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EARTH OBSERVATION SYMPOSIUM (B1)
Dual Use Earth Observation (6)

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EARTH OBSERVATION WITH MEO TRANSMITTERS AND UAS RECEIVERS: A POTENTIAL IMPLEMENTATION FOR FUTURE GALILEO UPGRADES

Abstract

New security needs are currently arising in many fields, e.g maritime surveillance and natural disasters, which require continuous or almost continuous monitoring of quite large areas. Such requirements cannot be fulfilled with existing LEO imaging systems, which offer high resolutions but are strongly limited in terms of repetitivity: at least several hours are required to repeat an observations of the same target area if one considers existing and firmly scheduled constellations. Although Synthetic Aperture Radars offer unique opportunities in such fields, an upgrade of existing LEO SAR constellations is not feasible in terms of number of satellites and orbital parameters. A different approach could be utilized, relying on MEO SAR transmitters and receiving-only radars on-board fleets of Unmanned Aerial Systems (UAS). In fact, increasing SAR operating altitude from LEO to MEO, along with an enhanced radar pointing flexibility, allows one to achieve good repetitivity by means of an acceptable number of satellites (at least with respect to LEO). If on the one hand, a monostatic MEO SAR would require an enormous amount of transmitted power to achieve signal to noise ratios comparable with the ones of LEO SARs, on the other hand an aerial vehicle would receive and adequate signal with a reasonable transmitted power. In fact, UAS altitudes (from 1000m to 10km-20km for typical of high altitude long endurance UAS – HALE) allows to reduce the path loss with respect to spaceborne receivers. In addition and in order to enhance flexibility and integration of different services, MEO satellites carrying transmitting-only SARs could be equipped with telecommunication transmitters which make use of the same antenna. Both services could be offered simultaneously, provided that transmitted information can be broadcasted on the radar signal. Such system could be implemented by enhancing the Galileo navigation constellation. In particular, imaging modes could be implemented adding a new specific antenna to Galileo satellites and implementing a large signal bandwidth by the joint exploitation of nominal navigation bands. The strawman system design and performance evaluation of will be reported in the paper.