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Satellite Laser-Ranging as Probe of Fundamental Physics

Satellite laser-ranging is a technique successfully used in Earth's sciences, geodynamics and space geodesy. However, laser-ranged satellites can also be used to test fundamental physics and Einstein's theory of General Relativity. Einstein's gravitational theory is central for our understanding of cosmology and high energy astrophysics. Nevertheless, interest in modified gravitational theories has been currently stimulated by the discovery of the accelerated expansion of the universe and by the related riddle of dark energy, which is today one of the most profound mysteries of physics. Here, we present some recent tests of fundamental physics and General Relativity obtained by the laser-ranged satellites LARES (LAsER RELativity Satellite, 2012) of the Italian Space Agency (ASI), LAGEOS (NASA, 1976), LAGEOS 2 (ASI and NASA, 1992), among which the accurate tests of dragging of inertial frames or "frame-dragging", an intriguing prediction of Einstein's theory. ASI successfully launched the LARES satellite in February 2012 and will launch in 2020 the new generation laser-ranged satellite LARES 2 to test fundamental physics and General Relativity and for other measurements in geodynamics and space geodesy.

