SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
Space-Based Navigation Systems and Services (1)

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GNSS PERFORMANCES FOR MEO, GEO AND HEO

Abstract

Global Navigation Satellite Systems (GNSSs) such as GPS, GLONASS, and the future Galileo and BeiDou, have demonstrated to be a valid and efficient system for various space applications in Low Earth Orbit (LEO), such as spacecraft orbit and attitude determination, rendez-vous and formation flight of two or more spacecraft, and timing synchronization. A GNSS presents a number of significant advantages, in particular for small satellites: it provides an autonomous navigation system, which requires just a relatively inexpensive realization and installation cost of the on board GNSS receiver, with low power consumption, limited mass and volume. Nowadays, the GNSS technology for LEO satellites is often used, thanks to the large number of visible satellites, the good geometry coverage and the strong signal power. However, the research of GNSS solutions for Medium Earth Orbit (MEO), Geostationary Earth Orbit (GEO) and High Earth Orbit (HEO) satellites is still new. In this context, this study aims to estimate accurately the GPS and Galileo performances for MEO, GEO and HEO use, such as for lunar applications. Unlike most of the previous investigations, our study is making use of a very accurate multi-GNSS constellation simulator "Spirent GSS8000", which supports simultaneously the GPS and Galileo systems and the L1, L5, E1, E5 frequency bands. Performances of GPS, Galileo and of both simultaneously, are evaluated in terms of availability, pseudorange error factors and geometry factors, taking into account all the errors in GNSS solution.