

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

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LARES SYSTEM DESIGN, DEVELOPMENT AND QUALIFICATION

Abstract

LARES (LAsER RELativity Satellite) System is an Italian space mission, developed by Carlo Gavazzi Space - CGS for the Italian Space Agency- ASI. LARES System is the first payload of the new European Launcher VEGA and it is planned to be launched in the second half of 2011. The mission has a main scientific goal that will allow the measurement of the relativistic Lense-Thirring effect with a very high accuracy. Two additional secondary objectives are part of LARES system: a support for launcher qualification and an educational goal. In fact, in addition to the strictly defined LARES satellite, that is the scientific experiment, the system includes a sophisticated acquisition and telemetry subsystem, devoted to the characterization of the environmental conditions inside the fairing, so contributing to achieve the Launch Vehicle qualification flight objectives. Then the LARES System will release ALMASAT-1, an Italian microsatellite devoted to validation of space technology applications, and the ESA nanosatellite Cubesats, provided by different European universities and research centres, as secondary payloads. More than the scientific aspects, this paper presents the LARES system design and development with respect to technological and launcher qualification requirements. The scientific mission will be performed by the LARES passive satellite, a 380 Kg omogeneous spherical tungsten body with 92 Corner Cube Reflector (CCR) installed on its external surface, while the paper describes the structural and mechanical design of the very complex satellite support, launch locking and separation mechanism subsystems, specifically designed to comply with the stringent requirements in terms of mass, Center of Gravity (CoG) and launch dynamic environment.. The LARES system verification plan and qualification test campaign are described, for all the various subsystems, for which a protoflight and standard Qualification (QM) and Flight (FM) Models 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 qualification: sine, random and acoustic vibrations, shock, thermo-vacuum and EMC. The system design and development has been performed by CGS under ASI contract, with tight interaction and support of ESA-IPT, because the LARES System itself is considered by ESA as an element part of the VEGA flight qualification