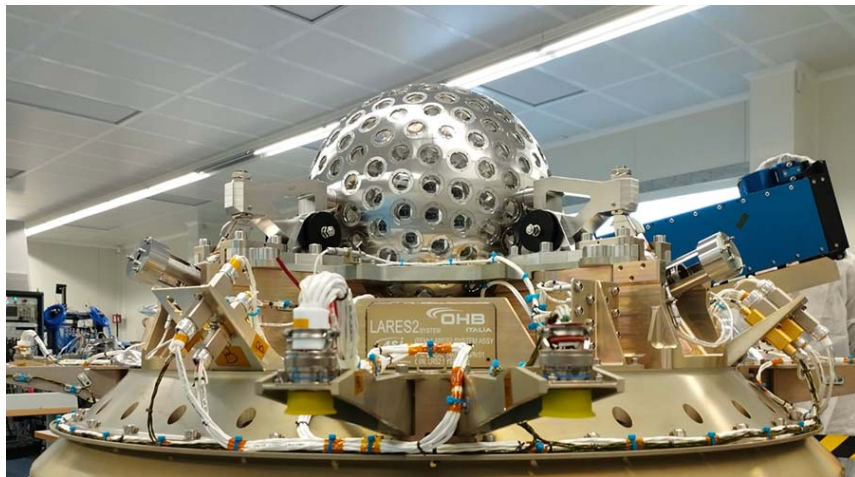


Newsletter Focus

LARES-2 TOWARDS THE LAUNCH PAD



24 March saw the conclusion of pre-launch testing, carried out by the Italian Space Agency (ASI), of the LARES-2 (*LAser RElativity Satellite 2*) systems, the satellite dedicated to the experimental verification of certain relativistic aspects predicted by Einstein's theory and to the accurate measurement of values of interest in the field of space geodesy (including the metrological definition of the position of the Earth's centre

of mass), which will be the main instrument on board the maiden flight of the new European launcher Vega C, currently scheduled for the end of May. The project, conceived by the scientific team of the Fermi Centre and the Sapienza University of Rome and coordinated by ASI, saw a fundamental contribution by INFN, which, thanks to its now recognised skills in the field of space technology implementation, was selected for the implementation of the entire satellite, after the experience already acquired with the satellite's predecessor, LARES-1.

Thanks to its characteristics, LARES-2, consisting of a high-density nickel sphere (424 mm in diameter and 300 kg in mass) equipped with 303 CCR (Cube Corner Retroreflectors), will represent a perfect reflecting target for the laser beams sent by the International Laser Ranging Service (ILRS) stations, which will hit the satellite during its orbit around the planet at an altitude of approximately 6000 km. Retro-reflective ray detection, carried out by the emission centres themselves, including the ASI Observatory (*Matera Laser Ranging Observatory*), will allow extremely precise measurements of the position of LARES-2 to be made and an understanding of how this is influenced by the gravitational field and the Earth's rotation.

The high mass and compactness of LARES-2 and the possibility of constantly following its trajectory through the laser positioning system that will be used, will allow the satellite to minimise the influence of other non-gravitational disturbances, making it *de facto* a test mass particularly suitable to test the General Relativity predictions, and thus the exact curvature of space-time induced by the Earth and the effects produced by so-called *Frame Dragging*, a distinctive gravitational phenomenon associated with the Earth's rotation. The implementation of a perfectly balanced, high density spherical structure and mirrors with shapes and qualities such as to retro-reflect the incident laser beams therefore represented crucial tasks for the future and proper functioning of LARES-2. Activities for which INFN, through the Frascati National Laboratories and the Padua division, was entirely responsible.

The vast experience acquired at INFN in the design and implementation of detectors and particle accelerators, and contributions to the implementation of fundamental equipment of the nuclear fusion program (IFMIF and DTT ancillary to the ITER project) were key to the success of the contribution, which saw INFN take over the role previously played by specialised companies (LARES-1). Finally, in addition to these activities, conducted at the Padua division, there were those carried out at the Frascati National Laboratories, responsible for coordinating the project and the 303 reflectors that constitute the satellite optics, integration of the latter and tests carried out to verify its space flight fitness.