Spectral Calibration of 64 Band Hyperspectral Imager of Chandrayaan-1

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Chandrayaan-1 the first planetary science mission to moon by ISRO was launched on 22nd October 2008 by using a variant of the flight proven PSLV-XL from the Satish Dhawan Space Centre at Shriharikota-India. It carried eleven payloads, five of them developed by ISRO and the remaining six were provided by various international agencies including NASA and ESA. Among the payloads developed by ISRO there were two light weight electro-optical instruments: A Sixty Four band Hyper Spectral Imager (HySI) for lunar mineral mapping in the visible and near infrared band and a Stereoscopic High Resolution Terrain mapping camera (TMC) for mapping the entire lunar surface in the panchromatic spectral band were designed, developed, characterized and delivered by the Sensors Development Area of Space Applications Center. The Hyper Spectral Imager, India's second space borne sensor of its kind operated in the spectral range of 400 to 950 nm has a spatial resolution of 80 x 80 m² and a swath of 20 Km at 100 Km circular orbit around the moon. It includes a 62.5 mm F/4.0 lens with a field of view of \pm 11.6 and \pm 5.6 degrees in the spectral and spatial directions respectively, a Linearly Variable Filter for spectral dispersion, an active pixel sensor area array device with 512×256 pixels mounted very close to the wedge filter, a compact detector head Assembly and a miniaturized camera electronics.

The Hyper Spectral Imager has been calibrated to extract meaningful spectral information. The spectral calibration of the instrument is a complex task especially when each pixel of the entire array has to be spectrally characterized. Spectral characterisation of HySI was carried out using a spectroradiometer system for all 64 bands in the zero spatial field and for 17 selected bands at the extreme spatial fields. Using the measured data obtained from these three sets and an algorithm developed based on the HySI (IMS-1) experience Relative Spectral Response (RSR) was generated for all 64 bands in the extreme spatial field positions and then mapped for all pixels of the array. The data obtained from the algorithm is validated using experimental data. This paper gives an overview of the preflight spectral calibration of the Hyper Spectral instrument, measurement methodology, RSR, and the other spectral parameters like Central Wavelength, Bandwidth and Out of Band Contribution.

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