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END-TO-END SPACE SYSTEM DEMONSTRATION CONCEPTS FOR A DISTRIBUTED SAR BY  
SMALL FORMATION FLYING SATELLITES**Abstract**

The paper discusses a mission concept for end-to-end space demonstration of Distributed Synthetic Aperture Radar (DSAR) principles and operations. This is realized by 3 satellites working in X-band, flying in a LEO close formation. One satellite embarks a Tx/Rx radar, i.e. it is a monostatic SAR. The other two satellites are Rx-only items. The system is expected to feature formation flying capabilities: it must be able to guarantee formation control and to perform formation reconfiguration maneuvers. Both Tx/Rx and Rx-only satellites are expected to be in the range of micro-satellite class ( $\leq 100$  kg). From the DSAR perspective, starting from the design of a general purpose monostatic SAR targeted to achieve 8m x 8m resolution on the ground, from an orbit altitude of 550 km, DSAR properties are exploited to demonstrate performance improvement, namely the achievement of 4m x 4m resolution with the same Noise Equivalent Sigma Zero (NESZ) requirement, testing suitable combinations of DSAR techniques like Signal-to-Noise Ratio (SNR) enhancement, Pulse Repetition Frequency (PRF) reduction, Coherence Resolution Enhancement (CRE). Moreover, at the nominal 8m x 8m resolution, 3D imaging and Ground Moving Target Indication (GMTI) techniques can be also tested. Specific solution for time and phase synchronization enabling bistatic operations are detailed in the paper, together with the individuation of techniques and sensors for accurate absolute and relative positioning and pointing.