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THE PHOTSAT MISSION: UV-OPTICAL ALL-SKY MONITORING WITH A CUBESAT

Abstract

PhotSat is a nanosatellite mission developed by the Institute of Space Studies of Catalonia (IEEC) aimed at mapping and monitoring the fully accessible sky every two days. The mission's goal is to collect data over a two-year period while orbiting at an altitude of roughly 500km in Low Earth Orbit (LEO).

It consists of a 12U cubesat equipped with two telescopes almost identical except for their wavelength sensitivity: a visual channel (or VIS, 500 to 700 nm, divided in two bands for better spectral resolution), and an ultraviolet channel (200-300 nm, single band to enhance signal and simplify optics). The two channels consist of specifically designed lenses (one for VIS and one for UV) coupled with space proven off-the-shelf detector technology. The telescopes will take measurements of the sky using a system of rotating mirrors. This approach allows the satellite to capture images of patches of the sky in various intervals of time, providing scientists with valuable data to study the properties and behavior of stars.

The PhotSat will be a multi-purpose space observatory capable of performing high precision photometry in the Visible and Ultraviolet bands. The observatory will be used for a variety of science cases and to provide supporting data to numerous on-going international programs including photometric characterization of sources observed by the JWST, cover the bright end of the LSST survey, combine space-based high quality multiband photometry with ground based observations, among others. More specifically, these kinds of observations will be relevant to the field of exoplanets, stellar physics, bright transient events (supernova, kilonova and more), variability of energetic events and solar system objects. With the increasing interest in exoplanet detection and characterization, PhotSat's mission is timely, as it will provide valuable data for researchers looking to better understand the properties and behavior of stars that host exoplanets. PhotSat also represents an innovative way to complement current astrophysics missions with smaller, more affordable satellites. As a small satellite, PhotSat is catalogued as a low cost LEO class and will be useful to gather insight into how to design, build, and operate future cubesats for science purposes. And given the development of the newspace sector, the mission also aims at developing a pipeline of expertise to be able to develop scientific experiments with these new platforms.