INFLUENCE OF ANTENNA HEIGHT AND SATELLITE GEOMETRY ON PSEUDO RANGE MULTIPATH

Gobinath Vaiguntharasa[1], Jenan Rajavarathan*[2], Dammalage Thilantha[3]
[1]*Survey Department of Sri Lanka*
[2]*Sabaragamuwa University of Sri Lanka*
[3]*University of New England*
**rjenan@stdgeo.sab.ac.lk*

Abstract

Multipath is known to be a hard to mitigate, site-dependent error in determination of positioning solutions of Global Navigation Satellite Systems (GNSS) applications. There are several better antenna designs and processing algorithms are being introduced at receiver level multipath mitigation. However, the combination of instrumentation setup and the receiver model used in field surveying varied the amount of multipath residual error remain in the position solution. This study analysis the pseudo range multipath effect on different GPS antenna configurations of (i) satellite geometry (ii) varying antenna heights and (iii) with two different GNSS brands. GPS observations considering the satellites above 150 elevation were performed over three experiment sites in a GNSS friendly environment for three continuous days. The results were comparatively analysed for same sidereal time of each day to ensure the repeatable availability of the GNSS satellites for the observations at each site. The multipath error induced by satellites was high varying between ± 0.015 m while evolving at low elevations of 250 to 450 and was low varying between ± 0.006m when the satellites moved to higher elevation above 500. Influence of multipath residual increase with the increment of instrument heights by approximate 15% in comparison when the instrument was placed on the ground, at zero-level. The least multipath impact was noted during the instrument was placed at zero-level. Leica GS15 receiver performed effectively in mitigating multipath residuals when compared to trimble 5700 receivers, where the trimble antenna and receivers were comparatively older. Carrier L2 signal responded well with least error impact of multipath residuals when compared to L1. A combination of well calibrated GNSS antenna and receiver design, ground level instrument height and better satellite geometry would be a better solution to mitigate basic level of multipath error in a practical scenario.

Keywords: *GNSS, GPS, Multipath, Pseudo range*