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Precise Orbit Determination of LAGEOS satellites: recent results on fundamental physics

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The LAGEOS satellites, launched for geodynamics and geophysics purposes, are offering also an outstanding test bench to fundamental physics. Indeed, their physical characteristics, as well as those of their orbits, and the availability of high-quality tracking data provided by the International Laser Ranging Service (ILRS), allow for precise tests of gravitational theories in a relatively "clean" environment. In this talk recent work aimed at testing gravitational theories will be presented. A fairly large amount of LAGEOS and LAGEOS II Satellite Laser Ranging (SLR) data has been analyzed with NASA/GSFC Geodyn II software, using a set of dedicated models for satellite dynamics, and the related post-fit residuals have been analyzed. In particular, general relativity effects leave peculiar imprint on nodal longitude, argument of perigee and inclination behaviour, which have been considered in our analysis. The most precise – as today – estimate of the effects on argument of perigee has been obtained, improving also the constraints on non-Newtonian (i.e. Yukawa-type) gravitational dynamics. The measurement error budget will be discussed, emphasizing the role of gravitational and non-gravitational forces modeling on the overall precise orbit determination quality.