SPACE POWER SYMPOSIUM (C3) Advanced Space Power Technologies and Concepts (3)

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ANALYSIS AND DESIGN METHOD OF ELECTRICAL POWER SYSTEM IN CHINA'S LUNAR EXPLORATION PROJECT

Abstract

The China's lunar exploration project is composed of three steps: "orbiting, landing and returning". The goal of the project is to implement the moon orbiting, soft landing on lunar surface and soil returning step by step.

The characteristics of lunar probe are that which have complex orbit and working modes, poor working environment, harsh weight constraint, deficient energy, autonomous surviving method during moonlight night and multi probes allying work. In order to meet the requirements of China's lunar exploration project, the factors which influence the electrical power system design are analyzed, such as space environment, flight procedures and working mode, orbit and attitude, analysis of the load power requirement, selection of the electrical power system topology, light compact design and etc. Considering the extreme temperatures and poor lighting conditions lunar probes experienced, this method solved the technical difficulties and key points, such as probe autonomous sleep and waking up, autonomous health management of electrical power system, light compact design and etc, through the design of a series of dedicated control circuits and control methods, a strategy for autonomous power management under complex orbit conditions and its software implementation, and a program of multi probes power sharing.

This paper proposed a set of analysis and design methods of electrical power systems in the China's lunar exploration project probes, which satisfies the mission requirements of the electrical power systems in the China's lunar exploration project probes and ensures reliable implementation of lunar exploration project objectives. Furthermore, the electrical power system design method might also be used for reference for other projects, such as deep space probes.