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LPUSAT - 1: A PIONEERING CUBESAT MISSION TO DETECT SMALL SIZED SPACE DEBRIS

Abstract

Growth of earth satellite population had significantly increased since 1965. Small debris or MMOD may not pose so much threat to small and big satellites, however they are a death sentence for cubesat. Our goal is to achieve space-based observations of the orbital debris environment. Among more than 10000+ objects larger than 10 cm in Earth orbits, only about 6% are operational satellites and the remaining are space debris. Ground based operators tracks these objects with radars and optical telescopes to determine their orbits and other characteristic parameters, including their sizes. Currently, there are more than 20,000 large-sized space debris which are trackable from Earth, along with an estimated number of over 750,000 smaller debris which are unable to be tracked.

LPUSAT-1, a nanosatellite incorporates a laser module and active imaging sensor as a scientific payload to map the unmapped space debris in LEO ,as a very little advancement is done to capture phase-space information of such debris. It will be the first attempt to use remote sensing technology in space using a LASER beam on-board a cubesat, demonstrating efficient and effective technological advances in power and detection that are the cornerstone of many other developments in the space industry.The mission of LPUSAT-1 is to dynamically construct a debris environmental model (a model defining the distribution and current quantities of debris) from debris measurement data, and to use this in formulating measures to both counter debris in the design of spacecraft and minimize collision damage.The mission will also contribute to the global effort of cataloging small sized orbital debris, and to improve safety for future manned and unmanned space missions.

In this paper a careful research and calculations has been made for standard 3D ranging and imaging by determining the number, position and amplitude of returns from a histograms of photons by reflected laser light source on to the sensors and through imaging sequence, the momentum is calculated from ground based test objects which are dynamic in nature.