UNIVERSITÄT DUISBURG ESSEN

Fachgebiet Hochfrequenztechnik

H F T

Fachbereich Ingenieurwissenschaften
Abteilung Elektrotechnik und Informationstechnik

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Aufgabe der Abschlussarbeit im ISE Masterstudiengang

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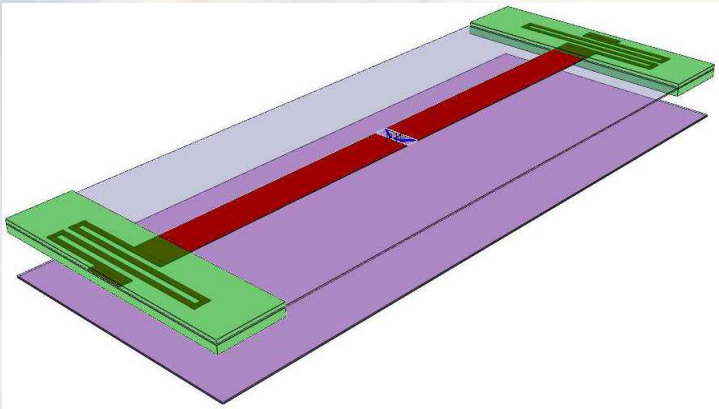
Thema: **Investigation of the influence of the RF Shield on the Impedance of Meander Dipole Coils in 7 Tesla MR imaging system**

Beschreibung:

Background: In Magnetic Resonance Imaging (MRI) at 7 Tesla, coils of the meander dipole – type have been successfully used as transmitting antennas. The meander dipole



coil uses a metallic shielding plate of width and length as the meander dipole spaced some 10 mm below the dipole.For the dipole antenna in free space, it was found that the limited size of the shielding plate makes it act like a director in a Yagi antenna, directing radiation power away from the dipole in its direction. Never-the-less, with the dipole is loaded by an absorbing medium (the patient or a phantom), the dipole radiates mainly into the direction of the load, opposite to the direction of the shielding plate. In any case, the “radiation resistance” of the dipole depends critically on the size of the shielding plate, reducing with increasing size of the shield. The same can be expected when the dipole with small shielding plate is mounted very close to a large, metallic ground plane. A related situation is the placement of a dipole coil inside a cylindrical conducting tube, e.g., the RF shield inside the bore of an MR magnet.

The task: The thesis is to investigate the impedance variation of a meander dipole coil as a function of its position above a conducting ground and inside a conducting cylinder. In particular, the task is to model a meander dipole with dielectric cover of the meander /3/, including the load and the conducting ground in a planar arrangement and in a cylindrical arrangement. The electromagnetic fields and the feed impedance of the dipole coil are to be calculated using the EMPIRE EM simulator.Results of interest for practical implementations are the dependence of the real part of the feed impedance (“radiation resistance”) and the Q-factor for a single coil and the change of mutual coupling in a two-element array as function of the spacing to the conducting ground.

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