UNIVERSITÄT DUISBURG ESSEN

Fachgebiet Hochfrequenztechnik

H F T

Fachbereich Ingenieurwissenschaften
Abteilung Elektrotechnik und Informationstechnik

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Aufgabe der Diplomarbeit im Hauptstudium II

für: Herrn Minghui **Wei**

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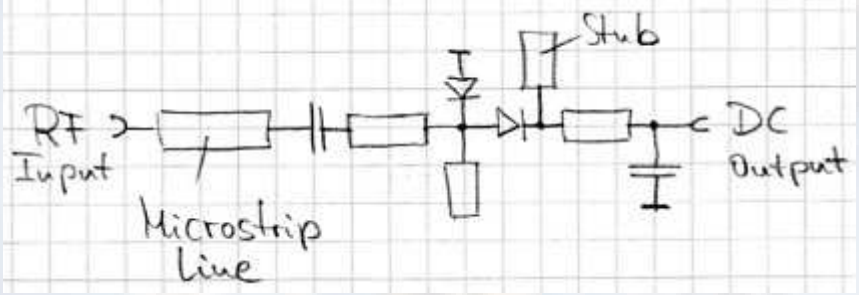
Thema: **Rectifier Circuit for Microwave Power RF-to-DC Conversion**

Aufgabe:

For an ongoing concept demonstrator project, a microwave power signal (about 1 Watt at 2.5 GHz) has to be converted into direct current (DC) to provide a power supply for a remote sensor which is fed by microwave radiation. The present demonstrator uses a rectifier circuit based on a design taken from a recent publication, which employs Schottky diodes designed for lower power switching / mixer applications at microwave frequencies. The resulting DC output power of the rectifier is low (low conversion efficiency) and strongly dependent on the load resistance (or load current), while the achieved DC open-circuit voltage is limited to about 4 Volts which indicates a cut-off problem of the diodes (reverse break-down voltage).



The task of the thesis is to optimize the RF-to-Dc conversion circuit using nonlinear simulation (applying our network simulation tool ADS) and experiment. In particular the task entails the following steps

- Check the literature for applicable RF-DC conversion circuit designs, in particular the literature on RFID transponders.
- Select applicable Schottky diodes and extract nonlinear models from the manufacturers' libraries or from ADS.
- Set up a network in ADS, based on the present circuit design and analyze the function of the circuit; check the effects of the diode parameters (knee voltage, reverse capacitance, forward resistance and reverse break-down voltage).
- Optimize the design by variations in the matching and filter circuit portions.
- Investigate the performance of the design as a function of input power and DC load current.
- Investigate the performance of a combination circuit with two rectifier circuits each fed by half the RF power and parallel combination at the DC output in order to achieve double the current.
- Build a circuit in microstrip technology and test its performance; try to improve input match using microstrip stubs at the input line.

At the end of the work, a public presentation of results is to be given.