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DESIGN OF SENTINEL-5 UV2VIS SPECTROMETER OPTIC

Abstract

The Sentinel-5 instrument, part of the joint ESA/European Union Earth observation programme COPERNICUS, is built by Airbus Defence Space GmbH. It is an assembly of Imaging spectrometers covering multiple spectral bands from 270nm to 2400nm. Sodern is developing the optics of the UV2VIS spectrometer (UV2VIS SO). It is part of the UV2VIS spectrometer, linking the slit - attached to the telescope - to the CCD array. It operates from 300nm to 500nm.

This paper gives an overview of the design rules and few critical aspects of performances identified by Sodern during the phase B, thanks to the strong heritage in the design and manufacturing of state-of-the-art optical sub-assemblies of Imaging spectrometers, with programmes such as MERIS (on-board ESA ENVISAT satellite) and the Camera Optical Sub-Assembly (COSA) on-board Sentinel-3 Ocean and Land Colour Imager (OLCI).

The following aspects have been investigated and will be discussed: implementation of a refractive optical prescription based on a grism (prism plus transmission grating) and use of iso-static mounts with epoxy bonding in order to overcome relatively large CTE mismatch between refractive lenses substrates, silica and CaF2, and titanium structure.

Operating from the UVB to the visible range, the spectrometer must cope with a large variation of its incoming signal, which makes straylight management a significant challenge. This challenge must be met while obtaining good image quality performance, tight co-registration, highly stable optics and very low contamination throughout its assembly and lifetime of up to 30 years. It also has to stay within an 11kg mass budget and total enclosed allocated volume in the order of 500mm x 250mm x 150mm.