

Millimeter Wave (mmWave) Circular Polarized Feed Horn with Inbuilt Polarizing Structure for an Offset Reflector Antenna for 6U Cube-Satellite Applications



The 6U Cube-Satellites (CubeSats) are miniaturized satellites in the low earth orbit (LEO) requiring high gain circular polarized antenna system to maintain the reliable communication link. We are working towards the development of a 6U (30 cm x 20 cm x 10 cm) CubeSat beacon which will allow for high data rate downlinks of at least 200 Mbps for remote sensing applications (i.e. cloud, precipitation, topography, ice cover, ocean salinity, surveillance, etc.), in the millimeter wave (mmWave) frequency spectrum. A new compact cylindrical waveguide feed horn antenna with inbuilt polarizing structure is designed and built which offers wide-band circular polarization (Frequency range: 79 GHz to 88 GHz with Axial Ratio better than 2) and symmetric radiation patterns. This horn is used as a feed source for an offset parabolic reflector. The reflector antenna is placed in a 6U CubeSat chassis and the effect of the chassis on the radiation pattern is also investigated. The radiation pattern is preserved after the integration of the antenna inside the chassis which provides circular polarization gain of around 35 dBic. We are currently working on achieving gimbal free beam steering of the reflector antenna's main beam using phase shifting metasurfaces.

Ghanshyam Mishra and Satish K. Sharma

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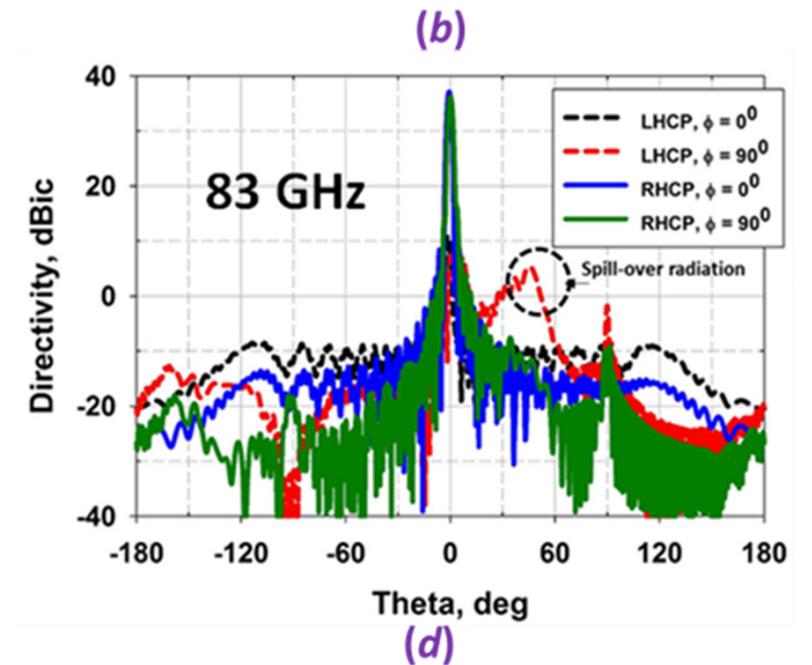
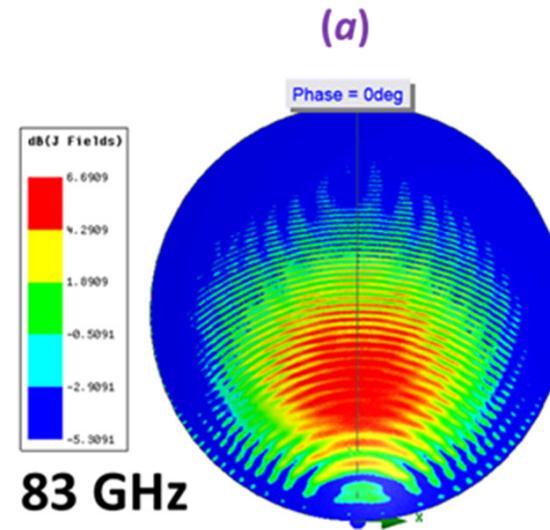
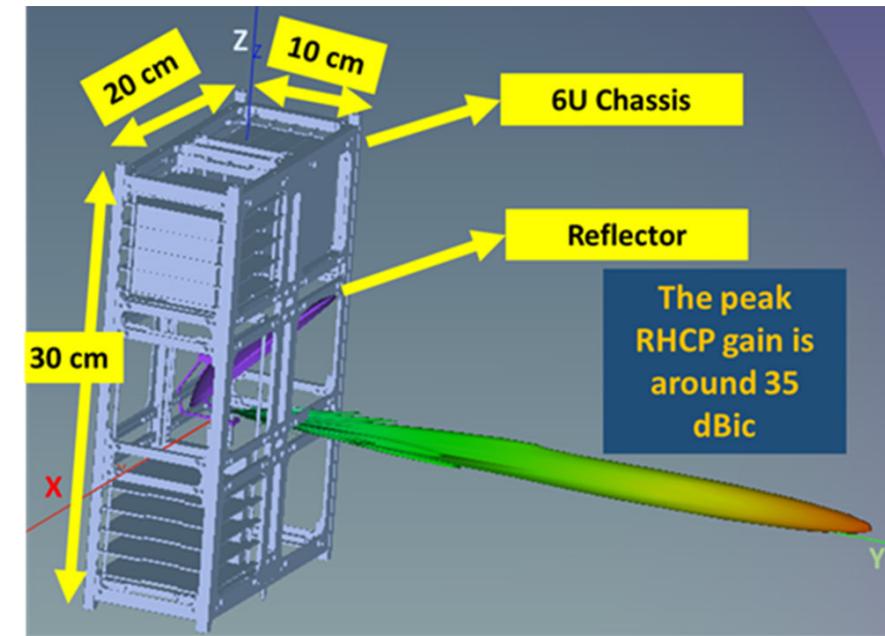
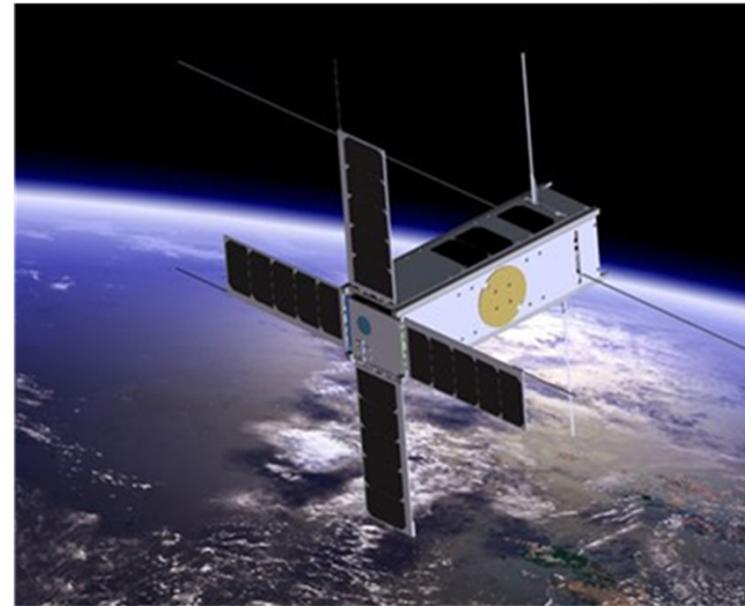


Figure Caption: (a) Illustration of a Cube-Satellite in the low earth orbit (LEO), (b) Proposed millimeter wave (mmWave, 83 GHz) right-hand circular polarized (RHCP) high gain (35 dBic) antenna integrated inside the 6U Cube-Satellite chassis, (c) Surface current distribution of the reflector antenna illuminated by its left-hand circular polarized (LHCP) feed source, and (d) RHCP cut radiation patterns of the reflector antenna with high directivity of 38 dBic.