

SPACE POWER SYMPOSIUM (C3)
Wireless Power Transmission Technologies, Experiments and Demonstrations (2)

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A REFLECTION BASED POWER AUGMENTATION CONCEPT FOR FRACTIONATED
SPACECRAFT SYSTEMS

Abstract

Fractionated Spacecraft System is a kind of networked satellite cluster, where several free-flying payload modules are supported by nearby-flying infrastructure modules supplying communications, data handling, guidance, power and other services. The models can be reconfigured, added, or exchanged independently from the others, even reused over several missions. In virtue of their distributive and unique flexible characteristics, fractionated spacecraft system is of great potential value in application missions of remote sensing, contingency succor, scientific exploration, etc. One of the disruptive technologies in Fractionated Spacecraft is wireless power transfer from energy service module to target power consumption modules. Previous investigated concepts include using lasers and microwaves. However, they both suffer an eclipse from low end-to-end efficiency far below 10%. In this article, we propose a novel wireless power augmentation solution. The unconverted sunlight is gathered with relatively low-cost small-scale modular spacecraft with light-weighted inflatable thin-film reflective structure. The collected sunlight is collimated and aimed to the photovoltaic arrays on the shadowed surfaces of the target modules. Since no special beam trapping devices or prescriptive pointing directions are needed, the target module are easier to design and can achieve better miniaturization levels. Also the unwanted overheating issues are diminished. The scheme is especially suitable for micro/nano-satellite modules with body-mounted solar panels.