

SPACE POWER SYMPOSIUM (C3)
Small and Very Small Advanced Space Power Systems (4)

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DESIGN OF MICROWAVE BEAM POWERED SENSORS FOR SPACE SWARM NETWORKS

Abstract

In this paper, a novel concept of energy harvesting powered sensor swarms in space is proposed. The Rosetta mission showed that a system with a core probe and small lander can be useful for detailed exploration missions. The properties of a system with a core probe which could deploy a swarm of low-power energy harvesting powered sensors after arrival to the target, are studied and described. Microwave data and power transmission was considered.

Since effectiveness and performance of RF harvesting systems depends not only on antenna efficiency, directivity and path loss, but also on a RF to DC conversion efficiency, a particular attention is given to analysis and measurement of Schottky barrier diode based RF to DC converters in L-band and S-band.

A properties of a system which provides full duplex communication were studied. A high power 868 Mhz FSK modulated carrier for energy and data transfer from the model of core probe was fed to the model of RF powered sensor, while at the sensor's antenna, the signal was split using a directional coupler between RF to DC converter and data receiving electronics. The communication from sensor to core satellite was provided by low power RF signal in an adjacent channel. The measured performance of the system validated the hypothesis and possibility of realization of the proposed concept.