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SKY COVERAGE ANALYSIS FOR A LIBRATION POINT OBSERVATORY WITH HIGH THERMAL STABILITY

Abstract

The Euclid dark energy mission is one of the potential future missions in the framework of the ESA Cosmic Vision Programme 2015-2025. The mission's purpose is to map 20.000 sqDEG of the sky region with galactic latitudes above 30 DEG in an effort to learn about the structure of the universe by observing the distribution and shape of distant galaxies that should be affected by weak gravitational lensing. In order to achieve the high thermal stability required by the payload, a large amplitude quasi-halo orbit around the night side Sun-Earth Libration Point L2 was selected. A step and stare approach was chosen for the sky scanning strategy of the telescope, where each field in the sky is observed for a certain amount of time. Due to the high thermal stability required, the spacecraft attitude with respect to the Sun is highly constrained and the accessible sky region at a specific epoch is strongly limited. This results in a time dependency of the sky regions to be scanned. Additional constraints exist by operational requirements, e.g. the regularly required station keeping manoeuvres on the libration point orbit, and on the patching of the single exposures, e.g. minimum required overlap. In order to minimize the mission cost, a full scan of the applicable sky region should be achieved in a minimum amount of time. The paper presents different sky scanning strategies and the resulting mission durations depening on how strict the attitude of the spacecraft is constrained.