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Assessment of high-rate GPS using a single-axis shake table

S. Häberling, M. Rothacher, and A. Geiger
Institute of Geodesy and Photogrammetry, ETH Zurich, Switzerland (shaeberling@ethz.ch)

The latest generation of GPS receivers is capable of tracking at 100 Hz potentially capturing high-frequency signals. The new possibility to measure highly dynamic motions could enlarge the applicability in navigation and Earth monitoring such as seismology.

In this study, we assess the potential of high-rate GPS with a sampling rate up to 100 Hz for a large spectrum of different motions. These motions are generated on a single-axis shake table carrying a GPS antenna. The real motion of the shake table is additionally monitored by highly accurate inductive sensors recording at 2400 Hz which deliver the ground-truth for the GPS assessment. In order to identify and quantify the internal GPS receiver errors as well as the external error sources, test experiments are carried out with zero-baselines, very short and long baselines.

Our experiment setup allows a detailed study of the dynamic behaviour of the GPS receiver signal tracking for different accelerations. The investigations are focusing on the impact of different tracking loop parameters for L1 and L2 on the GPS results. In order to minimize the receiver errors during highly dynamic motions, an optimal set of tracking loop parameters and a good understanding of the receiver transfer function are crucial. The characteristics of the results are also compared with tests carried out in static mode and using different receiver types.