

SPACE POWER SYMPOSIUM (C3)
Advanced Space Power Technologies and Concepts (3)

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POWERING SMALL SATELLITES USING SPACE PLASMA

Abstract

This paper demonstrates the application of space plasma to power small satellite systems. Current space systems utilize the solar cells to harness solar energy to sustain the satellite operations. The primary issue with this approach is that during eclipse, the satellite is unable to gather energy and has to be powered with the help of additional batteries. Batteries for a small satellite add to the mass and occupy space within the system. Another concern with this design arises due to the limited lifespan and operating temperature limits for a battery. The solar cells also undergo degradation over time. The proposed design eliminates the need for a power storage device and instead employs a continuous power generation system. Since the plasma is abundant in space irrespective of the orbit or orientation, it serves as the best candidate for a power source other than photons. The structure of the satellite will be so designed that it lets plasma have relative motion with the spacecraft. The mechanism consists of a hollow tube with a static magnetic field and conductors lined along its length. The moving plasma acts as a moving conductor within a magnetic field hence producing current in the fixed conductors placed along the tube. The current produced would hence be fed to power conditioning circuits for powering up the satellite operations. The magnetic field present in the hollow tube would also facilitate in stabilizing the satellite along one axis, reducing the complexity in attitude control.