Time/Distance Metrology based on Free-Space Optical Communication Links

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Abstract: Free space optical (FSO) links have become more interesting alternative to radio frequency for spatial metrology from ground. Employing a FSO link between ground-space, satellite laser ranging (SLR) is a core technique in numerous geodetic applications. To enhance the measurement performance of SLR, we suggest utilizing a high-data-rate FSO communication or laser communication (lasercom) link for time/distance measurement. Rapid improvement on data-debit of ground-space lasercom link enable using of 10 Gbps telecom signal to achieve an absolute, high sensitivity and accuracy time/distance measurement for ground-space link. In this presentation, we describe the measurement principle and the implementation of a 10 Gbps lasercom signal to achieve few tens of fs (or few µm in distance) sensitivity over both short and long time ranges. This is demonstrated through a folded 2.5 km free-space path for time and distance measurement.

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