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Identification and calibration of one-way systematic biases in SLR system

Basic application of Satellite Laser Ranging (SLR) is to measure distances of satellites as a function of time with millimetre precision and accuracy. In standard approach the SLR system calibrates transmitting and receiving part as a whole, however for new applications as one-way laser ranging, laser time transfer ground to space and for bi- and multi-static laser ranging to space debris the identification and measurement of biases related separately to transmitting and receiving parts of the system are needed. The epochs of transmission and reception of optical signals have to be referred to the local time scale and further to the coordinated time scale (UTC) with the accuracy reaching one nanosecond level or better. This requirement is about one hundred times more accurate than in standard SLR applications. A new procedure of calibration of one-way delays related to the SLR systems have been developed and tested along with the design and development of the necessary hardware components needed for calibration measurements. The calibration procedure and related hardware were tested in a real measurement at the SLR sites in Graz, Austria and Herstmonceux, UK. The one-way systematic biases were determined with the accuracy better than 20 ps.