

## ACCURACY ANALYSIS OF SHORT AND LONG BASELINES WITH DIFFERENT COMBINATION OF SATELLITE CONSTELLATIONS

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### Abstract

The use of satellites for precise positioning has become crucial in the modern world. The highest positional accuracy cannot be obtained using a single satellite constellation alone. This study aimed to assess the horizontal and vertical positional accuracy in both long and short baselines with different combinations of multi GNSS satellite constellations and their frequencies. The continuous GNSS observations of three stations: The Institute of Surveying & Mapping Diyathalawa (ISMD), SUSL, and Colombo CORS, were used for accuracy assessment. The precise point positioning (PPP) technique was used for determining the accurate locations of three base stations. It was found that GLONASS+GALIELO satellite constellations showed the best horizontal accuracy in short baselines of deviation of 7.43 mm while the constellation of GALILEO showed the highest vertical accuracy of deviation of 1.29 mm. For long baselines, the combination of GPS+GLONASS+GALILEO constellations showed the best horizontal accuracy of deviation of 3.42 mm while the constellation of GALILEO alone showed the best vertical accuracy of deviation of 2.66 mm. The accuracy analysis of different frequency combinations was performed for these best satellite constellations. The results showed that both modernized and legacy signals provide the best solutions to the horizontal positioning of deviation 1.43 mm in a short baseline while only the use of the modernized signals for the best vertical accuracy of deviation 1.14 mm. The results of long baselines showed both modernized and legacy signals provide the best solutions to the horizontal positioning of deviation of 1.14 mm while only the use of modernized signals for the best vertical accuracy of deviation of 1.42 mm.

**Keywords:** *GNSS constellations, PPP positioning, frequency and satellite combinations, baseline processing.*