

Time transfer using a calibrated GPS-Galileo receiver

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Measurements from Global Navigation Satellite Systems (GNSS) are used since the eighties to perform precise and accurate Time and Frequency Transfer. Only the GPS constellation was used during the last 25 years, with some experiments based on GLONASS measurements. This paper will study the added value of Galileo signals to get a calibrated time transfer solution, using code measurements on the four satellites of the current Galileo In-Orbit Validation (IOV) phase. In a first step, the hardware delays of the Galileo signals are determined from the known delays of GPS signals using ionosphere measurements of GPS and Galileo satellites appearing in the same direction. The different combinations of Galileo signals are also investigated, as well as the differences in results using different sets of satellite clocks and orbit products. Furthermore, using a fully calibrated GPS-Galileo receiver connected to a local realization of UTC, we determine UTC-UTC(k), using the broadcast values UTC-GST in Galileo navigation message, and UTC-GPSt in the GPS navigation message, and compare this results with the UTC-UTC(k) officially provided by the BIPM in the monthly CircularT. We furthermore compare the Galileo to GPS time offset (GGTO) computed from time transfer results for UTC(k)-GST and UTC(k)-GPST with the broadcast GGTO as appearing in the navigation message.