# ABSTRACTS (MASTER THESIS)

## Study on High Power Rectifier with GaN Schottky Barrier Diode

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In these days, the demand on a microwave high power transfer system is increasing. In order to realize a high power transfer system via microwave, a diode used for a rectifier of the receiving device is necessary to have a high breakdown voltage and be operated at a high frequency of GHz class. The purpose of this study is to develop a high power rectifier that has 70% of the RF-DC conversion efficiency (η) at several ten watts of the input power (Pin), with a GaN schottky barrier diode that has about 100 V of the breakdown voltage. The frequency of the microwave is 2.45 GHz.

First, rectifiers with packaged diodes were simulated. In the simulation results, 76% of η was obtained at 27 W of Pin. Then, the rectifiers were fabricated and experimented. As a result, 43% of η was achieved at 7 W of Pin. At more than 7 W of Pin, the diode was broken by overheat.

Next, diodes with AlN submounts were used in order to improve the heat radiation characteristics. In the simulation, 71% of η was gained at 20 W of Pin. In the experiment, 40% of η was achieved at 20 W of Pin. When Pin was larger than 20 W, a wire between the circuit and the diode was broken by a large current. With the submount diodes, the maximum Pin of the rectifier could be successfully 13 W larger than that with the packed diodes. However, there remained 31% efficiency difference between simulations and experiments.

Finally, in order to improve η in the experiments, a line length that was series to the diode (x) was investigated because x was adjusted in the previous experiments. Rectifiers with the submount diodes were simulated with changing x from 0 mm to 42.2 mm. 42.2 mm was the half wave length. As a result, η changed with a cycle of λg/4. Then, rectifiers were experimented with changing x. As a result, 45% of η was achieved at 20 W of Pin. It was succeeded to improve 5% of η in the experiments.

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