MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Space Structures 1 - Development and Verification (Space Vehicles and Components) (1)

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VV01 - LARES SYSTEM DEVELOPMENT AND VERIFICATION

Abstract

LARES (LAser RElativity Satellite) System is an Italian space mission, developed by CGS for the Italian Space Agency - ASI. LARES System has been the first payload of the new European Launcher VEGA and successfully launched the 13th of February 2012. The mission main scientific goal, defined by prof. I. Ciufolini, is to allow the measurement of the relativistic Lense-Thirring effect with a very high accuracy by using the LARES passive satellite, a 386.8 kg homogeneous spherical tungsten body with 92 Corner Cube Reflector (CCR) installed on its external surface. In addition, two secondary objectives were part of LARES mission: to provide a separation platform for additional payloads and to support the launcher qualification. In particular the LARES System deployed ALMASAT-1, an Italian microsatellite devoted to validation of space technology applications, and 7 ESA Picosatellite Cubesats, provided by different European universities and research centres, as secondary payloads. Finally, the system included an innovative sophisticated acquisition and telemetry subsystem, devoted to the characterization of the environmental conditions inside the fairing and at LV-P/L interface and to acquire video sequences of the lift-off (by using an external camera) and of payloads separations (by using an internal camera), so contributing to achieve the Launch Vehicle qualification flight objectives. In this paper the LARES system verification plan and qualificationtest campaign is described. The system was composed by different subsystems for which a Protoflight (PFM) and standard Qualification (QM) and Flight (FM) Models mixed approaches have been used. A non conventional verification strategy has been used in order to verify the compliance with all the requirements. The following tests were part of LARES System qualificationprocess: sine, random and acoustic vibrations, shock, thermo-vacuum and EMC. Particular attention was devoted to the verification of the capability to withstand the specified shock loads, because of the lack of historical experimental data for the VEGA launcher and the uncertainty in the prediction of this loads by analysis. Therefore, a robust and effective down scaled qualification approach has been applied, together with an accurate analysis at system and subsystem level. The qualificationprocess of the LARES system was performed by CGS under ASI control with ESA-IPT support, because the process itself was considered by ASI and ESA as part of the VEGA qualification.