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IMPLEMENTATION OF A EUROPEAN SPACE-BASED AIS SYSTEM FOR MARITIME SURVEILLANCE PURPOSES

Abstract

An important system in the field of global maritime surveillance is the Automatic Identification System (AIS), which is responsible for transmitting ship- and voyage-related data of surface vessels. Many entities use land-based AIS for monitoring and guidance of maritime traffic, which requires ships to be equipped with an AIS transceiver that sends logistical and navigational data about this vessel in the VHF frequency range.

In order to be able to perceive the maritime traffic situation beyond the land-based AIS range, introduction of a space-based AIS system is proposed. The primary figure-of-merit of a space-based AIS system is the probability of detection of a ship's AIS message in case the satellite receives a multitude of AIS messages. As these messages can overlap and interfere with each other, which will not happen at land-based receivers, the challenge is to filter out and decode single AIS messages. The final goal in the development of a space-based AIS system is the implementation of an operational and affordable system, consisting of satellite constellation, ground station network, data dissemination and distribution.

In Europe, several activities have been initiated by ESA and EC to validate AIS receivers, design first operational missions and to develop full space-based AIS constellations. One of these activities involves the development and performance assessment of a full-fledged European space-based AIS system, for which the consortium is responsible.

In this paper, implementation concepts of deploying a European space-based AIS system will be presented. It will start with a summary of the user requirements, which were gained by interviewing relevant users, including coast guards, port authorities, immigration authorities, and national customs, but also Pan-European projects and EU initiatives (e.g. GMES). Subsequently, several potential system scenarios are conceptualised. These will be coupled to corresponding technological solutions, which require trade-offs in the fields of receiver technology, antenna technology, constellation design and digital signal processing options. As a conclusion, a baseline architecture will be proposed showing most potential in fulfilling the user needs. Experiences gained with previous missions involving space-based AIS, which serve as helpful references, will also be briefly described.