Near-field Effects on GNSS Sites: Analysis using Absolute Robot Calibrations and Procedures to Determine Corrections

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The phase center and variations (PCV) of a GNSS antenna can be precisely determined using the Geo++® Absolute Field Calibration with a Robot. The PCV are determined free or significantly reduced of any mutipath effects depending on the antenna type. However, there are remaining multipath effects caused by the actual setup and the environment on the GNSS site, which can significantly modify the phase variations.

The site multipath influence itself can be separated into near-field and far-field effects, which do have different properties. Near-field effects cause a systematic bias especially in the coordinate height component. Far-field effects can be averaged out by sufficient length of observation data.

The absolute antenna calibration with the robot is an excellent instrument to investigate near-field effects on phase variations. A particular antenna setup mounted on the robot will be constantly rotated and tilted by the calibration procedure, but the geometry between received satellite signals and setup will not change. Due to the very long-periodic multipath in the close vicinity and electro-magnetic interaction of the antenna, the phase variation pattern change. Therefore, the near field effect of the antenna can be determined and investigated.

The capabilities of the robot concerning size and weight of the antenna setup as well as a representative mock-up of the GNSS antenna set-up are limited. Therefore also other means are currently investigated by Geo++ to determine the near-field effect.

Investigations on near-field effects using a robot, the separation of site dependent error components and feasible approaches to determine GNSS site near-field effects are discussed.