

49th IAA SYMPOSIUM ON SAFETY, QUALITY AND KNOWLEDGE MANAGEMENT IN SPACE
ACTIVITIES (D5)

Prediction, Measurement and Effects of space environment on space missions (3)

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ENDUROSAT'S CUBESAT NANO-SATELLITE AND MODULES SPACE QUALIFICATION TEST
CAMPAIGN

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 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 improving 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 description and results of the space qualification test campaign performed on Endurosat's Cubesat nano-satellite and modules. Physical properties evaluation (weight, center of gravity and momentum of inertia), thermal cycling, thermal vacuum cycling, vibration (sinusoidal and random) and pyroshock tests have been executed by CIRA's Space Qualification Lab from 3rd to 14th, December 2015. 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 sequence of the tests followed the "test as you flight" philosophy while durations and levels have been selected by tailoring the ESA standard ECSS-E-ST-10-03C and GEVS GSFC-STD-7000A.