

Performance of Real-time Precise Point Positioning in New Zealand

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SUMMARY

GNSS based high accuracy positioning services available today using are mostly based on differential techniques like RTK. However these kinds of services are only available inside a network of Continuously Operating Reference Stations (CORS) or a few kilometres from such stations. An emerging alternative to these infrastructure heavy method are the Precise Point Positioning (PPP) technique. PPP as a technique aims at delivering centimetre level accuracy positioning without the need of directly connecting to a local CORS. Although PPP still needs to monitor GNSS satellites and compute corrections for their signals, these corrections are calculated based sparse global networks. Recently research and development have also looked into satellite broadcast of corrections for PPP. The combination of sparse CORS and satellite delivery make PPP based positioning ideal for situations where local infrastructure is unavailable or unreliable.

The present document studies the potential performance of PPP in New Zealand. PPP is now a quite mature research topic and a number of real-time corrections for PPP are publicly available for testing. Three of these streams are used to calculate real-time kinematic PPP solutions and post process static PPP solutions in Auckland, Hastings, Wellington, Yaldhurst (Christchurch), Dunedin and Chatham Island. The selected real-time streams have been tested or are likely to be available as, satellite delivery services. MADOCA messages produced by the Japanese Aerospace Exploration Agency have been in tests using the Quasi-Zenith Satellite System since 2013. CLK81 messages streamed from the IGS real-time server are produced by satellite operators GMV using their magicGNSS software. Finally CLK9B produced by the French Space Agency (CNES) was broadcast by the QZSS in tests performed in 2014 and 2015.

Results of real-time positioning tests show that accuracies of 6 cm in horizontal positioning and 15 cm in vertical positioning can be achieved by kinematic PPP. The convergence times to 10 cm of horizontal accuracy are about 30 minutes.