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RAMAN LASER SPECTROMETER ADAPTATIVE OPERATION FOR MARS EXPLORATION

Abstract

The Raman Laser Spectrometer (RLS) is one of the Pasteur Payload instruments, within the ESA's Aurora Exploration Programme, ExoMars mission. Particularly, the RLS scientific objectives are as follows: identify organic compound and search for life; identify the mineral products and indicators of biologic activities; characterize mineral phases produced by water-related processes; characterize igneous minerals and their alteration products; characterise water/geochemical environment as a function of depth in the shallow subsurface

A flexible operational concept has been designed to accomodate scientific return to the sample nature and data bandwidth. The nature of the materials being analysed makes the measurement differ one to the other, based on the fluorescence, background and Raman efficiency. The acquisition of the spectra from different materials shall be, therefore, adaptative and dynamic to the sample. This, plus the restricted and changing communication bandwidth, makes mandatory the development of means to perform on-board: estimation of acquisition parameters, dynamic time-distribution, adaptative size of images and number of spots within the sample to be analysed.

Currently, development of extended Phase B is on going and it is expected to hold a PDR mid 2013. During this phase, the validation of algorithms is being done, and it's expected to share processing capabilities with the Rover.

RLS is being developed by an European Consortium composed by Spanish, French, German and UK partners. It will perform Raman spectroscopy on crushed powdered samples inside the Rover's Analytical Laboratory Drawer.

Conclusions: The RLS is a key tool to achieve ExoMars objectives and its current technological development provides a promising future for being used on other planetary missions as a non destructive analysis technique. A complete and flexible operation concept is necessary to make benefit of the full potential of the instrument.