

20th IAA SYMPOSIUM ON SPACE DEBRIS (A6)
Space Debris Detection, Tracking and Characterization - SST (1)

Author: Mr. Andrew Nicholas
Naval Research Laboratory, United States, andrew.nicholas@nrl.navy.mil

ON-ORBIT OPTICAL DETECTION OF LETHAL NON-TRACKABLE DEBRIS

Abstract

Objects in the size range of 0.1 mm to 3 cm are not currently trackable but have enough kinetic energy for lethal consequences to spacecraft. The detection of small orbital debris, potentially posing a risk to most space missions, requires a combination of a large sensor area and large time coverage. For example, a sensor with a time area product of $3 \text{ m}^2\text{-years}$ is considered to be able to make a significant contribution to our understanding of the near-Earth small debris population. Deploying large sensors, however, is generally resource intensive, due to their size and weight. The light sheet sensor concept, allows the creation of a “virtual witness plate”, which is created without any supporting physical structure and therefore presents an attractive opportunity for the detection small debris anywhere between low Earth orbit to interplanetary space. Recent technology maturation efforts in the laboratory successfully detected small debris (1.6 mm diameter) moving at 6.38 km/s. NRL is building the NASA funded instrument as a technology maturation effort for a flight demonstration on STPSat-7 in 2024. In this presentation, we will describe the instrument, present the laboratory data and analysis, and describe the instrument details for the STPSat-7 spacecraft slated for launch via the DoD Space Test Program in Q1 CY2024.