Lunar Exploration (3)
Lunar Analysis & Simulation (4)

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GNSS RECEIVER DESIGN AND FLIGHT DATA ANALYSIS FOR CIRCUMLUNAR RETURN MISSION

Abstract

Abstract: In previous Chinese lunar exploration mission, orbit determination mainly depends on ground-based TTC and VLBI. for CE-5T1 Circumlunar Return Mission, a multi-GNSS receiver of GPS and GLONASS was equipped to provide real-time positioning and timing services. The GNSS was activated twice on October 23,2014 from10,000 to 53,000 km and October 31,2014 from 50,000 to 5,000 km , in earth-moon and moon-earth transfer orbits. This flight experiment fully verifies the ability of onboard navigation based on GNSS receiver, which features weak signals processing and onboard orbits determination technology. According to analysis of raw data obtained from the spacecraft, the number of GPS satellites tracked are more than 4s and the number of GLONSS number tracked are more than 1s during the whole course. The performance of position accuracy is better than 50m and velocity accuracy is better than 0.05 m/s. Especially, data analysis shows that GPS/GLONASS transmitting angle can reach to more than 70deg, even 90deg in some case. The ration of GNSS satellites number from main-lobe and side-lobe is calculated in detail. Furthermore, it is providing important information about the characteristics of GPS/GLONASS signals received by a high altitude spacecraft, which has long been of interest to expand the field of GNSS application. This paper describes the design of high sensitivity receiver, and analyzes the collecting flight data deeply.