



Galileo onboard clocks and GNSS time transfer by means of Galileo

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The development of the Galileo System continues under the partnership of the European Commission and the European Space Agency. ESA is charged with the development of the elements of the “Global Component”, which will comprise the complete constellation of satellites together with the ground segment.

The performance of the Galileo space-borne clocks is of highest importance for navigation and integrity at the corresponding user level. Clock estimation and prediction errors driven by the onboard clock’s frequency stability and drift are directly mapped into the User Equivalent Range Error (UERE).

Two Rubidium Atomic Frequency Standard (RAFS) units developed by Spectratime (former Temextime) were launched on the first experimental Galileo satellite, the Galileo In-Orbit Validation Element A (GIOVE-A). The RAFS already demonstrated excellent performance during on-ground qualification and acceptance tests. To verify its performance on-board, an experimentation was carried out as part of the GIOVE Mission Segment. Under this Mission, an infrastructure was deployed including a network of 13 Galileo Experimental Sensor Stations (GESS) monitoring continuously the GIOVE-A signals. Using dedicated network adjustment techniques, the processing of these observables allows the restitution of the phase difference between the on-board clock and a ground reference. Such restitution however is affected by the noise of the measurement system (e.g. on-board and averaged on-ground group delays, orbit residuals, etc), therefore the “apparent” clock denomination.

The presentation will provide an overview of the technical status of the Galileo system development including the master working schedule. We will present the GIOVE-A

apparent clock results obtained since the ground infrastructure became operational for both the nominal and the redundant on-board clocks. The talk will outline the potential of Galileo for GNSS time transfer and the early use of the GIOVE satellites applying Experimental GPS to Galileo Time Offset (E-GGTO) information.