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IMPROVEMENT OF THE ULTRA SENSITIVE ELECTROSTATIC ACCELEROMETER FOR THE NEXT GRAVITY SPACE MISSIONS

Abstract

The sensor core configuration of the electrostatic accelerometers of the CHAMP, GRACE and GOCE missions has been especially designed for space applications and so optimized in regard to the weak level of acceleration to sustain and measure in orbit. The return of experience of these three gravity space missions which demonstrate the robustness and the performances of this family of space instruments, allows a better optimisation of the design of the accelerometer in terms of thermal stability and operation reliability for the near future missions as GRACE follow-on. Nevertheless because the next generation of low-low satellite to satellite tracking missions will take advantage of interferometer laser ranging methods to improve their performance, the noise level of the accelerometer has also to be lowered, especially in the low frequency bandwidth. In addition to the measurement of the surface forces exerted on the spacecraft by the atmospheric drag, by the Sun radiation and by the Earth albedo and infrared pressures, the accelerometer instrument becomes a major part of the attitude and orbit control system by acting as drag free sensor and by accurately measuring the angular accelerations. After a description of the present improvement with respect to the still in-orbit accelerometer models, the paper will propose possible future configurations or combinations of accelerometers