

MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM (A2)  
Gravity and Fundamental Physics (1)

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IMPROVEMENT OF THE MEASUREMENT OF FRAME-DRAGGING BY THE FUTURE LARES 2  
MISSION.**Abstract**

The angular momentum of a central body produces in general relativity an intriguing phenomenon called frame-dragging and induces a secular drift of the node of a satellite called the Lense-Thirring (L-T) effect that is extremely tiny for satellites orbiting around Earth. For the laser-ranged satellite LAGEOS it amounts to about 31 milliarcsec/year. The largest non-relativistic secular effects on the node of satellites are due to the non-sphericity of the terrestrial gravity field in fact this effect is several times greater than the L-T effect. By combining the longitudes of the nodes of two satellites: LAGEOS and LAGEOS 2, it is possible to cancel the nodal drift uncertainties due to the first even zonal harmonic,  $J_2$ , reaching an uncertainty of the order of 10%. The LARES (LAsER Relativity Satellite) space experiment, of the Italian Space Agency (ASI), together with the LAGEOS and LAGEOS 2 satellites will allow an accurate measurement of frame-dragging and Earth's gravitomagnetic field with an accuracy of approximately 1%. However, this measurement will be affected by the uncertainties due to the even zonal harmonics with degree strictly higher than four. The goal of this paper is to present the idea underlying the mission of placing in orbit the LARES 2 satellite. By placing LARES 2 in a supplementary orbit with respect to LARES or with respect to LAGEOS the effect of all the even zonal harmonics will be eliminated thus allowing a reduction on the uncertainty substantially below 1%. Furthermore, both, by measuring the perigee shift of LARES 2, and by processing the data of all the laser-ranged satellites of this constellation, LAGEOS, LAGEOS 2, LARES and LARES 2, it will be possible to put stronger limits on a conceivable Yukawa-type fifth-force as predicted by some alternative fundamental physics theories.