

Plasma Vehicle Charging Analysis for Orion Flight Test 1

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In preparation for the upcoming experimental test flight for the Orion crew module, considerable interest was raised over the possibility of exposure to elevated levels of plasma activity and vehicle charging both externally on surfaces and internally on dielectrics during the flight test orbital operations. Initial analysis using NASCAP-2K indicated very high levels of exposure, and this generated additional interest in refining/defining the plasma and spacecraft models used in the analysis. This refinement was pursued, resulting in the use of specific AE8 and AP8 models, rather than SCATHA models, as well as consideration of flight trajectory, time duration, and other parameters possibly affecting the levels of exposure and the magnitude of charge deposition. Analysis using these refined models strongly indicated that, for flight test operations, no special surface coatings were necessary for the thermal protection system, but would definitely be required for future GEO, trans-lunar, and extra-lunar missions.