

Exploration of Mars (08)
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A NEW SPECTROMETER CONCEPT FOR EXOMARS

Abstract

The ExoMars program is currently under evaluation and includes two missions to be launch on 2016 and 2018. The 2018 mission will include a joint Rover as part of ESA-NASA collaboration that will carry a comprehensive suite of analytical instruments dedicated to exobiology and geology research.

One of the instruments included in the payload is the Raman Laser Spectrometer (RLS) instrument that is focused on the analytical analysis of the geochemistry content and elemental composition of the observed crushed samples obtained by the drill system of the Rover. This goal shall be achieved by means of the Raman spectroscopy technique.

One of the most critical Units of the RLS instrument is the Spectrometer unit (SPU) that performs spectroscopy technique and operates in a very demanding environment (radiation, temperature, dust, etc.) with very restrictive design constraints (mass, power, schedule). It is a very small optical instrument capable to cope with 0.12 nm/pixel of resolution and withstand with the Martian environment (operative temperature conditions: from -40°C to 0°C (6°C for CCD)). The solution selected is based on a single transmissive holographic grating especially designed to actuate as the dispersion element.

This is **the first time** that a Raman spectrometer will perform analysis outside the Earth's surface.

The SPU Flight Model is being developed by a European Consortium composed by Spanish, German and UK as scientific and industrial partners.

In parallel, a set of activities have been performed by SPU Team in order to achieve the Technology Readiness level 5 (TRL5: Component and/or breadboard validated in a relevant environment) for RLS

D-PDR. Main activities:

* Grating validation test campaign. * SPU breadboard Assembly, Integration and Verification Plan. Main objectives are to determine concepts feasibility, to prove and confirm the viability of the RLS SPU unit, to ensure manufacturing tolerance and optical compensators and others.

Due to Exomars re-definition started on spring 2011, RLS Delta-PDR planned for July 2011 was postponed by ESA until the rover and ALD are re-designed, and the new instrument re-design is done accordingly.

Nevertheless, it was decided by RLS Team to perform an internal peer review of the extended phase B activities, which is the Instrument Concept Design Review (CoDR) and has taken place on November 2011.

It has not been a formal review to freeze any technical aspect, but to confirm that the instrument performances based on the chosen concept and technologies will achieve the scientific objectives.