

SPACE EXPLORATION SYMPOSIUM (A3)

Mars Exploration – Part 2 (3B)

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EXOMARS RLS SPECTROMETER: A BIG SCIENTIFIC AND TECHNOLOGICAL CHALLENGE

Abstract

ExoMars 2018 mission is an ESA-Roscosmos collaboration and will deliver a European rover and a Russian surface platform to the surface of Mars. The ExoMars rover will search for signs of life. It will collect samples with a drill that is designed to extract samples from various depths. Once collected, it is delivered to the rover's analytical laboratory, which will perform mineralogical and chemistry determina-

tion investigations.

One of the key rovers laboratory instruments is the **Raman Laser Spectrometer (RLS)** which capabilities and objectives are in the line of ExoMars ones. RLS is able to characterize mineral phases produced by water-related processes, to characterise water/geochemical environment as a function of depth in the shallow subsurface, to identify the mineral products and indicators of biologic activities and to identify organic compound and search for life. RLS is based on Raman spectroscopy technique that provides a fingerprint by which the molecule can be identified.

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 – 0.15 nm/pixel of spectral 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, UK and German.

In parallel, a set of activities have been performed by SPU Team in order to achieve the **Technology Readiness level 5 (TRL5)** for RLS Delta PDR. These activities are:

- >Grating validation test campaign.

- >Optical glasses characterization plan.

- >SPU breadboard AIV Plan: Main objectives are to determine concepts feasibility, to prove and confirm the viability of the SPU, to ensure manufacturing tolerances, optical compensators and others.

Currently Extended Phase B of Exomars 2018 is on going and a RLS Delta-PDR is planed for Q3 2013.

Conclusion: RLS Instrument SPU fit perfectly with Exomars Technological and Scientific objectives and is a key instrument to achieve them.