

Lunar Exploration (3)

Lunar Concepts (3)

Author: Dr. sheng yang

China Academy of Space Technology (CAST), China, buaa_ys@tom.com

Dr. Meng Li

China Academy of Space Technology, China, Arahms@sina.com

Dr. Zhen Huang

Institute of Manned Space System Engineering, CAST, China, huangzhencast@126.com

A TT&C SYSTEM FOR LUNAR EXPLORER BASED ON GROUND STATION AND TDRS

Abstract

Generally, the Tracking Telemetry and Command (TT&C) for lunar explorer was based on ground stations, such as Deep Space Network (DSN) of NASA. Now, the Tracking and Data Relay Satellite (TDRS) was widely used for Low Earth Orbit (LEO) space mission. It also can be used for lunar exploration mission with the support of ground station. A TT&C system based on one ground station and two TDRS was presented for lunar explorer. Firstly, a mathematical model for the coverage of lunar explorer was established. Then, the coverage of lunar explorer by one ground station, one ground station plus one TDRS and one ground station plus two TDRS were analysed respectively. The result show that when the angle (θ) between the TDRS and the ground station satisfy $9.65 \text{ deg} < \theta < 45 \text{ deg}$, the TT&C system composed of one ground station and two TDRS can cover the lunar explorer 100% without lunar exclusion. Finally, the simulation was carried out. The coverage for lunar explorer of the presented TT&C system was the same as 3 ground stations with the interval of 120 deg on the earth (just like DSN). The presented TT&C system can also be used for manned lunar exploration mission in the future.