

Evaluating GNSS receiver robustness at low latitudes under ionospheric scintillation

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An approach for testing the robustness of GNSS receivers under ionospheric scintillation was implemented using a GNSS simulator and receiver raw data recorded during previous scintillation events at low latitudes. The GNSS simulator allows to reproduce RF signals from a GNSS constellation under standard ionospheric conditions. In this work, it is intended to reproduce RF signals under scintillation. This requires the data treatment of the amplitude and phase variations of receiver raw data GNSS signals formerly acquired. Such actual data is employed as an input to the GNSS simulator in order to modify one or more channels that are simulated. Therefore, it was possible to test a given GNSS receiver reproducing past scintillation conditions and providing test reproducibility. These tests allow to demonstrate a good agreement between the performance of the considered GNSS receiver under real and simulated ionospheric scintillation conditions. The proposed approach was successfully evaluated by a variety of tests applied to different GNSS receivers, including one low-cost receiver under development. This work may contribute to real time testing of algorithms intended for Total Electron Content (TEC) calculation, scintillation alerts, prediction and mitigation, as well as Ground Based Augmentation System (GBAS) evaluations.

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