example, we have examined non-linear refraction of ZnO thin films the emission of second harmonic $\lambda=532$ nm. Maintenance of this station includes regular re-examination of interference filter with respect to temperature dependence of transmitted spectral band. According to our result the best temperature for transparency is 38oC.