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IN-ORBIT PERFORMANCE OF THE DUAL-CONSTELLATION GNSS POD RECEIVER OF SENTINEL-6 MICHAEL FREILICH

Abstract

With the launch of the Sentinel-6 Michael Freilich satellite in Nov. 2020, the first operational multi-constellation (GPS + Galileo) multi-frequency GNSS POD receiver has been put into orbit. This receiver, referred to as PODRIX, provides excellent real-time Position, Velocity and Time (PVT) performance and at the same time generates the high-quality measurements forming the basis for state-of-the-art Precise Orbit Determination (POD) performed on ground also by the Copernicus POD service, of which PosiTim is part. PODRIX has been developed by RUAG Space, the leading supplier of products for the space industry in Europe, and with a growing presence in the US. The receiver's dual-constellation capability ensures inherently higher integrity and availability of the PVT solution, but also for the first time demonstrates the excellent dual-frequency system performance of the Galileo constellation. The achieved POD performance shows a significant improvement compared to the previous GPS-only receiver generation for space still operating on the Copernicus Sentinel A/B satellite blocks.

In this paper we provide an overview of the PODRIX receiver architecture and briefly discuss the evolution from and the differences to the previous RUAG receiver generation, covering both hardware and software aspects.

In the main part of the paper, PVT performance evaluations are presented and discussed based on actual in-orbit data generated for different PODRIX receiver configurations, such as GPS-only, Galileo-only and dual-constellation. These results are generated by comparing the PVT solution reported by the receiver to the 'true' reference orbit calculated by means of sophisticated POD algorithms achieving centimeter-level accuracy. Some showcase results of the achievable POD performance are also presented and discussed.

The paper closes with an outlook on upgrades of the PODRIX software, which allow further advancements in performance, which have partly been achieved already or are in the planning phase.