



Galileo satellite antenna modeling

Peter Steigenberger (1), Rolf Dach (2), Lars Prange (2), and Oliver Montenbruck (1)

(1) German Space Operations Center, Deutsches Zentrum für Luft- und Raumfahrt, Germany (peter.steigenberger@dlr.de), (2) Astronomisches Institut, Universität Bern, Switzerland

The space segment of the European satellite navigation system Galileo currently consists of six satellites. Four of them belong to the first generation of In-Orbit Validation (IOV) satellites whereas the other two are Full Operational Capability (FOC) satellites. High-precision geodetic applications require detailed knowledge about the actual phase center of the satellite and receiver antenna. The deviation of this actual phase center from a well-defined reference point is described by phase center offsets (PCOs) and phase center variations (PCVs).

Unfortunately, no public information is available about the Galileo satellite antenna PCOs and PCVs, neither for the IOV, nor the FOC satellites. Therefore, conventional values for the IOV satellite antenna PCOs have been adopted for the Multi-GNSS experiment (MGEX) of the International GNSS Service (IGS). The effect of the PCVs is currently neglected and no PCOs for the FOC satellites are available yet.

To overcome this deficiency in GNSS observation modeling, satellite antenna PCOs and PCVs are estimated for the Galileo IOV satellites based on global GNSS tracking data of the MGEX network and additional stations of the legacy IGS network. Two completely independent solutions are computed with the Bernese and Napeos software packages. The PCO and PCV values of the individual satellites are analyzed and the availability of two different solutions allows for an accuracy assessment.

The FOC satellites are built by a different manufacturer and are also equipped with another type of antenna panel compared to the IOV satellites. Signal transmission of the first FOC satellite has started in December 2014 and activation of the second satellite is expected for early 2015. Based on the available observations PCO estimates and, optionally PCVs of the FOC satellites will be presented as well. Finally, the impact of the new antenna model on the precision and accuracy of the Galileo orbit determination is analyzed.