

Proposed strategies for optical observations in a future European Space Surveillance Network

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Two ESA-funded feasibility studies that aimed to develop observation strategies, to propose suitable sensor architectures, and to assess the expected performance of an independent European Space Surveillance System were carried out during the last years. The French company ONERA led a study team comprising a number of European companies in both studies.

The proposed system consists of two subsystems, a phased-array radar system that shall be located in the South of Spain, and a network of ground-based electro-optical telescopes at four low-latitude sites. This proposed space surveillance system allows to build-up and to maintain a catalogue of orbital elements of objects in space, provides means to perform additional space surveillance tasks such as independent detection of fragmentation events, launches or manoeuvres, and allows to acquire the necessary measurements to assess the collision risk between catalogued objects.

As a member of both study teams, the Astronomical Institute of the University of Bern (AIUB), Switzerland, contributed to the observation strategy definition, the system design, and the performance estimation of the optical observation part of the space surveillance system. This part of the system is intended to cover the geostationary orbit (GEO) and the medium Earth orbit (MEO) regions.

This paper focuses on the development and evaluation of observation strategies for GEO and MEO within a space surveillance network. Observation requirements, possible strategies fulfilling the requirements, and the expected performance of selected strategies in terms of the coverage of a reference population are addressed.

We conclude that the GEO and MEO region shall be covered by "stripe-scanning" approaches carried out by a network of telescopes. The simulation of the approaches using a DISCOS reference population reveals that for both regions a nearly complete coverage can be guaranteed within a short time.