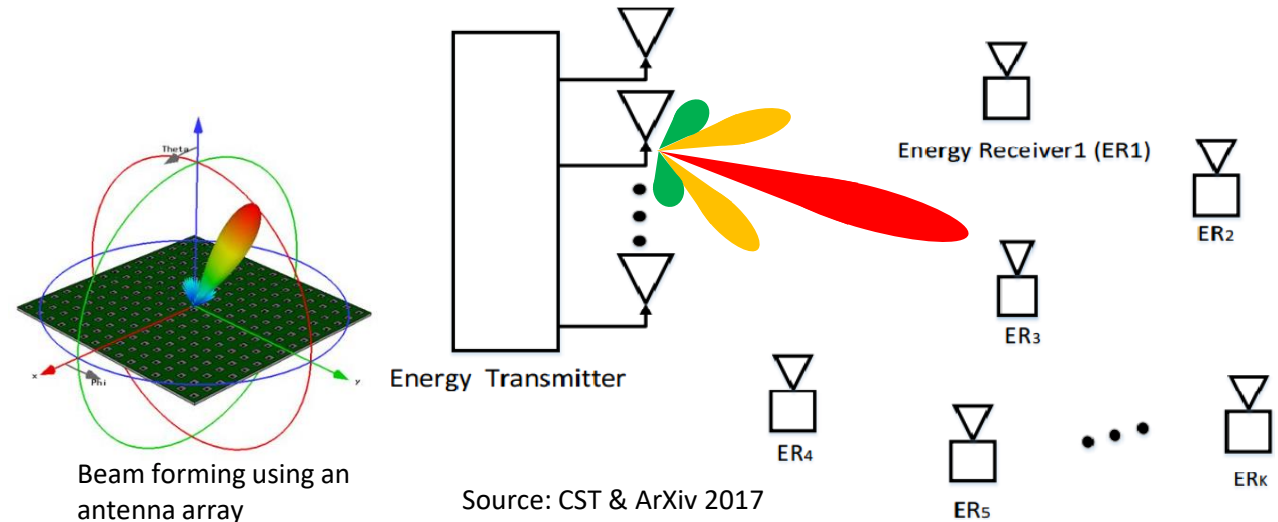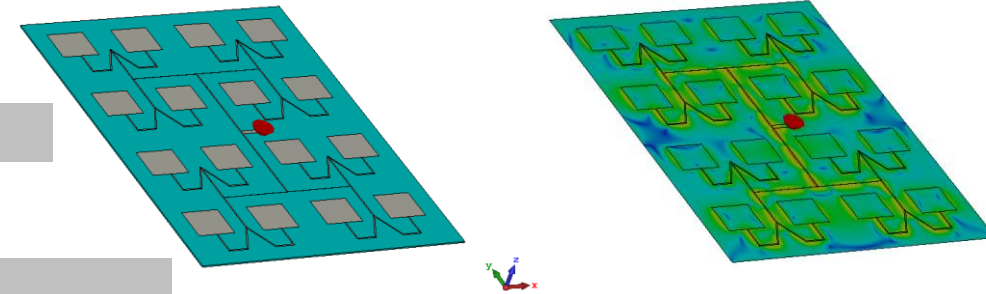## Topic

Development of a method for wireless energy transmission in the far field using beamforming

Question

Which amounts of energy can be transmitted wirelessly at which distances using electromagnetic waves and beamforming?

Tasks

- Literature and research in the field of antenna technology and wireless power transmission in the far field
- Investigation of different frequencies and antenna designs for wireless far field power transmission with beamforming
- Simulation of a test setup with a transmit and receive antenna in CST Studio Suite
- Analysis of the thermal behaviour of the antenna structure and assessment of the maximum performance in continuous operation
- Comparison of different designs of antenna structure on electromagnetic radiation and thermal behavior
- Conversion of the beamforming of an antenna array to increase and direct the radiated energy
- Evaluation of the results as a function of the radiation angle, the receiving power and the thermal behaviour in the simulation environment
- Creation of a report and lecture

Beam forming using an antenna array

Energy Transmitter

Energy Receiver1 (ER1)

ER2

ER3

ER4

ER5

ERk

Source: CST & ArXiv 2017

Contact

Sven Lange
Fraunhofer ENAS
Department: Advanced System Engineering
Phone: 05251 / 60-5643
Mail: sven.lange@enas-pb.fraunhofer.de

Dr.-Ing. Denis Sievers
University of Paderborn
Theoretical Electrical Engineering (TET)
05251 / 60-3010
sievers@tet.upb.de

TET
Theoretische Elektrotechnik
Prof. Dr. Jens Förstner

ENAS

Topic

Development of locating coils for inductive locating at 13.56 MHz

Question

How do the locating coils have to be designed in order to achieve the best possible inductive locating of a miniaturized sensor (Sens-o-Sphere, diameter 8 mm) in a volume of 50 cm x 30 cm x 30 cm?
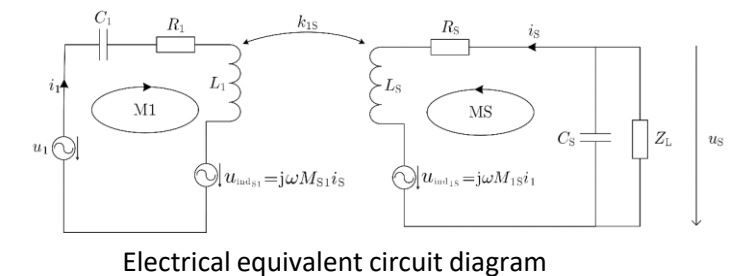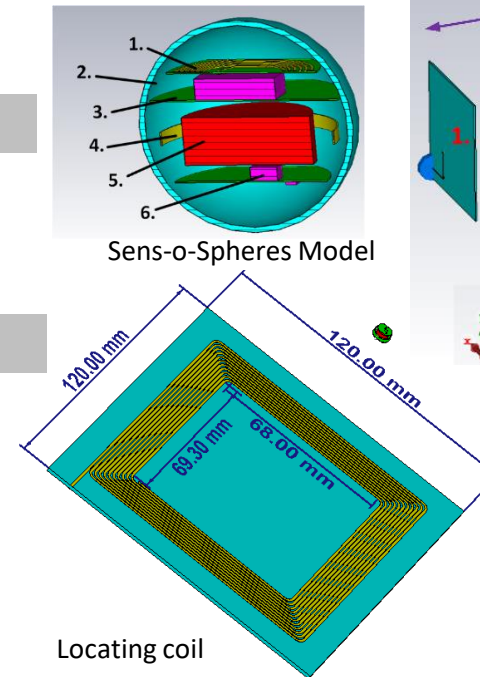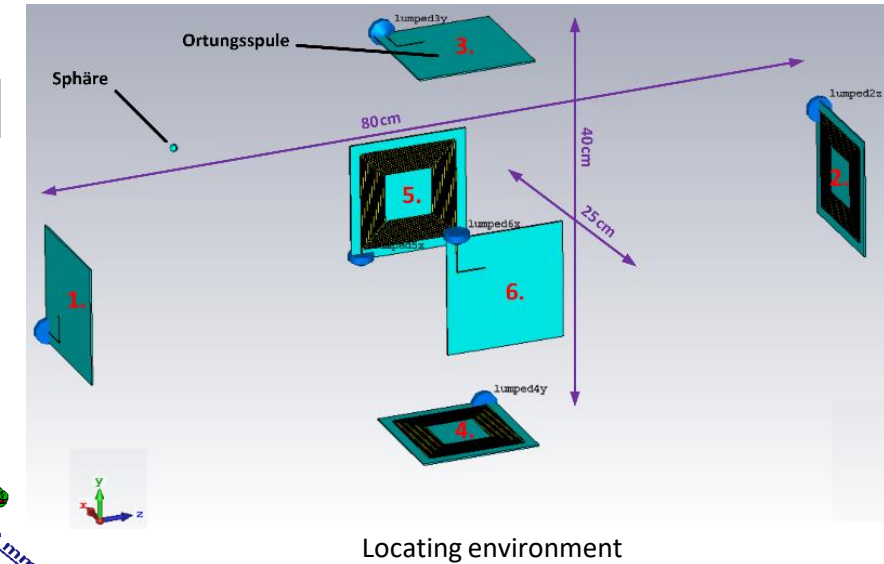
Idea

- Simulation of different planar coil designs
- Moving the object to be located in the entire volume
- Calculation of the coupling between the locating coils and the Sens-o-Sphere
- Comparison of different coil designs

Tasks

- Literature
- Become familiar with CST Studio Suite
- Set-up of different simulation models in CST Studio Suite
- Calculation of the mutual inductance between the Sens-o-Sphere and a locating coil
- Simulation of the complete locating environment with six locating coils and the Sens-o-Spheres
- Shift and rotation of the Sens-o-Spheres in the simulation environment
- Evaluation of the different coil designs and their optimal positions
- Creation of a report and presentation

Sens-o-Spheres Model

Locating coil

Locating environment

Electrical equivalent circuit diagram

Contact

Sven Lange
Fraunhofer ENAS
Department: Advanced System Engineering
Phone: 05251 / 60-5643
Mail: sven.lange@enas-pb.fraunhofer.de

Dr.-Ing. Denis Sievers
University of Paderborn
Theoretical Electrical Engineering (TET)
05251 / 60-3010
sievers@tet.upb.de

TET
Theoretische Elektrotechnik
Prof. Dr. Jens Förstner

UNIVERSITÄT PADERBORN
Die Universität der Informationsgesellschaft

Fraunhofer
ENAS

Prioritisation:
■ Project work
■ Bachelor thesis

Topic

Analysis of UWB technology (ultra-wideband) and its application for indoor positioning

Question

Which applications are possible with the UWB method and for which environments is a location with UWB suitable?

Tasks

- Literature and research of the UWB procedure and its application in localization
- Characterization of the UWB properties to different environmental parameters
- Comparison of different UWB modules available on the market
- Selection of a suitable UWB module for first tests
- Creation of the electronics for the locating module
- Simulation of the UWB antenna in CST Studio Suite
- Characterization of the UWB Process in CST Studio Suite
- Creation of a software for reading out relevant data of the UWB module for a localizatio
- Measurement and calculation of the distance between two UWB modules
- Creation of a method for 3D localization with UWB
- Verification of the procedure with real measurement data
- Assessment of the UWB technology for localization
- Preparation of a report and lecture
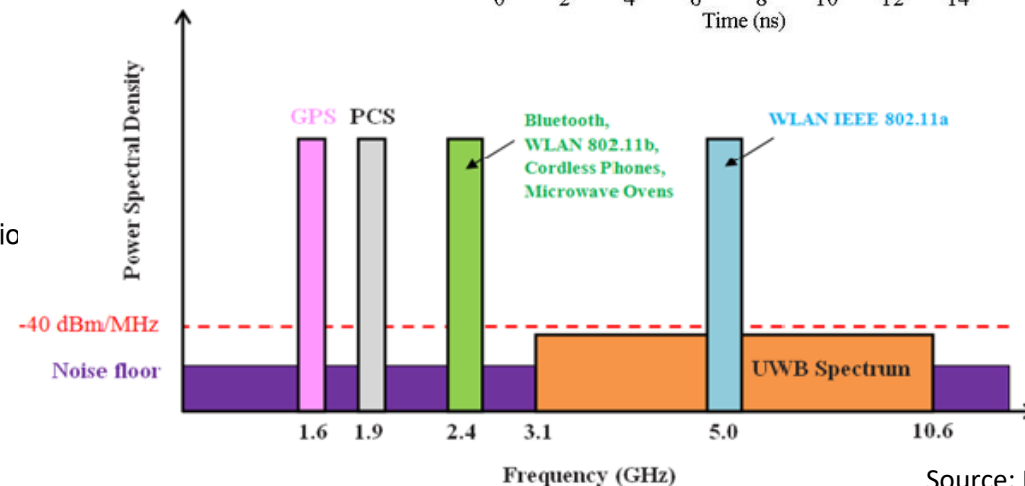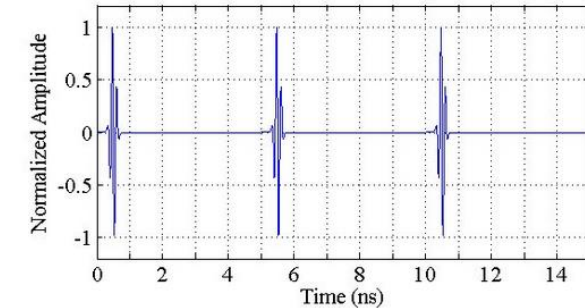
Source: IEEE & DW1000 Tag

Contact

Sven Lange
Fraunhofer ENAS
Department: Advanced System Engineering
Phone: 05251 / 60-5643
Mail: sven.lange@enas-pb.fraunhofer.de

Dr.-Ing. Denis Sievers
University of Paderborn
Theoretical Electrical Engineering (TET)
05251 / 60-3010
sievers@tet.upb.de

TET
Theoretische Elektrotechnik
Prof. Dr. Jens Förstner