Geophysical Research Abstracts
Vol. 14, EGU2012-6592, 2012
EGU General Assembly 2012

MA_MISS: Mars Multispectral Imager for Subsurface Studies

M. C. De Sanctis (1), A. Coradini (1), E. Ammannito (1), A. Boccaccini (1), T. Di Iorio (1), E. Battistelli (2), and A. Capanni (2)

(1) INAF, IAPS, Roma, Italy (tatiana.diiorio@ifsi-roma.inaf.it), (2) Selex Galileo, CAmpi Bisenzio, Italy

A Drilling system, coupled with an in situ analysis package, is installed on the ExoMars Pasteur Rover to perform in situ investigations up to 2m in the Mars soil. Ma_Miss (Mars Multispectral Imager for Subsurface Studies) is a spectrometer devoted to observe the lateral wall of the borehole generated by the Drilling system. The instrument is fully integrated with the Drill and shares its structure and electronics. For the first time in Mars exploration experiments the water/geochemical environment will be investigated as function of depth in the shallow subsurface. Samples from the subsurface of Martian soil are unaltered by weathering process, oxidation and erosion. Subsurface access can be the key to look for signs of present and past environmental conditions, associated to the possibility for life (water, volatiles and weathering process). The analysis of uncontaminated samples by means of instrumented Drill and in situ observations is the solution for unambiguous interpretation of the original environment that leading to the formation of rocks. Ma_Miss experiment is perfectly suited to perform multispectral imaging of the drilled layers. Ma_Miss is a miniaturized near-infrared imaging spectrometer in the range 0.4-2.2 μm with 20nm spectral sampling. The task of illuminating the borehole wall and collecting the diffused light from the illuminated spot on the target requires a transparent window on the Drill tool, which shall prevent the dust contamination of the optical and mechanical elements inside. Hardness of sapphire is the closest to diamond one, thus avoiding the risk of scratches on its surface. The Sapphire window is cylindrical, and bounded such as to realize a continuous auger profile. Ma_Miss Optical Head performs the double task of illuminating the borehole wall with a spot around 1 mm diameter and of collecting the scattered light coming from a 0.1 mm diameter spot of the target. The signal from the Optical Head to the spectrometer is transferred through the different elements of the Drill by means of fiber optics and an optical rotary joint implemented in the roto-translation group of the Drill. Ma_Miss Optical Head has been tested in the breadboard to capture the diffused light from the observed target and transfer the signal to a laboratory spectrometer for analysis. The Optical Head of Ma_Miss has been tested after integration in ExoMars Drill. The drilling experiment has been carried out in realistic media (tuff, red brick). The test shows good performance of Optical Head illumination capability and of the window cleanliness during the drilling. Illumination spot is focused at the nominal distance of 0.2 mm from the sapphire window. During the ExoMars Pasteur Rover mission, the Ma_Miss experiment will allow collecting valuable data of the drilled stratigraphic column, will document “in-situ” the nature of the samples that will be delivered to the Pasteur Laboratory and will be able to identify hydrated minerals, sedimentary materials and different kind of diagnostic materials of Martian subsurface.