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THE CHALLENGE OF INTEGRATING AND ALIGNING A NEW TYPE OF EO INSTRUMENT: THE ENMAP HYPERSPECTRAL IMAGER

Abstract

The Environmental MApping Programme (EnMAP) is a satellite mission for Earth observation funded by the German space agency DLR. It relies on a push-broom hyperspectral imager covering a broad spectral range in the visible and the mid-infrared (420 nm to 2450 nm) with a 30 m spatial resolution. EnMAP features more than 200 spectral channels with high signal-to-noise ratio to provide high-definition spectral data for the remote monitoring of ecosystems, agriculture and land utilization. The optical payload is a combination of telescope, spectrometers and cameras with on-board calibration unit. EnMAP instrument design was developed at OHB Optical Science excellence centre in Munich, Germany. Design particularities such as architecture split, mechanisms function, assemblies materials and features are briefly presented to highlight the challenges they imply in the instrument integration and alignment. The means enabling the successful integration of sub-systems within 50-micrometer accuracy are detailed, being the integration conditions and handling, the in-house pre-assembly of mirrors and prisms, or the systematic characterization of sub-systems and the related coordinate system management. Key features of Mechanical Ground Support Equipment successfully used in cleanroom are shown along with their modularity for cost efficiency. Furthermore, some critical optical systems require additional alignment down to a few micrometers accuracy. The features of the custom Ground Support Equipment and of the integration facility are detailed in the light of the successful single-iteration alignments and of the various measurements performed (wavefront error, MTF, radiometric spectral calibration, stray light among others).