

EARTH OBSERVATION SYMPOSIUM (B1)
International Cooperation in Earth Observation Missions (1)

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HYPERSPETRAL INSTRUMENTATION NEW DEVELOPMENTS AT SELEX GALILEO

Abstract

Hyperspectral imaging has become a very powerful remote sensing tool for its capability of performing chemical and physical analysis of the observed areas. The request for advanced instrumentation has grown in the last years, and Selex Galileo (SG), as a leading optical instrument manufacturing Company, has developed instruments for both space and avionic platforms. This paper summarizes the current activities at Selex Galileo Space Line of Business for some hyperspectral instruments devoted to Earth observation and planetary exploration. Emphasis will be given to the technological challenging aspects that have been faced for the design and development of these instruments:

In particular, this paper describes the design concepts and main drivers of the following instruments: PRISMA (PRecursore IperSpettrale della Missione Applicativa) Hyperspectral Instrument is an advanced hyperspectral sensor including also a panchromatic camera at medium resolution. Pushbroom concept based, it provides hyperspectral images of the Earth at 30 meter spatial resolution, 30 km swath width in about 200 spectral bands at spectral resolution better than 10 nm. Spectral range is from 0.4 micron to 1.010 micron (VNIR) and from 0.920 micron to 2.505 micron (SWIR). Panchromatic images are instead provided at higher resolution (5 m), coregistered to the hyperspectral ones, so to allow testing of images fusion techniques. The PRISMA Hyperspectral Instrument is the focus of the new Earth Observation mission that a consortium of Italian companies has started developing under contract of Agenzia Spaziale Italiana (ASI). The launch of this mission is scheduled in the middle of 2011.

JIRAM (Jovian Infrared Auroral Mapper): is an instrument development by Italian scientists from the INAF-IFSI (Roma) in the frame of cooperation between ASI and NASA/JPL for the Juno mission to Jupiter. SELEX Galileo is the prime contractor for hardware development. Indeed this instrument belongs to a family of image spectrometers that are currently flying on the ESA Rosetta and Venus Express missions as well as the NASA Dawn mission. The primary goal of JIRAM is to probe the upper layers of Jupiter's atmosphere down to pressures of 5-7 bars at infrared wavelengths in the 2- 5 micron using an imager and a spectrometer simultaneously by the use of a double focal plane. The instrument provides 330 spectral bands with an average spectral sampling of 10 nm. Phase C is currently going-on. The paper describes main aspects of the spectrometer module.

VIHI: it is a VIS/NIR hyperspectral imager under development by SELEX Galileo under ASI contract as part of a suite of optical instruments called SIMBIO-SYS, which will provide images and spectra in Vis/NIR range of the entire surface of Mercury. The payload suite also includes a high resolution camera (HRC) and a stereo imaging camera (STC), and is part of the Italian contribution to ESA MPO Orbiter for Bepi Colombo mission to Mercury. The spectrometer module, subject of this paper, makes use of a

reflecting telescope and a grating spectrometer in Littrow configuration which give a spatial sampling of 0.25mrad and a spectral resolution of 6.25nm in the range 400-2000 nm. The 256 pixels in the spatial direction give a FOV of 64mrad which coupled with the S/C motion will provide the global coverage of the planet surface in just 6 months of operations around Mercury. Phase B1 work is on-going.