

**Aufgabe der Abschlussarbeit im  
ISE Masterstudiengang**

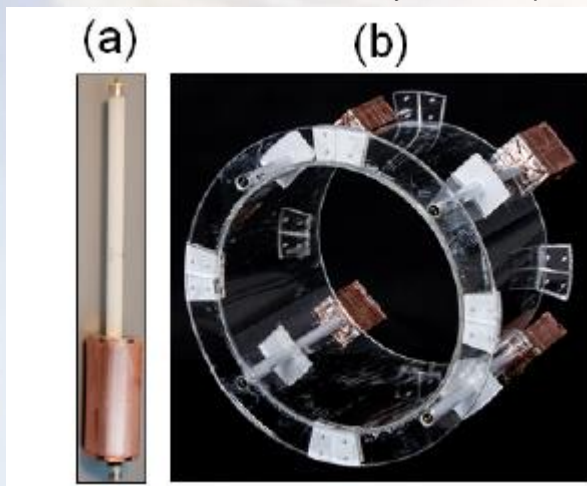
**für:** Herr Mohammed Abdallatif

**gestellt von:** Prof. Dr.-Ing. Klaus Solbach  
Fakultät für Ingenieurwissenschaft - Hochfrequenztechnik

**Thema:** **Investigation of the Fluorescence Tube as a Dipole Coil 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. In a recent presentation /1/, a fluorescent tube was proposed to be used as the RF coil in an MR system. The principle of operation of the tube is assumed to be basically the



same as in recent reports of “plasma antennas”: It is assumed that inside the tube after switch-on of the plasma a conducting medium is established which can conduct the RF signal similar to a metallic conductor. However, based on the available literature, little is known about the distribution of the electron density and conductivity along the length of the tube. Concerning the proposed application, it is not known what RF current distribution along the length of the tube can be established, what kind of electric and magnetic near fields can be generated by the RF current and what losses occur in the system. The thesis is to give some answers using suitable RF experiments and EM simulations.

The task: The first step in the thesis should be a review of the applicable literature with a view to the

understanding of the fundamental mechanisms of the plasma in a fluorescent tube and how it can be modelled. In a next step, the thesis is to investigate the fields and scattering parameters at 300 MHz of a fluorescent tube of about 30 cm length in a transmission line setup; the setup is also to be modelled in an EM-simulator in order to model the properties of the plasma in a simple way, in particular by using conductivity as the basic description. The excitation of the plasma should include the power supply used for lighting purposes as well as RF power up to 500W pulse in order to represent the dependence of the plasma conductivity on RF power level.

In a second set of experiments, the fluorescent tube is to be installed as a monopole radiator in the anechoic chamber and its current distribution, radiation pattern and gain is to be measured and compared to the same setup with a metallic conductor replacing the tube. In a modelling approach, the characterization of the plasma in the first part of the thesis work should be used to explain the results of the antenna measurements, including the dependence of antenna parameters on RF power.

/1/S. A. Aussenhofer, A.G. Webb, “Plasma based MRI” in Proc. Intl. Soc. MRM (2015), p. 0701.

**After delivery of the thesis, a public presentation of the results is to be given at the HFT department.**