Design, construction and optical test of a laser-ranged test mass for deep space missions

S. Berardi, A. Boni, S. Dell'Agnello, M. Martini, G. Patrizi, G. O. Delle Monache, N. Intaglietta, C. Lops, C. Cantone, L. Porcelli, M. Garattini, M. Maiello
INFN-LNF, Italy
giordano.patrizi@lnf.infn.it

In the context of a three-year study on "Cosmology and Fundamental Physics" (COFIS, Work Package 5200) funded by ASI and led at national level by P. de Bernardis, we designed a prototype laser-ranged test mass to study gravity for a deep space mission satellite formation, based on a laser ranging system onboard the mothership. The test mass has been built by LNF in the framework of the ETRUSCO INFN experiment, with INFN funding for hardware and manufacturing. Optical far field diffraction pattern tests of over 100 prototype retroreflectors and of the fully optically instrumented test mass have been completed. This prototype will be useful to study the inverse-square law in the interplanetary space with future deep space missions, like ESA's L-Class mission to the Jovian system, JUICE, or with other proposed Solar System missions.