Ground Performance of Dual Frequency SAR for Chandrayaan-2 Mission

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ISRO’s second moon mission Chandrayaan-2 carries a L&S Band Dual Frequency SAR as a science payload on its orbiter. The Dual Frequency SAR(DFSAR) payload will be the first planetary radar payload to have a full polarimetric mode of observation which will provide the most robust substantiation on the presence of water-ice in the lunar polar-regions. The payload can image from incidence angles of 10° to 35° synchronously in both L&S bands, sharing a common antenna with selectable slant-range resolution from 2m to 75m. The differential penetration capabilities of dual frequency will enable in quantitative estimation of water-ice & radio-physical characterization of the lunar regolith. This will significantly enhance our understanding of surface properties of Moon, especially in the polar regions.

Planetary missions impose severe constraints on mass, power and data rate. The payload has been miniaturized to meet the stringent mass limits will be the smallest dual frequency SAR payload launched by ISRO. It uses large scale power reduction by using efficient devices. The data rates have been reduced by up to a quarter by implementing onboard-range compression and block adaptive quantization techniques. The end to end system (except antenna) along with onboard processing was validated by feeding the output to a delay-line and then back to the system. The polarimetric calibrations were carried out on the complete integrated system attached with the antenna.

This paper evaluates the developed systems performance to meet the scientific objectives and the various information required for the polarimetric calibration, their derivation from the lab measurements and proposed onboard calibration operations.