



General Relativity and Quantum Cosmology

Odyssey 2 : A mission toward Neptune and Triton to test General Relativity

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Odyssey 2 will be proposed in December 2010 for the next call of M3 missions for Cosmic Vision 2015-2025. This mission, under a Phase 0 study performed by CNES, will aim at Neptune and Triton. Two sets of objectives will be pursued. The first one is to perform a set of gravitation experiments at the Solar System scale. Experimental tests of gravitation have always shown good agreement with General Relativity. There are however drivers to continue testing General Relativity, and to do so at the largest possible scales. From a theoretical point of view, Einstein's theory of gravitation shows inconsistencies with a quantum description of Nature and unified theories predict deviations from General Relativity. From an observational point of view, as long as dark matter and dark energy are not observed through other means than their gravitational effects, they can be considered as a manifestation of a modification of General Relativity at cosmic scales. The scientific objectives are to: (i) test the gravitation law at the Solar System scale; (ii) measure the Eddington parameter; and (iii) investigate the navigation anomalies during fly-bys. To fulfil these objectives, the following components are to be on board the spacecraft: (i) the Gravity Advanced Package (GAP), which is an electrostatic accelerometer to which a rotating stage is added; (ii) radio-science; (iii) laser ranging, to improve significantly the measure of the Eddington parameter. The second set of objectives is to enhance our knowledge of Neptune and Triton. Several instruments dedicated to planetology are foreseen: camera, spectrometer, dust and particle detectors, and magnetometer. Depending on the ones kept, the mission could provide information on the gravity field, the atmosphere and the magnetosphere of the two bodies as well as on the surface geology of Triton and on the nature of the planetary rings around Neptune.

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