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SPECIFIC FEATURES IN TESTING SMALL-SIZED SPACE EQUIPMENT

Abstract

The field of nanosatellite development is experiencing rapid growth, leading to an increased demand for satellite testing services. Situated in Estonia, the laboratory complex at Tartu Observatory, part of the University of Tartu, is committed to addressing this growing need. These cutting-edge laboratories play a pivotal role in supporting space technology development and testing and, in particular, testing for sinusoidal and random vibration, mechanical shock, and thermal vacuum testing, specifically designed for the most miniature satellites in accordance with the ECSS standards. Additionally, the laboratories can calibrate and characterize optical instruments, including hyperspectral radiance and irradiance sensors, light sources, and optical filters. These facilities have climate-controlled cleanrooms and electrostatic discharge-protected areas to ensure ideal development and testing conditions. Accredited under ISO 17025, the laboratories maintain high-quality standards. As the laboratories at Tartu Observatory have successfully conducted tests for clients from various backgrounds, ranging from CubeSat cameras to 6-unit CubeSats and P-PODs, a lot of experience have been gained in the field of testing of space technology throughout the years. This experience underscores the critical importance of proper testing fixtures, as they significantly influence the success of nanosatellite testing campaigns.

Based on the testing history with small satellites, it is evident that the design of testing fixtures can significantly impact the success of a nanosatellite testing campaign. While fixture design plays a role in thermal vacuum testing, its true importance becomes evident during mechanical testing. Vibration and mechanical shock tests of nanosatellites are easily influenced by the fixture used since the fixture often outweighs the device being tested, making the resonant frequencies of the test fixture an essential aspect to consider when planning a testing campaign. Vibration and mechanical shock tests of nanosatellites are particularly susceptible to the influence of the fixture used, as the fixture's mass often surpasses that of the device under test. Consequently, careful consideration of the resonant frequencies of the test fixture is essential when planning a testing campaign.

This presentation highlights the critical significance of employing proper test fixtures in satellite testing. Challenges associated with inadequately designed fixtures will be discussed, and outstanding examples will be presented to illustrate the importance of designing and using proper test fixtures. These examples will demonstrate real-world scenarios where careful attention to fixture design significantly contributed to the success of satellite testing campaigns.