

SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)  
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RESEARCH OF GNSS SIGNAL MONITORING METHOD BASED ON LEO CONSTELLATION

**Abstract**

**Purpose:** Global satellite navigation system (GNSS) has become a critical infrastructure of the world. Monitoring GNSS signals worldwide will be greatly helpful for the system to provide high quality services. However, constructing signal monitoring stations oversea is often constrained by many non-technology factors. And, terrestrial stations are also easily affected by natural disasters and intentional or non-intentional interferences. Recently, a lot of systems based on LEO satellite constellation are proposed for global communications and data collections. With increasing processing capability of satellite payloads and the progress of multi-GNSS receiver techniques, monitoring GNSS signals on-orbit is becoming realistic.

**Methodology:** This paper presents a multi-GNSS signal monitoring method with LEO satellite constellation. Firstly, precise orbit and timing of LEO satellites are obtained in real time on-orbit by using IGS RTS Products based on precise point positioning (PPP) algorithm. Secondly, raw data of GNSS signal measurements observed on-orbit are collected into a ground based data processing center. The data are processed there and used to estimate the orbit and timing of GNSS satellites.

**Results:** This paper analyzed how parameters affect the performances of GNSS signal monitoring, such as constellation configuration, orbit estimation accuracy, data transmission bandwidth and time latency. Preliminary simulation results showed that the proposed method can achieve the accuracy level of GNSS satellite orbit determination better than 1 meter and greatly improved the positioning accuracy of GEO satellites.

**Conclusions:** With the development of the LEO constellation in future, monitoring GNSS signals on LEO orbit will be a good choice for system design and a supplement to ground based GNSS signal monitoring network.

**Keywords:** GNSS; Signal Monitoring; LEO constellation; Precise Orbit Determination