



SETA-Hyperspectral Imaging Spectrometer for Marco Polo mission.

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The Marco Polo NEO sample return M-class mission has been selected for assessment study within the ESA Cosmic Vision 2015-2025 program. The Marco Polo mission proposes to do a sample return mission to Near Earth Asteroid. With this mission we have the opportunity to return for study in Earth-based laboratories a direct sample of the earliest record of how our solar system formed. The landing site and sample selection will be the most important scientific decision to make during the course of the entire mission. The imaging spectrometer is a key instrument being capable to characterize the mineralogical composition of the entire asteroid and to analyze the of the landing site and the returned sample in its own native environment.

SETA is a Hyperspectral Imaging Spectrometer able to perform imaging spectroscopy in the spectral range 400-3300 nm for a complete mapping of the target in order to characterize the mineral properties of the surface. The spectral sampling is of at least 20 nm and the spatial resolution of the order of meter.

SETA shall be able to return a detailed determination of the mineralogical composition for the different geologic units as well as the overall surface mineralogy with a spatial resolution of the order of few meters. These compositional characterizations involve the analysis of spectral parameters that are diagnostic of the presence and composition of various mineral species and materials that may be present on the target body. Most of the interesting minerals have electronic and vibrational absorption features in their VIS-NIR reflectance spectra.

The SETA design is based on a pushbroom imaging spectrometer operating in the 400-3300 nm range, using a 2D array HgCdTe detector. This kind of instrument allows a simultaneous measurement of a full spectrum taken across the field of view defined by the slit's axis (samples). The second direction (lines) of the hyperspectral image shall be obtained by using the relative motion of the orbiter with respect to the target or by using a scan mirror. The SETA optical concept is mostly inherited from the SIMBIO-SYS/VIHI (Visible Infrared Hyperspectral Imager) imaging spectrometer aboard Bepi Colombo mission but also from other space flying imaging spectrometers, such as VIRTIS (on Rosetta and Venus Express, VIR on DAWN).