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SAR SMALLSAT CONSTELLATION: SYSTEM TRADE OFF ACROSS MULTIPLE IN-CLINATIONS

Abstract

The Space sector is experiencing unprecedented transformation and developments in different countries around the world, since major technological advances push the industry versus a new global innovation stage. In particular, the Earth Observation Small Satellite constellations are driving the market demands towards Earth Observation information closer to the final user needs improving the traditional images and services model. The added-value services provided by the small satellites constellations are aimed to quickly acquire information in response to a sudden crisis occurrence on several geographical scales (earthquakes, floods, morphological stability, devastation by multiple factors, fires, etc..) and other commercial applications. The small-micro satellites constellations can provide higher revisit sensing than the large satellite system thanks to the potential higher number of satellites easily deployed in constellation with the multi launch capability. With regards to the SAR space systems, the new high revisit SAR Small Satellite Earth Observation constellations can effectively complement and integrate the existing large earth observation assets to improve revisit time and responsiveness. This synergic approach will allow the achievement of the right balance of the two satellites' classes to meet the final user needs. This paper will be focused on a trade-off analysis on the orbital design, which is a fundamental topic to address the best solution for the specific constellation purpose. An overview of SAR space system versus inclination (polar/medium inclination/equatorial), power system, duty cycle and other design parameters will be analyzed evaluating pros and cons. Through dedicated constellation design algorithms and cost optimization functions an accurate trade-off allows the identification of the best solution based on the target area of interest. Finally, the complementarity with the existing space assets (e.g. Copernicus, Cosmo Sky Med. . . .) will be evaluated as an important aspect to meet the user needs.