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The Status of Quasi-Zenith Satellite System Development

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Quasi Zenith Satellite System (QZSS) is a regional space-based Positioning, Navigation and Timing (PNT) system that uses a constellation of satellites placed in multiple orbital planes. Satellites composed constellation have the same orbital period as a traditional equatorial geostationary satellite, however, they have a large orbital inclination. According to the current design, the constellation is composed three satellites. Each satellite traces same ground track with eight hours interval. The system covers regions in East Asia and Oceania and intends to ensure that users are able to receive positioning signals from a high elevation Japan at any times.

“More stars” is a primary essential requirement for GNSS applications from geodesy to navigation use of handheld equipment. The constellation design of the QZSS leads the improvement of availability effectively as less as number of satellite. Especially, the satellite with high elevation angle is highly important for land mobile users in the urban canyon and mountainous terrain. In Japan, there are many mountainous and urban areas with dense buildings and narrow roads. Under these conditions, it is expected that the augmentation of GPS by QZSS will improve the performance of GPS in such areas where we cannot see a sufficient number of GPS satellites due to some obstacles.

QZSS will transmit six positioning signals on four frequencies, L1 C/A, L1C and L1-SAIF on 1575.42 MHz, L2C on 1227.6 MHz, L5 on 1176.45 MHz, and LEX on 1278.75 MHz. L1C/A, L1C, L2C and L5 have not only same RF properties but also same message structure and format as GPS. QZSS and GPS have highly interoperable

relationship. It is expected that PNT users could obtain benefit from QZSS augmentation easily with minimum receiver modification.

The QZSS project will be promoted incrementally in accord with the official policy of the Government of Japan released on March 31, 2006. As the first step, the first QZSS satellite will be launched in JFY 2009, i.e. end of March 2010 and technical validation and application's demonstration will be conducted. The second and third satellite will follow the successful completion of demonstration. The first satellite development is on going steadily. The current status and future development plan are described in this paper.