
ISLAND: the Inverse Square Law And Newtonian Dynamics Space Explorer

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Résumé

The Inverse Square Law And Newtonian Dynamics Space Explorer (ISLAND) is a new science concept developed by ONERA and collaborators to test the gravitation inverse square law at small scales and at the largest scales reachable in the Solar System. Its instruments are based on the same (tested and proven) technology as that of missions like LISA Pathfinder and MICROSCOPE.

Using a Yukawa parameterization to quantify deviations from the Inverse Square Law, we expect ISLAND to improve the current constraints by two orders of magnitude at scales smaller than 100 microns and at scales larger than 6 AU (beyond Jupiter's orbit).

In this talk, I will present and motivate the science case for ISLAND, and show how we can meet the aforementioned improvement of constraints on Yukawa-type deviations from Newton's gravity. The first goal can be reached by using existing concepts of torsion pendulums, that must nevertheless be adapted for the micro-gravity environment. This adaptation can be readily done with, for example, ONERA's experience in ultrasensitive electrostatic accelerometry. The second goal can be reached by using accurate absolute accelerometers, which are able to measure absolute accelerations of 1 pm/s². Such accelerometers are developed at ONERA: they add a bias rejection system to the more common accelerometers that have flown in GOCE and LISA Pathfinder.

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