High Accuracy Positioning using LEX Signal from Quasi-Zenith Satellite

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Abstract: In this paper we reported the experiments for comparison of accuracy between LEX signal and VRS(Virtual Reference Station)-GPS. Japanese government launched QZS (Quasi-Zenith Satellite) in 2010 with two purposes, one is GPS availability enhancement and another is GPS performance enhancement. GPS availability enhancement is able to broadcast same as the GPS signal from QZS that is same mechanism of GPS. GNSS receiver can obtain position information by using signal from GPS. QZS has two special signals that were not mounted with the GPS. One is L1-SAIF that will able to get sub-meter accuracy position information and, another is LEX that can get centimeter accuracy positioning. Using LEX signal positioning method has been called PPP(Precise Point Positioning) which is new positioning method and , it has not been established in the world. Japan established the method by LEX signal. (Japan is going to establish this technology by LEX signal.) QZS has special orbit through the near zenith over Japan for 8 hours and, user will be able to get accurate position information that was not affected multipath. Now QZS has been using on the experiment in Japan and East Asian areas. On our laboratory experiment, LEX signal and VRS-GPS system were used to compare accuracy. The experiment was conducted 3 times. The first experiment was March 5th to 9th,2012, the second experiment was April 23 to 27,2012 and the third experiment was March 5th to 8th,2013. First and second experiments did fixed condition and moved experiments and, third experiment did in neighborhood of campus building by fixed condition. All experiments were conducted same equipment and vehicle. Purpose of fixed experiment was to check the effect of satellite number in the view sky of QZS's orbit in all the day. The purpose of experiment on moving is to get moving position information and moving images. Those images took forward direction and upper direction in the vehicle and, as a result, we got very interested data. On the fixed experiments, positioning error of LEX signal was very big, because of number of satellite decrease at that time, however, positioning error of VRS does not has so much. On the moved experiments, accuracy of positioning in VRS-GPS was better than that of LEX. Near the building, tunnel and mountain area, LEX system was more inaccurate than we were imagining. In this paper we introduced high accuracy positioning experiments using LEX signal.

Keyword : LEX, QZS, GNSS, PPP, Accuracy Verification