

The LARES 2 satellite for testing general relativity successfully placed in orbit with VEGA C

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The 13 July 2022, ten years after the successful LARES 1 mission, a new laser ranged satellite for testing the space time warp produced by the Earth rotation, predicted by general relativity, has been placed in the final orbit with high accuracy. VEGA C, the newest European Space Agency launch vehicle developed by ASI-ESA-Avio, an empowered version of VEGA used for the LARES 1 satellite ten years ago, passed the qualification flight with full marks. The main objective of the LARES 2 satellite, of the Italian Space Agency, is to provide tests, with unprecedented accuracy, of the phenomenon of frame-dragging predicted by general relativity, that is with accuracy improved by about one order of magnitude, or better, with respect to the LARES 1 mission. LARES 2 will also provide other tests of general relativity and gravitational physics. This will be achieved thanks to the very special orbit chosen for the LARES 2 satellite which is supplementary to that of LAGEOS 1 (launched by NASA in 1976). For that reason the orbital injection accuracy required for the LARES 2 satellite was much more stringent than the one previously chosen for LARES 1. The very preliminary orbital determination, obtained with the laser ranging data, available a few days after the first laser returns acquired by the Matera Laser 29 Ranging Observatory (MLRO) on the 16th of July 2022, confirms that the orbital injection accuracy is much better than what requested by the scientific team of the LARES 2 mission and very much below the 3-sigma accuracy reported by the launch vehicle user's manual. This, along with the improved Earth gravitational field obtained with the GRACE Follow-On mission, will allow to obtain a better improvement, with respect to what expected, of the measurement of the Earth frame-dragging, potentially bringing the measurement accuracy to about 0.1%. In the paper, the LARES 2 mission will be described in more detail along with the error budget of the space experiment.