

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

Author: Mr. Marek Novák
Czech Technical University In Prague (CTU), Czech Republic

CHARACTERIZATION OF RF TO DC CONVERTERS FOR L-BAND AND S-BAND POWER
TRANSMISSION

Abstract

In this paper, a method for testing and characterization of RF to DC converters for wireless power transmission is presented. The application field for RF to DC converters is continuously growing. The energy harvesting from electromagnetic waves is one of the basic elements of space-based solar power stations. In this work, a method for testing and characterization of RF to DC converters is proposed. Schottky barrier diode based rectifier architectures were considered and tested. However, the presented method can be used for characterization of all RF to DC converters.

A custom automated test bench for characterization was designed and built. Measurements were taken from 0.9 to 4 GHz at input powers from -10 dBm to $+20$ dBm. A low spur RF PLL synthesizer was used with a wideband RF amplifier and attenuator with 0.5 dB step. Voltage-current characteristics were obtained using a calibrated precision programmable load. A complete characterization of basic types of RF to DC converters was done. The resulting graphs show that both incident power and frequency affect the conversion efficiency. Efficiency over 45

The results clearly show that the RF to DC converters exhibit higher efficiency when subjected to higher input power levels. This confirms that an energy transmission in short high energy pulses would be more efficient than transmitting the power using lower power and continuous beam. The results of this work can be used in design of maximum power point tracking systems for wideband and/or wide input power range RF to DC converters as well as in novel RF to DC converter structures and increasing its efficiency.