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MINIATURIZED SAR PAYLOAD FOR EARTH OBSERVATION WITH NANOSATELLITES

Abstract

Distributed SAR imaging from space exploits the distribution of the key system resources, normally concentrated in a single, large and complex satellite, among many small-sized and simpler systems, thanks to the proper combination of the signals from each single node of the swarm. The simultaneous operation of the satellites represents a Multiple- Input-Multiple-Output SAR system (MIMO-SAR), for which several concepts have been presented in the scientific literature. Indeed, the theoretical maturity of this technique is significant, however the practical feasibility has not yet been demonstrated. In 2020, the demonstrative Mission SATURN was proposed and is currently being studied with the support of the Italian Space Agency (ASI). The main target of the SATURN mission is to demonstrate the key technology "Cooperative Multiple-Input-Multiple-Output (MIMO) Swarms of SAR MicroSats" for innovative, low cost and versatile

Earth Observation applications. In this work, we present the architecture and the implementation of a miniaturized SAR payload, called MINISAR, suitable for operation in a MIMO SAR system. The paper reports the design, the choice of the components and the qualification of the SAR payload by means of testing in thermo-vacuum chambers and vibration facilities.