

Aufgabe der Abschlussarbeit im ISE Masterstudiengang

für: Herrn Taglub Hussein Attar **Alshibani**

gestellt von: Prof. Dr.-Ing. K. Solbach
Fakultät für Ingenieurwissenschaften - Hochfrequenztechnik

Thema: Transmit/Receive Coil for 7-Tesla Magnetic Resonance Tomograph (MRT)

Description:

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 compact radiator coils which produce strong RF magnetic fields at a frequency of 300 MHz and can be used in a closely spaced array. A new concept for a suitable coil has been developed which employs an air-microstrip transmission line as the radiator coil in combination with a 3 dB hybrid as a feed network. The realization technology is RF-printed circuit technology using a dielectric substrate for the feed network with the air-microstrip radiator mounted at the back of the substrate.

Thesis Task:

The Master Thesis task is to design and build two coils using microstrip line on a dielectric laminate as the printed circuit technology for the hybrid and the matching circuit and evaluate the coils experimentally as well as by field theoretical simulation.

In particular the task is to

- perform a literature search in order to identify relevant coil concepts
- model the existing microstrip radiator design together with a simple phantom in close proximity using a field theoretical simulator and derive the feed point impedance of the coils and investigate the magnetic field distribution in front of the radiators
- lay-out and simulate in ADS (Advanced Design System microwave circuit analysis tool) a folded branch-line coupler as the feed network
- lay-out, simulate and optimize in ADS the complete circuit including a simple matching network and the microstrip radiator elements
- prepare the data files for production of the printed circuit board
- assemble and test the complete circuit including a phantom in close proximity (match, efficiency, magnetic field distribution) using the network analyzer
- Investigate the mutual coupling of two coils side by side in close distance (array application)

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