

Performance of Real-Time Precise Point Positioning Using MADOCA-LEX Augmentation messages

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SUMMARY

The Quasi-Zenith Satellite System (QZSS) is a Japanese regional satellite navigation system consisting of several QZSS satellites in highly inclined elliptical orbits that allows it to cover a wide area in East Asia and Oceania. QZSS is a satellite-based augmentation system for the GPS, GLONASS and Galileo constellations, transmitting navigation signals that are compatible and interoperable with these Global Navigation Satellite Systems (GNSS). In addition to the navigation signals, QZSS also transmits the augmentation signals L1-SAIF and L-band Experimental (LEX) Signal. The LEX signal is unique for QZSS in that it is capable of delivering 2kbps (1695bps of effective bit rate) of correction messages compared to the 250bps of legacy Satellite based Augmentation Systems (SBAS) like the MTSAT Satellite-based Augmentation System (MSAS). This enhanced capacity allows augmentation messages aimed at centimeter-level Precise Point Positioning to be broadcasted over the QZSS wide area of coverage. One such message is the Multi-GNSS Advanced Demonstration of Orbit and Clock Analysis (MADOCA) based messages which are currently being broadcasted by the LEX signal. The aim of this research was to evaluate the quality of the corrections include the MADOCA messages and the performance of real-time PPP using these augmentation messages. Centimeter level accuracies were obtained for static PPP after 2 hours of convergence and decimeter level accuracies were obtained for kinematic PPP after 1.5 hours of convergence. This service is expected to become continuously available for most of East Asia and Oceania region in 2018, when the QZSS constellation gets enhanced to 4 satellites