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iSat Surface Charging and Thruster Plume Interactions Analysis

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Characterizing the electromagnetic interaction of a satellite in low Earth, high inclination orbit with the space plasma environment and identifying viable charging mitigation strategies is a critical mission design task. High inclination orbits expose the vehicle to auroral charging environments that can potentially charge surfaces to kilovolt potentials and electric thruster propulsion systems will interact with the ambient plasma environment throughout the orbit. NASA is designing the Iodine Satellite (iSAT) cubesat mission to demonstrate operations of an iodine electric thruster system. The spacecraft will be deployed as a secondary payload from a launch vehicle which has not yet been identified so the program must plan for the worst case environments over a range of orbital inclinations. We will first present results from a NASA and Air Force Charging Analyzer Program (Nascap) -2k surface charging calculation used to evaluate the effects of auroral charging on the spacecraft and to provide the charging levels at other locations in orbit for a thruster plume interaction analysis for the iSAT mission. We will then discuss results from the thruster interactions analysis using the Electric Propulsion Interactions Code (EPIC) with inputs from Nascap-2k. The results of these analyses are being used by the iSAT program to better understand how their spacecraft will interact with the space plasma environment in the range of environments that could be encountered when the final mission orbit is selected.