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SAT4EO HIGH-RESOLUTION OPTICAL EARTH OBSERVATION SYSTEM BASED ON INNOVATIVE COST-EFFECTIVE SPACECRAFT

Abstract

Following the successful launch and on-going operations of the medium-resolution wide-swath DEIMOS-1 satellite and the high-resolution agile DEIMOS-2 mini-satellite, Elecnor-Deimos has embarked on the design and development of a high-performance low-cost satellite oriented to the Earth Observation (EO) market, with the objective to launch the first spacecraft of the new Sat4EO satellite series by 2020.

The Sat4EO mission consists of an **EO optical mini-satellite** providing **very high-resolution** (VHR) products, including innovative technological solutions in the platform, payload and data processing domains. One of the key objectives is to open the EO market in VHR to incoming users, who trigger new applications, encompassing disaster management, energy and natural resources, intelligence and homeland security.

The Sat4EO agile satellite is intended to enable the acquisition of VHR optical images with a **sub-metric ground sampling distance** (with a goal spatial system resolution after post-processing of 0.5 m) from low Earth orbit.

The Sat4EO satellite is being designed and developed to address a wide spectrum of EO mission scenarios and potential applications. In particular, this spacecraft is deemed well-suited for mission concepts based on a **constellation of similar low Earth orbit (LEO) satellites** that combine their operations and observation capabilities to enhance the mission return (coverage and revisit time performance, data throughput, system responsiveness). The Sat4EO spacecraft solution could also be tailored for **very low Earth orbits (VLEO)**, so as to improve the image resolution, while targeting low-cost satellites with relatively short mission lifetimes and fast replenishment.

The goal of developing a high-performance low-cost satellite prompts a concurrent optimisation of the mission, the platform, the payload and the system operations concept. The optimal engineering design solutions are seamlessly coupled with the technology-driven aspects. **Key enabling technologies** have been identified in the frame of the Sat4EO mission design: disruptive designs for VHR optical payloads,

post-processing techniques to enhance the resolution provided by the payload sensor, high-performance AOCS to yield agility and good pointing accuracy, micro-electromechanical systems, innovative solutions for the on-board software and the space-to-ground communications, novel manufacturing techniques such as additive manufacturing.

The on-going study, funded by ESA and by Elecnor-Deimos, addresses the initial design phases for developing new satellite platform and payload solutions. The study is also intended to define and analyse end-to-end mission and system concepts based on innovative space technologies, which can be offered to potential customers as turnkey solutions.