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METOP-SG MICROWAVE IMAGER INSTRUMENT MICROVIBRATION CAMPAIGN

Abstract

The MicroWave Imager (MWI) Instrument is part of the payload complement of the MetOp-SG Satellites type B; it is a conical scanning radiometer, providing precipitation monitoring as well as sea ice extent information. The instrument continuous rotation produces a complex microvibration spectrum of exported forces and torques which can affect other MetOp-SG instruments' pointing performances. Therefore, exported microvibrations is limited by specific requirements to be verified by test.
The measurement of exported forces and torques is affected by many disturbances which are not present in orbit and that shall be characterized and possibly minimized by proper design of the test setup.
The microvibration test facility, which has been developed specifically for MetOp-SG instruments at Airbus EVT Toulouse test center, comprises a pneumatic suspension system to isolate from external noise sources the marble test bench on which the specimen is mounted on a triaxial load cells system. The suspension system is a critical element due to its modal behavior that can affect the system dynamics and the measurements. Thanks to the analysis of the results collected during the MWI EM microvibration campaign, the setup has been upgraded and optimized for the PFM test.
In addition to the external disturbances from the ground, also the specimen itself, due to its shape, introduces aerodynamics disturbances which play a significant role because they occur at the same rotation frequency of the residual instrument unbalance. So, they have been characterized through analysis and reduced by performing the test under a controlled atmosphere of helium.
The instrument rotating part is about 120kg, with more than 20kg.m^2 rotating inertia at the continuous rotating speed of 45rpm; the test on the MWI EM has been performed also with an off-loading device designed at OHB-I to simulate 0g conditions in orbit and have a more representative value of the bearings

noise at higher frequencies.
All these elements together contribute to create a complex test setup which is the subject of this paper. The whole experience gained during the MWI microvibration test campaigns will be described: an overview of the MWI microvibration requirements, the detailed description and characterization of the test setup and of the sources of disturbance, the obtained results and their correlation to instrument inertia properties together with the lessons learnt during the microvibration test campaigns of the EM and PFM models of the instrument carried out in Airbus EVT test center in Toulouse, under ESA supervision.