Challenges in the Performance Optimization and Characterization of Terrain Mapping Camera Onboard Chandrayaan-1

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Candrayaan-I carried a stereoscopic high spatial resolution Terrain Mapping Camera (TMC) for mapping the lunar surface in panchromatic band. TMC provides stereoscopic triplets (Fore: -25°, Aft: +25° and Nadir: 0°) of any target scene in pushbroom mode for obtaining photo-selenological and elevation information of the lunar terrain. TMC employs a single f/4 optical system with three linear APS detectors corresponding to each view. The required along track field angle of ± 25° is realized with the help of a pair of plane mirrors placed strategically on either side of the 0° field. TMC camera has been designed and realized under various mission constraints of minimum mass, power and size posing challenges in design, assembly, integration and optimization of the imaging instrument. Focusing the three detectors optimally at the focal plane of the lens assembly, minimizing their in-plane rotation while maintaining the inter-detector alignment – all simultaneously to achieve the three desired view directions has been quite an involved task. In this paper we discuss the methods of alignment and subsequent measurements along with the challenges faced during optimization and characterization of performance parameters like SWR, geometric distortion and inter-detector alignment to achieve the required performance.

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