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## LEDSAT: IN-ORBIT DEMONSTRATION MISSION FOR LED-BASED CLUSTER LAUNCH EARLY IDENTIFICATION AND IMPROVED LEO SURVEILLANCE

**Abstract**

The increasing number of small satellite cluster launches, such as CubeSats, leads to a greater risk of confusion and collision after deployment. Thus, several researches in this field are currently on-going to further improve the capabilities in space surveillance for satellite early identification. The LEDSAT (LED-based SATellite) project aims to investigate the performances of a technology based on LEDs (Light Emitting Diodes) to this purpose. The idea has been conceived and designed by an Italian student team

from Sapienza - University of Rome in cooperation with the Astronomy Department of University of Michigan. The development of this CubeSat is an educational project and it will be carried on at the Sapienza Space Systems and Space Surveillance Laboratory (S5Lab). The on-board payload will flash with different patterns in order to simplify the possibility to distinguish different in-orbit objects by minimizing the confusion between them. The main objectives of this mission regard the testing of LED-based techniques for the nanosatellite tracking, attitude reconstruction and for the communication with ground in case of the TTC (Telemetry, Tracking, and Command) subsystem failure. The design and the main features of this CubeSat have been defined in order to allow its detection by means of optical observations performed during night-time by observatories involved in the project. In particular, the optical network is composed of six observatories located at medium al equatorial latitudes. The LEDSAT mission willing to explore new and promising techniques conceived for gathering important information about the status of the in-orbit CubeSat. Through active illumination on the nanosatellite, it will be possible to increase the possibilities for observing it by using the available ground-based telescopes without the need of direct Sun illumination. The paper outlines the LEDSAT mission architecture and scientific background, highlighting expected performances in terms of CubeSats mitigation and surveillance.