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IN-FLIGHT RESULTS FROM THE GPS RECEIVER ON SMALLGEO

Abstract

The first SmallGEO platform used as satellite bus for the Hispasat 36W-1 mission has been launched on 27 January 2017. As an experimental payload, it carries a GPS receiver which aims at proving feasibility of GPS usage in a geostationary orbit (GEO). The data gathered by the GPS receiver enables a detailed assessment of the achievable tracking and navigation performance of a GPS receiver in GEO. This paper presents both the first in-orbit flight results as well as a comparison of the flight data to ground-based analyses. The first results show that GNSS receivers can be used successfully in higher orbits.

The GPS receiver was switched on shortly after launch and remained powered throughout the transfer to the geostationary arc experiencing situations both below and above the GPS constellation. Although the large orbit maneuvers in the transfer phase were not provided as input to the GPS receiver, the results from this phase in terms of satellite tracking behaviour provide valuable information regarding the ability of the receiver to track GPS signals in various transfer orbits. The results are presented and analyzed, taking into account the instantaneous geometry and the different visibility conditions. During most of the transfer phase the satellite was in a sun-pointing attitude and advantage was taken of the fact that two switchable antiparallel antennas have been embarked on SmallGEO.

After arrival in geostationary orbit, the satellite acquired an Earth-pointing attitude in which only the main GPS antenna pointing towards the Earth was used. The paper elaborates on the number of satellites tracked, the signal strengths acquired from the GPS satellites as well as on the navigation performance that could be reached in geostationary orbit. The obtained in-flight data is then compared to the expected performance based on analysis and simulation to show that the receiver meets the expectations.

Finally an outlook is given on the future use of GNSS receivers in geostationary orbits in general and the enabling feedback received from the SmallGEO GPS experiment in particular.