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IMPLEMENTATION OF THE GALILEO HIGH ACCURACY SERVICE ON AN ACCURATE GNSS RECEIVER FOR LEO

Abstract

Accuracy demands for positioning satellites in Low Earth Orbit are constantly increasing. On one side, this is caused by the new types of missions proposing cooperative orbiting scenarios (formations and constellations), where manoeuvres' planning and execution need precise knowledge of PVT for all assets. On the other side, the exponential growth of the number of satellites leads to ever-increasing conjunction alerts, which are forecasted taking into account large errors in initial positioning. In our previous work, we introduced OrbFIX, a low-power, high-reliability receiver capable of decimeter-level precision, in its high-performance mode. Designed as a combination of performant COTS and radiation redundant components, the device has undergone an extensive test campaign, including mechanical and high-energy protons irradiation. As of January 2023, the Galileo High Accuracy Service (HAS) provides free access to information required to compute a Precise Point Positioning (PPP) solution. The data is transmitted through the Galileo E6-B signal, meaning that various devices can access these corrections. However, decoding the HAS message is computationally expensive and, to the best of our knowledge, no receiver has this capability up to this point. The paper presents the design drivers of OrbFIX, the implementation and the results of the test campaign. The development is currently continuing with a qualification campaign and the in-orbit demonstration for conforming to the expected functionality. The paper focuses on the design and implementation of a specialized add-on to the OrbFIX receiver which computes the HAS corrections that are later used in the PPP algorithm. Notably, the efforts were focused on running and optimizing the algorithms for the low-power processor, while maintaining a high output rate and precision.