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MODELING AND ANALYSIS FOR SPACECRAFT DATABASE OF ELECTROMAGNETIC COMPATIBILITY

Abstract

As science and technology of electroncomputer and auto-control technique developed rapidly, it has been greatly applied and used in spaceflight project. Therefore it has more and more variety of electron devices in limited space at spacecraft. These electron devices include communicate systemapplication system and TTC (Tracking, Telemetry Command) system etc. All of these electron devices make up of complicated electromagnetic environment. In addition thunderstorm activity, earthquakes, volcanic eruptions, electromagnetic signals etc can result in greatly change of electromagnetic environment. Therefore in order to safeguard these sensitive electron devices working reliably and exactly without other devices Electro-Magnetic Interference, the electromagnetic compatibility (EMC) design of the whole spacecraft became greatly important. Generally electromagnetic compatibility design of spacecraft includes two components: the spacecraft's EMC prediction analysis designs and the spacecraft's EMC tests for all the component of the electron devices. This paper mainly discusses EMC prediction analysis and EMC database modeling for spacecraft.

There are some military standards of EMC design requirements which derived from MIL-STD-461, MIL-STD-464, and MIL-STD-1541 etc. These standards separately specify the EMC requirements for system level sub- system level and subsystem (equipment) level. This paper focuses on system level EMC database modeling of spacecraft. Since there are many electromagnetic interference sources for the sensitive electron devices on the spacecraft, kinds of different EMI sources will be discussed at the beginning. The EMI radiated sources such as strong electromagnetic pulse, various payloads radiated emissions and high-power DC/DC conducted emissions etc will be analyzed in details. After that, as for sensitive devices easily to be interfered by others types of EMI sources, the EMI estimation formulae will be deduced. Following that, according to deduced EMI estimation formulae, the EMI prediction models for sensitive devices will be given out. Because of several of sensitive devices on the spacecraft, different database estimation model should be made according to the allowed EMI safeguard levels.

Based on which has been discussed spacecraft database of EMC, the subsystem (equipment) level devices EMC prediction can be simulation under this model. This design methodology can be used in spaceflight project of the various payloads to ensure compliance with the stringent EMI requirements.