UNIVERSITÄT DUISBURG ESSEN

Fachgebiet Hochfrequenztechnik

H F T

Fachbereich Ingenieurwissenschaften
Abteilung Elektrotechnik und Informationstechnik
Institut für Nachrichten- und Kommunikationstechnik

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Diplomarbeit / Masterarbeit

Aufgabe der Abschlussarbeit im

ISE Bachelor/Masterstudiengang

für: Herrn Umut Bulus

gestellt von: Prof. Dr.-Ing. K. Solbach
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Thema: Mobile Phone Antenna Modelling

Description of Problem:

In many modern mobile phones and W-LAN devices, the antenna element is integrated with the printed circuit board (PCB) so that no part of it protrudes from the package. Several types of antenna elements are found in state-of-the-art devices, mainly variants of the planar inverted- F antenna (PIFA) and monopoles either as part of the PCB or as miniature surface mounted devices. It has been found out that the antenna element in such closely integrated situations couples strongly with the printed circuit board, which acts as a second radiator and helps to increase efficiency and bandwidth of the antenna, see doctoral thesises of Manteuffel and Geissler, papers by Tamgue Famdie, Master thesis of Calixte Dongmo and Studienarbeit of Jens Leiß (both in 2005).

The task of the thesis work is to investigate the coupling of discrete antenna element and printed circuit board and to develop an equivalent circuit representation of the antenna element and the coupled printed circuit board and of the coupling mechanism. In particular the task incorporates

- Search for applicable publications and patents
- Design and test (pattern and reflection coefficient) of a PIFA and a monopole antenna element on a large ground plane for a frequency around 1 GHz
- Measurement of reflection coefficient of the antennas mounted on a PCB. Measurements are to be taken for different positions and orientations of the antennas on the PCB and the length of the PCB has to be varied around 100 mm for best bandwidth. From the measurements, the resonance frequency and the bandwidth has to be evaluated.
- Testing of the PCB as a dipole antenna (pattern and reflection coefficient) by intersecting the conductor cladding in two parts and feeding the parts via a balun and coaxial cable.
- Investigation of the coupling of antenna-element and PCB: The antenna elements are mounted in different positions / orientation on the PCB and the two-port coupling coefficient is measured and analyzed.
- Design of a network model for the combined antenna/PCB-system based on resonant circuits and transmission lines and implementation in the Advanced Design System tool and optimizing parameters for best fit with measurments

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