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COSMO-SKYMED SECONDA GENERAZIONE: QUAD-POL CAPABILITY

Abstract

COSMO-SkyMed Seconda Generazione (CSG) is an Earth Observation space program funded by the Italian Space Agency (ASI) and the Italian Ministry of Defence (ItMoD), which is composed of two satellites with a Synthetic Aperture Radar (SAR) payload and will assure the service continuity with respect to the current fully-deployed four-satellites COSMO-SkyMed (CSK) system, increasing its operational performances. As an evolution of the CSK polarimetric capabilities, the CSG SAR payload will implement a Dual-pol mode for the main acquisition modalities, transmitting horizontal (H) or vertical (V) polarization and receiving simultaneously both the H and V components of backscattered echoes. Furthermore, CSG will have a full Quad-pol mode able to estimate the polarimetric characteristics of a target or of an area. In order to acquire the complete scattering matrix (Quad-pol mode), the transmission rate is doubled and the H and V polarizations are used alternatively for the transmission pulse. Both the H and V channels are simultaneously acquired at receiver, thus the four channels (HH, HV, VV, and VH) can be acquired on the same scene keeping the phase coherence information. In addition, a multi-polarization image can also be acquired using the PING-PONG mode (i.e. “alternating” or “burst polarimetric mode”). The main difference between the two implementation is that in the Quad-pol mode a coherent phase information on the polarimetric channels is acquired, whilst in PING-PONG no phase coherence among the channels is available. This comes at the expenses of the swath width that is more favorable in PING-PONG. The aim of this paper is to describe the architectural implementation of the Quad-pol capability in CSG system, and to analyze the expected incremental benefit in the exploitation of CSG data respect to CSK data.