SPACE LIFE SCIENCES SYMPOSIUM (A1)
Radiation Fields, Effects and Risks in Human Space Missions (4)

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RESEARCH OF SPACE RADIATION ENVIRONMENT SIMULATION SYSTEM ORIENTED HARDNESS DESIGN FOR CONTROL SYSTEM

Abstract

Many kinds of radiation in SRE may affect a spacecraft during the whole flight mission. Sometimes the lightning EMP (Electro Magnetic Pulse) will influence the launch process near the earth. Space radiation, near earth space radiation, even nuclear explosion radiation and HPM (High-Power Microwave) may influence the spacecraft in earth orbits. These issues of SRE will cause the material and electron component degenerating, losing functions, falling into troubles and shortening life. Ultimately, they may cause the flight mission cancelled. Space Radiation Environment (SRE) often influences Spacecraft during a flight process. It is becoming more important to research resist-radiation defending during deep space exploration and manned space flight. The research of SRE modeling and simulating orients to resist-radiation defending. The main research work includes SRE conceptual model analyzing, SRE system modeling, infrastructure designing of SRE simulation system and conclusion. Finally, hardness design models are simulating in the SRE simulation system to illustrate the effects. Building a whole SRE simulation system is a challenging work and the system scheme is helpful for related researchers to design a similar system. During the SRE conceptual model analyzing, a three-layered description is given to present the whole SRE related to the spacecrafts and their control system instruments. The modeling of SRE system starts at the designing of SRE model around common SRE conceptual model, then analyzing the influence of SRE and damaged models. Finally, the defending measures of SRE are discussed according to the hardness design of control systems. Considering the demand of resist-radiation hardening technology, the SRE simulation system is designing by using the ideas of SBD (Simulation Based Design). The engineering design of layered and standardized network and resources sharing collaborative environment is presented to support virtual flying in SRE simulation. The numeric and visualized models of spacecraft entities, spacecraft behaviors and SRE dynamics can be integrated and running to demonstrate the schemes and results of protection designing for control system instruments. SRE simulation refers to many phenomena of space radiation, even many knowledge in human unaware domains. The research of SRE simulation system is very challenging engineering, which refers to multi-field or multi-disciplinary. The object of these research works is serving for spacecraft to resist radiation. By the SRE simulation system, researchers can master the damaging mechanism and protection design of SRE. The research is comprehensive and helpful for further researching or related designing.