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MINI-SLR: A FULLY AUTOMATED MINIATURE SATELLITE LASER RANGING GROUND STATION

Abstract

Satellite Laser Ranging (SLR) has evolved from a geodesy tool to a widely used mission support system. Currently, about 60 satellite missions depend on continuous laser ranging data to derive exact position information, among them several earth observation and many navigation satellites. Even more satellites have used SLR measurements in their early orbit phase to calibrate or verify their onboard navigation. In the future, the demand for laser ranging measurements may rise further, as more and more operators of small satellites, or even the proposed mega-constellations, realize the potential of this technique for obtaining centimeter-precise orbit information during and even after the mission. On board, only a small and light-weight retroreflector is required. On the ground, a world-wide network of around forty stations is available for tracking (International Laser Ranging Service, ILRS).

However, many current ILRS stations are at their limit in terms of number of tracked satellites. Furthermore, the world-wide coverage is rather uneven, with many productive stations in Europe and Asia, only a few in Africa and the Americas and none at very high latitudes (north or south). A few new stations are under construction, more are being planned around the world.

German Aerospace Center is currently developing a new, small and inexpensive SLR system that may be very well suited for the further expansion of the laser ranging network. The whole system is housed in a 2m x 2m x 1.5m box, which is fully sealed and weather proof. It contains not only the mount with transmitter and receiver telescope and the laser, but also all data acquisition and experiment control systems. Our own control software, which is already used in two other SLR systems, will be used to operate the system completely autonomously. Using an infrared laser at low pulse energies avoids problems with aircraft safety. Compared to current SLR stations, which often occupy a whole observatory building and are operated by on-ground staff, this miniSLR system will cut both installation and operating costs significantly. This contribution will present the set-up and first tests with the miniSLR system.