UNIVERSITÄT DUISBURG ESSEN

Fachgebiet Hochfrequenztechnik

H F T

Fachbereich Ingenieurwissenschaften
Abteilung Elektrotechnik und Informationstechnik

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Aufgabe der Abschlussarbeit im ISE Bachelorstudiengang

für: Herrn Poh Seng Pua

gestellt von: Prof. Dr.-Ing. K. Solbach
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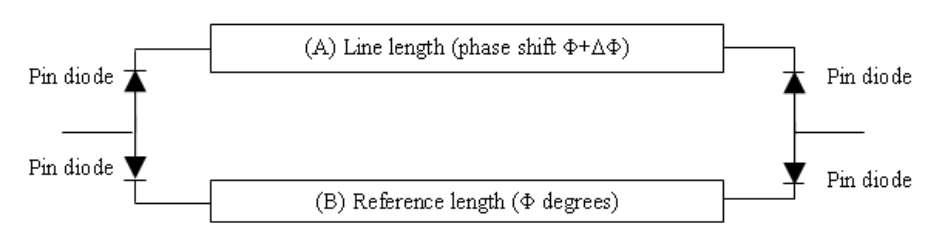
Thema: **Analogue Phase-Shifter Circuit for 7-Tesla Magnetic Resonance Tomograph (MRT)**

Thesis Task:

Our research project "7-Tesla MRT Ganzkörperspule" aims at the development of an array of coils (antennas) which can be electronically steered in phase and amplitude in order to compensate inhomogeneous field distributions inside the patient body. One work package requires the design of electronic phase shifters for the small-signal radio frequency (RF) signals at 300 MHz which excite eight high-power amplifier stages. The required phase shift is 360° which shall be realized in dual steps (bits) of an analogue RF-circuit.



The realization technology is to be RF-printed circuit technology using electronic switches to switch between two transmission lines of different length to realize a differential phase shift.

The thesis task is to design a printed circuit for the 180°- and 90°- "bits" of the phase shifter, using PIN-diodes as the electronic switches and other surface-mount technology (SMD) components and using micro-strip line on a dielectric laminate as the printed circuit technology.

In particular the task is to

- select capacitors and inductors for the bias circuit and dc-blocking
- lay-out and simulate in ADS (Advanced Design System microwave circuit analysis tool) the transmission lines between the switches
- lay-out and simulate in ADS the complete circuit including the passive components, the PIN-diodes and the transmission lines
- prepare the data files for production of printed circuit boards
- assemble and test the circuits (match, insertion loss, insertion phase) using the network analyzer
- optimize the circuits for correct phase shift between the switch states

After completion of thesis work a public presentation of results is to be given at the department.