Relativistic Positioning as a complementary technique of LASER Ranging

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Relativistic positioning methods and techniques will be presented. Such techniques, besides incorporating general relativity from the very beginning, are based only on local accurate time measurements, allowing both for self-positioning for a receiver of signals sent by known emitters, and for the positioning of a remote emitter in the reference frame of at least four known receivers. The approach basically solves a geometric problem in four dimensions on a curved space-time manifold. In general, the accuracy of the final space-time positioning depends on the accuracy of the time measurements performed at the receivers and on the precision with which the space position of the receiving/emitting reference stations is known. The method is exemplified considering the ground based stations of the ILRS network and the Galileo satellites, especially the two actually parked on high eccentricity orbits being the object of the Italian Space Agency (ASI) Galileo for Science project. The relativistic positioning approach could be complementary to the LASER ranging technique, especially for transverse positioning. Furthermore, it would allow self-guidance for spacecraft in the solar system provided well localized beacons are available not only on earth, but possibly in the Lagrange points of the sun-earth pair (or other pairs of celestial bodies) or even considering pulsars.