MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM (A2)
Gravity and Fundamental Physics (1)

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THE MICROSCOPE SPACE MISSION: FROM FLIGHT HARDWARE TO IN-ORBIT CALIBRATION

Abstract

The MICROSCOPE space mission aims at testing the Equivalence Principle (EP) with an accuracy of 10e-15. This principle is one of the basis of the General relativity theory; it states the equivalence between gravitational and inertial mass.

The test is based on the precise measurement of a gravitational signal by a differential electrostatic accelerometer which includes two cylindrical test masses made of different materials. Two differential accelerometers constitute the payload on board a drag-free microsatellite which is controlled inertial or rotating about the normal to the orbital plane with a very stable angular velocity.

The acceleration estimates used for the EP test are disturbed by the instrument's physical parameters and by the instrument environment conditions on board the satellite. These parameters are partially measured with ground tests (for instance in the case of electronics parameters) or during the integration of the instrument in the satellite (alignment). Nevertheless, the ground evaluations are not sufficient with respect to the EP test accuracy objectives. An in-orbit calibration is therefore needed to characterize them finely.

After a general description of the MICROSCOPE space mission and the status of progress flight hardware production and test, the paper will describe the specific procedures which are planned to be implemented in orbit for the calibration; the results of the theoretical evaluation of the calibration process will be also provided.