31st IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
Interactive Presentations - 31st IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (IPB)

Author: Mr. Gabriel Jose Gutierrez
Argotec, Italy

Ms. Giorgia Casadei
Argotec, Italy
Mr. Miguel Pereira
Argotec, United States
Mr. Matteo Gatti
Argotec, Italy
Mr. Angelo Masera
Argotec, Italy
Dr. Angelos Vourlidas
Johns Hopkins University Applied Physics Laboratory, United States
Mr. Robert Mertes
Argotec, United States

ECLIPSING BOUNDARIES: MINICOR CUBESAT DESIGN FOR NEXT-GENERATION SOLAR OBSERVATION

Abstract

The observation of solar activity is crucial for understanding the Sun's internal complexities and its influence on both planetary and human activities. With the revolution of smallsat technology, these compact platforms will become invaluable assets in the realm of solar observations and space weather monitoring. Among the diverse selection possible of heliophysics payloads, coronagraphs stand as the sole instruments capable of tracking the evolution of Coronal Mass Ejections (CMEs) across near-Sun space, offering vital insights into the dynamics of CME development and movement. The Miniature CORonagraph (MiniCOR) mission, a 6U CubeSat, aims to tackle the technical hurdles of nanosatellite missions, while making substantial contributions to solar science. MiniCOR's goal is to monitor solar eruptions and the dynamics of CMEs, delivering data with higher cadence and equal or better sensitivity than conventional full-size instruments. With a state-of-the-art design, MiniCOR relies on advancements in Active Pixel Sensor (APS) detectors, and heritage from compact imaging systems. With a mission duration of six months, MiniCOR is set to outperform current missions in capturing intricate solar wind patterns, CMEs, and inner coronal phenomena, making a significant leap in our capacity to monitor solar activity. Building on the legacy of robust deep space platforms like LICIACube and ArgoMoon, and successful coronagraph missions such as STEREO, PUNCH, Solar Orbiter and Parker Solar Probe, the MiniCOR mission aims for sustainability and resilience, ensuring effective operations in the harsh space environment. The payload is a traditional externally occulted Lyot coronagraph, with a field of view extending from the inner limit at 2.5 solar radii (Rs) to an outer limit at 20 Rs. The instrument is composed of two folding mirrors and a deployable boom with an external occulter, meeting the highly constrained 3U volume requirement. The collaborative endeavor leading MiniCOR's Phase A development, under NASA's H-FORT program, brings together the expertise in space instrumentation of Johns Hopkins University's Applied Physics Laboratory, the detector and coronagraph expertise of the Naval Research Laboratory, and the heritage in HAWK platform CubeSat technology of Argotec Inc. MiniCOR's compact

design enables fast assembly, testing, and deployment, and enables a shift to smaller, efficient instruments for critical solar observations and paves the way for affordable coronagraph constellations at strategic points like Lagrange points or cis-lunar orbits.. This mission will enhance our solar corona and CME understanding and demonstrate the potential of sustainable CubeSat missions in solar research.