

Tailoring of ECSS Standard for Space Qualification Test of CubeSat Nano-Satellite

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Abstract : There is an increasing demand of nano-satellite development among universities, small companies, and emerging countries. Low-cost and fast-delivery are the main advantages of such class of satellites achieved by the extensive use of commercial-off-the-shelf components. On the other side, the loss of reliability and the poor success rate are limiting the use of nano-satellite to educational and technology demonstration and not to the commercial purpose. Standardization of nano-satellite environmental testing by tailoring the existing test standard for medium/large satellites is then a crucial step for their market growth. Thus, it is fundamental to find the right trade-off between the improvement of reliability and the need to keep their low-cost/fast-delivery advantages. This is particularly even more essential for satellites of CubeSat family. Such miniaturized and standardized satellites have 10 cm cubic form and mass no more than 1.33 kilograms per 1 unit (1U). For this class of nano-satellites, the qualification process is mandatory to reduce the risk of failure during a space mission. This paper reports the description and results of the space qualification test campaign performed on Endurosat's CubeSat nano-satellite and modules. Mechanical and environmental tests have been carried out step by step: from the testing of the single subsystem up to the assembled CubeSat nano-satellite. Functional tests have been performed during all the test campaign to verify the functionalities of the systems. The test duration and levels have been selected by tailoring the European Space Agency standard ECSS-E-ST-10-03C and GEVS: GSFC-STD-7000A.

Keywords : CubeSat, nano-satellite, shock, testing, vibration

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