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STRAIN-RIGIDISED WIDEBAND CONICAL HELIX ANTENNA FOR CUBESAT DEPLOYMENT

Abstract

CubeSats are an increasingly popular platform for scientific applications in Low-Earth Orbit. However their inherent size limitations make long-range radio communications and applications requiring large structural elements difficult to implement. Inflatable Structures are one way to overcome this, but they have inherent issues such as vulnerabilities to micrometeorite impacts and low structural strength. Metal-Polymer Strain rigidisation, as used by NASA in the 1960s, is one way to mitigate these issues. The PICARD (Prototype Inflatable Conical Antenna - REXUS Deployment) experiment aims to build upon this technology. If fabricated with the metal layer covering only part of the surface, the structure will still rigidise when strained; however the individual, separate metallic elements could be used for electronic communications across inflatable structural sections, or as part of an antenna. The inflatable structure considered in PICARD is a Wideband Conical Helix antenna, as proposed for the WISCER [Wideband Ionospheric Sounder CubeSat Experiment] mission. The WISCER mission was proposed by the SERENE institute at the University of Birmingham and is intended as a precursor to space-based Earth-Observation Radar systems; the mission aims to characterise the impact of the Ionosphere on UHF radar measurements. To test the performance of the antenna structure in a space-like environment, the PICARD experiment will be launched aboard a REXUS sounding rocket (courtesy of DLR SNSB) to an altitude of 90km altitude, achieving a miligravity time of around 140 seconds. The primary goal lies within the deployment behaviour characterization while the secondary goal is of the validation on the deployed antenna performance. Not only will this test validate the deployment method but also provide information on how the antenna inflates, settles and rigidises.