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RLS RADIOMETRIC MODEL: A POWERFUL TOOL FOR RADIOMETRY PREDICTIONS.

Abstract

Raman Laser Spectrometer (RLS) is one of the Pasteur payload instruments located at the Rover of the Exomars mission and within the ESA's Aurora Exploration Programme. RLS will explore the Mars surface composition through the Raman spectroscopy technique. This technique allows the study of the vibration transitions undergone by the chemical bonds of a compound, which is excited by a monochromatic light source, and is sensitive to the phase (composition and structure) of the analyzed compound. For such a purpose, the instrument is divided in several units: a laser for Raman emission stimulation, an internal optical head (iOH) for sample excitation and for Raman emission recovering, a spectrometer with a CCD located at its output (SPU), the optical harness (OH) for the units connection, from the laser to the excitation path of the iOH and from the iOH reception path to the spectrometer, and the corresponding electronics for the CCD operation. Due to the variability of the samples to be analyzed on Mars, a radiometry prediction for the instrument performance results to be one of the most critical issues of the project. In such a framework, and taking into account the SNR (signal to noise ratio) required for the achievement of successful results from the scientific point of view (a proper information about the Mars surface composition), a radiometric model has been developed in order to provide the requirements for the different units, i.e. the laser irradiance, the iOH, OH, and SPU throughputs, and the samples that will be possible to be analyzed in terms of its Raman emission and the relationship of the Raman signal with respect to fluorescence emission, among others. In this paper, and after an instrument brief description, the radiometric model fundamentals, in terms of calculations and approximations, as

well as the first results obtained during the bread board characterization campaign are reported on.