

The Impact of Auroral Electron Streams on LEO Polar Satellites As a Source of Charging

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Low Earth Orbit (LEO) satellite charging has become primary concern nowadays due to its interaction not only with ionospheric plasma but also with auroral electron streams. The interaction occasionally lead to destructive effects through accumulative electrical charge from various sources on satellite. In this study we have simulated the ionospheric plasma and auroral electron interactions with some LEO polar satellites using Electro-Magnetic Spacecraft Environment Simulator (EMSES). We exploited some polar satellites registered in Satellite News Digest (SND) database. We adopted empirical plasma parameters obtained from International Reference Ionosphere (IRI) model as an input for EMSES within particular time. The integral flux of > 30 keV electrons used in this study exceeds 10^6 particles/cm².ster. In the first phase of simulation we neglected the effects of photoelectrons together with secondary and backscatter electrons. The results show that the effect of solely ionospheric plasma on satellites is insignificant in which the floating potential varies from -0.5 to -2.25 Volts. In contrast, the impact of auroral electrons on LEO polar satellites results in electric potential of satellite on the order of -100 Volts. This large potential can be hazardous to satellite as seen in this study

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