

SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)  
Future Space Transportation Systems Verification and In-Flight Experimentation (6)

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VV01 LARES SYSTEM AVIONIC SUBSYSTEM DESIGN, DEVELOPMENT AND TESTING

**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 prpf. 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 new generation avionic system design, development and testing is described, and its suitability for general space transportation applications is highlighted. The avionic system has been conceived as a self standing and highly independent module to be embarked with negligible impacts on external interfaces. The main features of the system are: assisting the Launch Vehicle in the acquisition and monitoring of key environmental parameters inside the launcher fairing, allowing satellites separation, visual monitoring of the satellites separation from the launcher and the launch vehicle stages separations during ascent; power autonomy

with dedicated battery and transmitter for downloading data to ground segment. The development and design of the LARES avionic system have been performed by TEMIS under CGS technical control in the frame of ASI contract, with tight interaction and support of ESA-IPT, because the LARES System itself has been considered by ESA as an element part of the VEGA flight qualification.