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PRELIMINARY RESULTS FROM THE LARES MISSION TO TEST GENERAL RELATIVITY

Abstract

The LARES mission was conceived for placing in orbit an almost perfect test particle that will follow a geodesic of spacetime. The accurate orbit determination together with the accurate modeling of classical perturbation effects on the satellite is a key factor for the success of the mission. According to the theory of General Relativity a current of mass-energy will induce an additional deformation to spacetime, thus Earth, with its rotation, will induce a very small perturbation on the node of an orbiting satellite. This phenomenon is caused by the gravitomagnetic field and is known as frame dragging or the Lense-Thirring effect. To measure this effect with a reasonable accuracy, the analysis of LAGEOS and LAGEOS 2 data was already performed back in 2004. However to perform a very accurate test of the Lense-Thirring effect a specifically designed third satellite was required. After many years since the first proposal was submitted, finally in 2008 the Italian Space Agency (ASI) and the European Space Agency (ESA) decided to exploit the VEGA maiden flight to accommodate LARES (LAser RElativity Satellite) on a dedicated launch. Subsequently, several additional university satellite projects were accepted for launch along with LARES, on the 13th of February 2012. The launch was very successful both for the VEGA and LARES teams, the satellite being released with a very high accuracy on the nominal orbit: circular at 1450 km and 69,5 degrees inclination. In the paper it will be shown that LARES behaves as the best test particle available in the solar system, being an extraordinary instrument for testing not only fundamental physics but also to perform studies on geodesy and geodynamics. In this paper we will present the preliminary results of the first two years of orbital analysis of LARES data.