

29th IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
Small Earth Observation Missions (4)

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SATURN – A SYNTHETIC APERTURE RADAR CUBESATS SWARM MISSION FOR EARTH
OBSERVATION**Abstract**

The Italian Space Agency has recently started a program aimed at placing Italy in a condition of consolidated leadership in the CubeSat sector, to be achieved with appropriate investments of value, wisely distributed between missions, and the development of a national technological roadmap. In regard to a

dedicated mission call for tenders, a significant response from the Italian space community has been received, with tens of submitted proposals and a very diversified spectrum of topics. In this framework, the SATURN (Synthetic Aperture radar cUbesat foRmation flyiNg) proposal by OHB Italia S.p.A. has been funded and is now ongoing the phase A. The main objective of the SATURN mission is to demonstrate the key technology “Cooperative Multiple-Input-Multiple-Output (MIMO) Swarms of SAR CubeSats” for innovative, low cost, and versatile Earth Observation capabilities. As a first step, SATURN would demonstrate the key technology with a formation flying of 3 CubeSats equipped with a miniaturized SAR Instruments, before scaling up the system to full performance capability. The demonstrative swarm with 3 CubeSats will achieve an imaging resolution of 5x5 m with a swath of 30 km. SATURN aims at becoming the first-ever Space SAR MIMO mission, introducing a new paradigm in SAR Earth Observation. Leveraging on the MIMO concept, SATURN allows low-cost, scalable SAR missions for a quick approach to Space for private and public entities. It also allows the distribution of the key resources, normally concentrated in a single (large and complex) satellite, among small-sized and simpler systems, thanks to the proper combination of the signals from every single node of the swarm, that is the basic element of a distributed and reconfigurable SAR antenna. Moreover, the swarm configuration allows overcoming the single point of failure of one single large satellite. Future SATURN-like missions, deployed in different swarm configurations from 3 up to 36 CubeSats, are expected to bring technological breakthroughs and enhance the Italian competitiveness in the European and global Earth Observation scenario providing low-cost services. At the same time, smaller swarms will be interesting to have an economically viable and scalable space SAR asset. The developed SAR payloads could also become the first SAR COTS for CubeSats. In the final paper, the SATURN project details will be provided, with particular focus on the innovations introduced in the field of swarms of SAR CubeSats. First results, arising from phase A preliminary studies, will be presented as well as mission future perspectives.