

Enhanced Dickson voltage multiplier rectenna by developing analytical model for radio frequency harvesting applications

Radio frequency (RF) energy harvesting has experienced a rapid development recently because of the increasing number of RF transmitter sources. This article illustrates a novel analytical model for the voltage multiplier rectifier at 900 MHz. The model proposes a method of deriving the output characteristics of the rectifying circuits in terms of two main parameters; voltage and current. The design consists of seven stages of Dickson voltage multiplier rectifier. A Schottky diode HSMS 285C was used in the design. Equations for the model were developed. These equations were used to extract the values of output voltage and current. A simulation was optimized using advanced design systems. The system was correspondingly fabricated and tested for input power range of 1×10^{-5} - 1×10^{-1} W. Experimental results show that an output voltage of 5.45 V and current of 1.26×10^{-5} A are achieved at 10 dBm using a 10 k Ω load, achieving an efficiency of 37.82%.

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