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MANAGING THE MICROVIBRATION IMPACT ON SATELLITE PERFORMANCES

Abstract

Due to the increasing needs on the performance of satellites, in particular optical satellites, microvibrations have become more and more important over the last years.

Microvibrations affect a large number of observation satellites – Earth observation – and space observation missions. Further microvibrations are also a concern for other missions with sensitive instruments like Fourier spectrometers, high-precision accelerometers or reference oscillators.

In classical fields like structural dynamic engineering, management approaches have been established and implemented in all space projects. This paper presents a corresponding approach for the area of microvibrations.

Focus is on the definition of all key elements needed to establish a microvibration control approach. This includes the establishment of microvibration budgets and associated summation rules. Equipment and system modelling and analyses tools are defined. A systematic way for microvibration disturbance minimization is presented and rules for the application are defined. Specific emphasis is given to the definition of microvibration interface requirements and the associated control process.

The concepts developed in this study have been verified by tests performed on a typical Reaction Wheel, Reaction Wheel Isolator and a satellite. The satellite test has been performed on a Platform Structural Model accommodating the Reaction Wheel and Isolator plus an optical telescope breadboard. The activity was supported by FEM analysis in terms of transfer function determination and modelling of coupled noise sources within the satellite.