Abstracts

Theoretical and Experimental Investigation of a Rectenna Element for Microwave Power Transmission

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The diode characteristics at 2.45 and 35 GHz and the use of a frequency selective surface are investigated for the application of microwave power transmission. A method has been devised to experimentally characterize a packaged GaAs Schottky barrier diode by inserting in a microstrip test mount. The nonlinear equivalent circuit parameters of the diode are determined by a small signal test method. The method analyzes the diode's scattering parameters at various bias levels. A large signal measurement using the same test mount has also been configured to determine the power conversion efficiency from microwave to dc as well as determining the de-embedded network impedance of the diode. A nonlinear circuit simulation program rising a multi-reflection algorithm is used to verify the experimental results of a 2.45 GHz diode. A Ka-band mixer diode is also simulated for a 35 GHz rectenna. Based on the simulation results, a patch-type 35 GHz rectenna is designed and tested in a waveguide simulator. The efficiency is measured as 29% with a 120 mW input power. Because the diode could generate undesirable harmonic radiation, a frequency selective surface is designed to reduce the second harmonic radiation for a 2.45 GHz rectenna. Theoretical results agree fairly well with experiments for all these studies.

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