

IAF SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
Advances in Space-based Navigation Systems, Services, and Applications (6)

Author: Dr. Xin Nie

Beijing Institute of Aerospace Systems Engineering, China Aerospace Science and Technology Corporation
(CASC), China, nxbuua@126.com

AN ANALYSIS OF POSITIONING PERFORMANCE BASED ON LEO SATELLITES

Abstract

At present, the world is welcoming a boom in the construction of low-orbit satellite constellations. There are several potential constellations in the field of communication or remote sensing. As GNSS already provides services worldwide, there are currently no plans to build large-scale constellations. In order to improve the performance of navigation and positioning services, this paper proposed a system based on LEO satellites. The system does not require a separate navigation constellation, and can provide navigation services based on LEO communication satellite or other LEO satellites. LEO satellites use GNSS receivers to achieve time synchronization between LEO and MEO satellites. The hosted payload or communication and navigation integrated payload is used to broadcast the navigation signal. After link budget calculation and beam width analysis, the signal of LEO is 20dB higher in ground than that of MEO, with the same transmitting power. A simulation is performed based on a communication constellation under construction. The simulation results show that due to the characteristics of large dynamics, positioning accuracy can reach decimeters based on carrier phase measurement. At the same time, the convergence time is reduced within 1 minute. The system can expand the service area, improve positioning accuracy and shorten convergence time, solving the shorting comings of GNSS service based on MEO satellites. This solution will give users greater convenience and better service experience while increasing the benefit-cost ratio of satellite systems.