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NAVIGATION AID IN THE ARCTIC REGION THOROUGH GALILEO/UAS PARASITIC IMAGING

Abstract

Maritime security and environmental protection are becoming crucial aspects of next years for a number of issues, e.g. pollution, illegal fishing, illegal immigration practices, with the European Maritime Safety Agency (EMSA) playing a leading role in this ambit. In addition, one of the side effect of global warming is probably going to have an impact on economy in the next years: (a) the classical polar routes tend to be opened much longer than in the past on a near term and (b) on a further term the opening on new routes at higher latitudes are under study to reduce delivery times and fuel consumption. In support the foreseen increase of maritime traffic in the Arctic, critical needs and the way to fulfill them are on the agenda of the main organization, with reference to aid to ship navigation (ship and icebergs information), tanker accident monitoring, rescue support in the Arctic region (e.g. ESA studies in the framework of the European crisis response space architecture; Arctic Marine Shipping Assessment 2009 Report by the Arctic Council). Such applications typically require continuous or almost continuous monitoring of quite large areas and cannot be fulfilled with existing LEO systems, which offer high resolutions but are strongly limited in terms of repetitivity (several hours). A different approach could be utilized, relying on the scheduled Galileo constellation, whose navigation signal could be used by receiving-only radars on-board Unmanned Aerial Systems (UAS). Galileo satellites have in fact great advantages with respect to other GNSS in this respect: channels E5a and E5b can altogether transmit a bandwidth of 50MHz, larger than GPS (10MHz) and Glonass (5MHz) with great benefits on image resolutions. The proposed paper presents a preliminary feasibility assessment and performance evaluation of a parasitic imaging system based on Galileo a non cooperative transmitters and receivers on board of high altitude (10-20km) long endurance UAS (HALE - High Altitude Long Endurance), able to perform ship and iceberg detection and downlink tis navigational information to the users. In particular, achievable resolutions (5-30 meters) are analyzed as well as service capability in terms of service availability in time in the Arctic and further analyzed on specific polar routes.