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ABSTRACTS (MASTER THESIS)

Research on Rectenna Rectifier for Wireless Power Transmission Application to High Speed Wireless Communication System

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The objective of the present thesis is to design rectenna rectifier for wireless power transmission application to high speed wireless communication system. Nowadays, they propose a high speed wireless communication system at 60 GHz utilizing repeaters across the wall. A repeater is inside of a building and the other is outside. Wireless power transmission technology can be utilized for supplying electricity from the inside repeater to the outside. We design a 60 GHz rectifier to realize high speed communication and wireless power transmission in the same frequency band. First we applied a design method of the 24 GHz-band rectifier, which was developed in the previous study, to 60 GHz-band rectifier. We adopted a microstrip line as a transmission line. We selected the Teflon substrate of 0.1mm thickness and set the width of the center conductor narrow in order to suppress the effect of the surface wave to conduct accurate simulation in ADS (Advanced Design System). Then we modeled end launch connector and microstrip line to conduct simulation in ADS more precisely. Then the rectifier achieved the efficiency of 20.7 % in the simulation. Second, we improved RF-DC conversion efficiency of the rectifier. We improved a length of the transmission line between the anode terminal and the through hole to decrease propagation loss. The improved rectifier we designed achieved the efficiency of 46.2 % in the simulation when input power was 80 mW. We clarified the reason why improvement of the line length increased the efficiency by an equivalent circuit. Finally we designed single-series rectifier. The rectifier achieved the efficiency of 45.3 % when input power was 40 mW. The simulation result of power loss ratio on a designed rectifier is shown in Figure 1. We succeeded in reducing the input microwave power without degradation of RF-DC conversion efficiency.

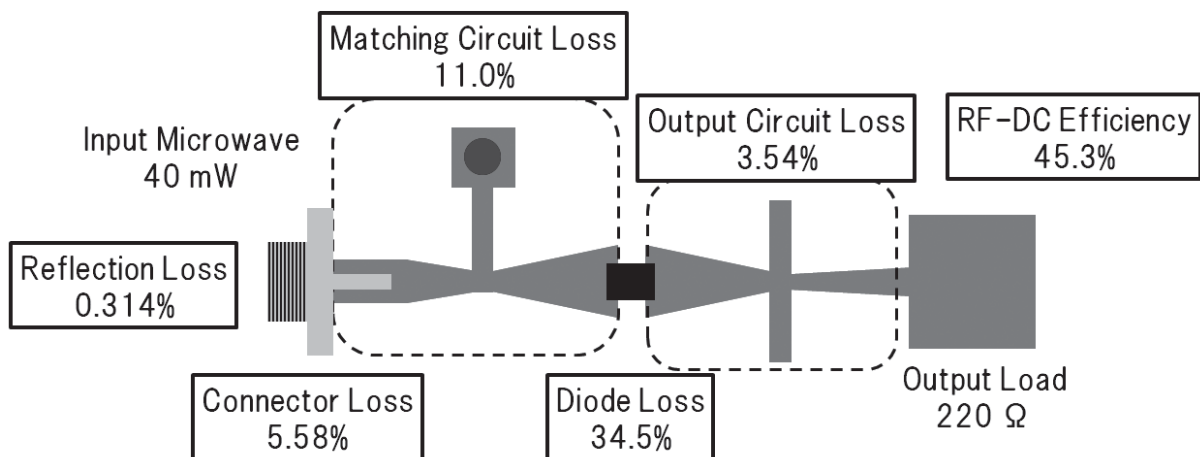


Figure 1. Simulation result of power loss ratio on a rectifier.