

21st IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)  
Space Systems and Architectures Featuring Cross-Platform Compatibility (7A)

Author: Prof. Mengu Cho  
Kyushu Institute of Technology, Japan, cho@ele.kyutech.ac.jp

ISO STANDARD DRAFT “DESIGN QUALIFICATION AND ACCEPTANCE TESTS OF  
SMALL-SCALE SATELLITES AND UNITS SEEKING LOW-COST AND FAST-DELIVERY”

**Abstract**

There is increasing demand of small-scale (small/micro/nano/pico) satellite development and utilization worldwide. The mission success rate of small-scale satellites is lower than traditional large/medium class satellites. Small-scale satellite failure is dominated by infant mortality. The low success rate may jeopardize commercial use of small-scale satellites. A certain set of tests is necessary to improve small-scale satellite reliability to an acceptance level suitable for commercial investment. That being said, applying the same test requirements and methods as those applied to traditional large/medium satellites will nullify the low-cost and fast-delivery advantages possessed by small-scale satellites. This standard describes test requirements and test methods to qualify the design and manufacturing methods of small-scale satellites and their units, and to accept the final products. Their mass and size is, but not limited to, typically less than 50kg and 50cm, respectively. The standard places emphasis on achieving reliability against infant mortality after the launch while maintaining low-cost and fast-delivery. Since 2011, an international collaborative effort has been carried out to develop the standard draft. It is now 87 pages covering 30 test items, such as thermal vacuum, vibration and others. Logical flow charts to select the necessary test items are provided. The standard tailors the existing standard such as ISO-15864, but the differences from the test standard for traditional satellites are clearly specified. The standard gives specific test levels to qualify satellite units. The qualification test gives the minimum assurance that the COTS-based unit is good as a satellite unit. The appendix explains the rationale of the test levels and conditions described. This paper presents an ISO standard draft in detail that was proposed to ISO/TC20/SC14 in December 2013. The small satellite size is merely a result of seeking low-cost and fast delivery. To achieve these two points, the satellite design relies on COTS units and the satellite size inherently becomes smaller. The standard is applied to satellites whose development methods are different from the ones used for traditional satellites where the reliability often supercedes the cost and schedule. It is meaningless to limit the scope based on specific categories of satellite size such as micro-, nano- and pico- whose definitions are not agreed worldwide. Therefore, the wording of “small-scale” is used in the standard.