Paper ID: 51011
student

IAF MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Interactive Presentations - IAF MATERIALS AND STRUCTURES SYMPOSIUM (IP)

Author: Mr. Andreas Johann Hörmer
Graz University of Technology (TU Graz), Austria

Mr. Manuel Kubicka
Graz University of Technology (TU Graz), Austria

IMPROVING VIBRATION TEST RESULTS AND COVERAGE BY ACOUSTIC MEASUREMENTS

Abstract

A launch into orbit applies strong physical forces to every component inside a spacecraft. Vibration tests are performed to the levels of the selected launch vehicles to ensure the viability of the hardware. Especially in small satellites and CubeSats, electronics tend to get smaller in size, and thus the resonant frequencies of the modules are increasing. Since hardware is exposed to physical stress as much information as possible should be gathered during each vibration run. The miniaturisation of components does not always allow to place acceleration sensors on the desired physical locations and the weight of theses sensors might influence the device under test (DUT) significantly in terms of resonance frequency.
This paper presents a method to get additional results and to enhance the test during a vibration test campaign. Sensor placement on a module is typically limited to some few suitable locations, which leads to certain resonance frequencies potentially not being discovered at all. Standard vibration tests cover frequencies of up to 2 000Hz, but small components may be susceptible to harmonic resonances in higher frequency regions. Additional acoustic measurements during the vibration test can enhance the test coverage with respect to hidden resonances and to higher frequency domains To achieve this, microphones are placed near the device under test, covering a frequency range up to 20 000Hz. As a test device, a dedicated printed circuit board (PCB) for a cubesat platform is equipped with acceleration sensors and its frequency response will be recorded with a capacitive microphone. In this paper a comparison is made between the vibration test results provided by acceleration sensors and the acoustic measurement to evaluate the reliability, advantages and disadvantages of the acoustic method.