Impact of disturbed ionospheric conditions in EGNOS performance

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The European Geostationary Navigation Overlay Service (EGNOS) is the Europe's regional satellite-based augmentation system (SBAS). It provides an augmentation service to the Global Positioning System (GPS) L1 Coarse/Acquisition (C/A) civilian signal by providing corrections and integrity information for GPS space vehicles (ephemeris, clock errors) and information to estimate the ionosphere delays affecting the user. This information provided by EGNOS improves the accuracy and reliability of GNSS positioning information while also providing a crucial integrity message. This is especially relevant for civil aviation community, which, thanks to this improvement, can perform precision approaches (APV-I and LPV200) using GNSS, with a clear optimisation of the cost of the infrastructure with no impact in the safety of the operations.

One of the most important figures for EGNOS is the availability of the system, which is characterized by the proportion of time during which reliable navigation information is presented to the crew, autopilot, or other system managing the flight of the aircraft. (ICAO SARPS).

ESSP, as EGNOS Service Provider, monitors the daily availability for these flight operations (APV-I, LPV200), considering the system available when operational requirements defined in ICAO SARPS are met. In this case, EGNOS is considered available when the Protection Levels, an upper bound of the aircraft position error with the specified integrity risk, are lower than the Alarm limits defined by ICAO for these operations.

One of the main degradation sources in the EGNOS availability (and others SBAS) is the ionosphere, especially under disturbance conditions (e.g. geomagnetic storms, scintillation ...) (Pintor et al., 2015; Haddad, 2016).

In the frame of the H2020 project - TechTIDE, the impact of disturbed ionospheric conditions in the EGNOS availability has been analysed. TechTIDE project is generating a warning system which will provide Travelling Ionospheric Disturbances (TID) information and some ionospheric activity indicators. These products would be used for the definition of mitigation strategies in some operational systems (EGNOS, N-RTK and HF communications).

As part of TechTIDE project, ESSP has assessed the impact of disturbed ionospheric conditions in EGNOS availability and defined a relationship with an ionospheric activity indicator provided by TechTIDE warning system. This paper presents the outcomes of this assessment.

References:
