

SPACE SYSTEMS SYMPOSIUM (D1)  
System Engineering Tools, Processes & Training (I) (3)

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LARES: THE CHALLENGING DEVELOPMENT OF THE FIRST PAYLOAD FOR VEGA  
LAUNCHER MAIDEN FLIGHT

**Abstract**

LARES (LAsER RELativity Satellite) is a coming soon mission of the Italian Space Agency, whose main scientific goal is the measurement, through the International Laser Ranging Service (ILRS) network, of the relativistic Lense-Thirring effect with a very high accuracy, strongly improving the results obtained by the LAGEOS satellites and providing important elements for further investigations on Einstein's General Relativity theory. The LARES system was selected as first payload for the maiden flight of VEGA, the new ESA small launcher, scheduled in the second half of 2011 from Guiana Space Centre in Kourou. This makes the mission a very challenging experience for the Italian space community. In fact, while meeting very stringent scientific requirements, the LARES system will also contribute to the qualification flight objectives of the VEGA launcher, especially by dedicated telemetry equipments and sensors for the characterization of the environmental conditions during the launch phase. Additionally, the LARES System is designed to accommodate and release CUBESATs, pico-satellites developed for educational purposes by European universities selected by ESA, and ALMASat-1, an Italian microsatellite devoted to validation of space technology propulsion applications. These secondary payload passengers increase the importance of the mission and the complexity of the whole system, in terms of orbit propagation analysis, development and integration specifications and planning. In this paper the LARES mission peculiarities as first payload in a qualification flight is highlighted. This unusual role of support for the launcher qualification implies several programmatic and technical issues: not only the spacecraft and the launch vehicle development plans have to be harmonized, but also the interfaces requirements are continuously reviewed and verified, environmental loads predictions are updated, functional combined tests are scheduled. The system engineering implications required a strong effort, not only to satisfy the needs of the scientific investigation, but also to accomplish the Launch Vehicle qualification flight objectives; to this aim, a strong coordination and synergy between the Payload Team (ASI and its prime contractor CGS S.p.A.) and the VEGA Integrated Project Team located in ESRIN was necessary. All the Payload activities have to be carried out in line with the main milestones of the VEGA Launcher qualification process, namely the VEGA Ground Qualification Review (GQR) that has to demonstrate the conformity and compliance of the launch system to the design requirements by means of specific tests and analysis qualified on ground and the results of the operational qualification following the combined test campaign.