MICROGRAVITY SCIENCES AND PROCESSES (A2)
Microgravity Experiments from Sub-orbital to Orbital Platforms (3)

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TECHNOLOGY DEVELOPMENT FOR FUNDAMENTAL PHYSICS SPACE MISSIONS AIMING AT HIGH PRECISION GRAVITATIONAL FIELD MEASUREMENTS

Abstract

Since several years the Center of Applied Space Technology and Microgravity (ZARM) is involved in the development of high precision instruments for the measurement of gravitational field effects in space. The contribution to the development of the differential accelerometer of the French MICROSCOPE mission (CNES/ONERA/PTB/ZARM), that aims at a test of the Equivalence Principle in space is only one example for the efforts in this area. The activities of ZARM in the area of zero-g atom interferometry and BEC for space applications are also very promising and seem to become a perfect addition to the well established conventional capacitive accelerometer technology. But, due to the long development time frame and the yet low technology readiness level (TRL) of the atom interferometry technology for space applications the traditional accelerometer technology is still in progress. In 2008 ZARM started to develop the technology for special devices needed for deep space missions aiming at high precision gravitational field measurments with conventional capacitive accelerometers. In close cooperation with ONERA a device for the rejection of the instrument bias of high precision capacitive accelerometers and gradiometers has been developed. This so called bias rejection system is important to reject the bias effects on the measurements especially for long term interplanetary data aquisition. The device consists of a piezo electric turning mechanism used to rotate the accelerometer to several specific positions with very high angular accuracy. The development is driven by the (still ongoing) planning of new payload and mission concepts especially in the frame of the ESA Cosmic Vision series. The current status and the main development challenges are described in the contribution.