

SPACE EXPLORATION SYMPOSIUM (A3)  
Solar System Exploration (6)

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GG MISSION AND SPACECRAFT DESIGN

**Abstract**

GG is a project in Fundamental Physics under consideration as candidate for the next generation of missions of the Italian Space Agency. The mission of GG is to test the Equivalence Principle to 1 part in  $10^{17}$ , four orders of magnitude better than any ground experiment to date, by a new instrument concept, without cryogenics, designed and optimized for the purpose. A laboratory version of the experiment, GGG, is ongoing since 2003 at the INFN laboratories in Pisa, with ASI funding, providing experimental evidence of all the components that will be needed in space, and constantly improving sensitivity within the limits imposed by the ground environment. Studies on the space mission have been funded by ASI since the late 1990's. Recently, a new industrial study has been awarded by ASI to Thales Alenia Space-Italy, to bring the design concept up to date with respect to both the GGG lab experience and progress in the enabling technologies such as drag-free control, as successfully demonstrated by ESA's gravity mission GOCE. The achievements of the study include a high fidelity GG software simulator, developed after the blueprint of the GOCE simulator, and a proven Spin Rate Sensor breadboard. As a result of this new study, the GG project is mature, should this be the decision of ASI, for an immediate start of an Implementation Phase that would bring the satellite to launch readiness in four years.