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Simulation Study on Spacecraft Surface Charging Induced by Jovian Plasma Environment with Particle in Cell Method

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Abstract : Space plasma caused spacecraft surface charging is the major space environment hazard. Particle in cell (PIC) method can be used to simulate the interaction between space plasma and spacecraft. It was proved that surface charging level of spacecraft in Jupiter's orbits was high for its' electron-heavy plasma environment. In this paper, Jovian plasma environment is modeled and surface charging analysis is carried out by PIC based software Spacecraft Plasma Interaction System (SPIS). The results show that the spacecraft charging potentials exceed 1000V at 2Rj, 15Rj and 25Rj polar orbits in the dark side at worst case plasma model. Furthermore, the simulation results indicate that the large Jovian magnetic field increases the surface charging level for secondary electron gyration.

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