Antenna calibrations for TRF scale determination and their influence on coordinate estimation

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Global Navigation Satellite Systems (GNSS) can typically not contribute to the scale of the terrestrial reference frame since the satellite antenna offsets are not a priori known to the scientific community and need to be estimated. In 2016, the European GNSS Agency (GSA) disclosed antenna patterns for the Galileo In Orbit Validation (IOV) satellites. In November 2017, also the patterns for the Full Operational Capability (FOC) satellites have been disclosed. With the second disclosure the antenna phase center offets (PCO) and phase center variations (PCV) for the full Galileo constellation are now publically available.

For the receiver antennas the situation is different. The IGS network consists of group calibrated receiver antennas based on robot calibration. Since these calibrations include only GPS and GLONASS, no patterns for the Galileo frequencies are available at the moment. Within the EUREF Permanent GNSS Network (EPN) a subset of individual chamber calibrated antennas including the full range of calibrated frequencies (e.g. E1 and E5) is accessible.

We present a dedicated study of the impact on the usage of the released Galileo satellite PCV and PCO on a global scale using IGS robot calibrations. We will analyse their effect on the station coordinates introducing an inter-system translation vector between GPS and Galileo.

Additionally, we will also study the impact of using E1 and E5 patterns instead of using the GPS values for Galileo based on the available receiver antenna chamber calibrations. This allows, at least a limited evaluation to which extent these alternative calibration values are compatible to those traditionally used by the IGS.