

Laser Tracking of Space Debris at SLR Graz

Kirchner Georg

Austrian Academy of Sciences, Austria

Georg.Kirchner@oeaw.ac.at

In order to test laser ranging possibilities to space debris objects, the Satellite Laser Ranging (SLR) Station Graz installed a frequency doubled Nd:YAG pulse laser with a 1 kHz repetition rate, a pulse width of 10 ns, and a pulse energy of 25 mJ at 532 nm (on loan from German Aerospace Center Stuttgart – DLR). We developed and built low-noise single-photon detection units to enable laser ranging to targets with inaccurate orbit predictions, and adapted our standard SLR software to include a few hundred space debris targets. With this configuration, we successfully tracked – within 13 early-evening sessions of each about 1.5 h – 85 passes of 43 different space debris targets, in distances between 600 km and up to more than 2500 km, with radar cross sections from $>15 \text{ m}^2$ down to $<0.3 \text{ m}^2$, and measured their distances with an average precision of about 0.7 m RMS.

Such debris measurements should be possible at several SLR stations around the world, without major changes, upgrades or costs; we see several benefits for science, for space debris issues, and last but not least for the participating SLR stations.