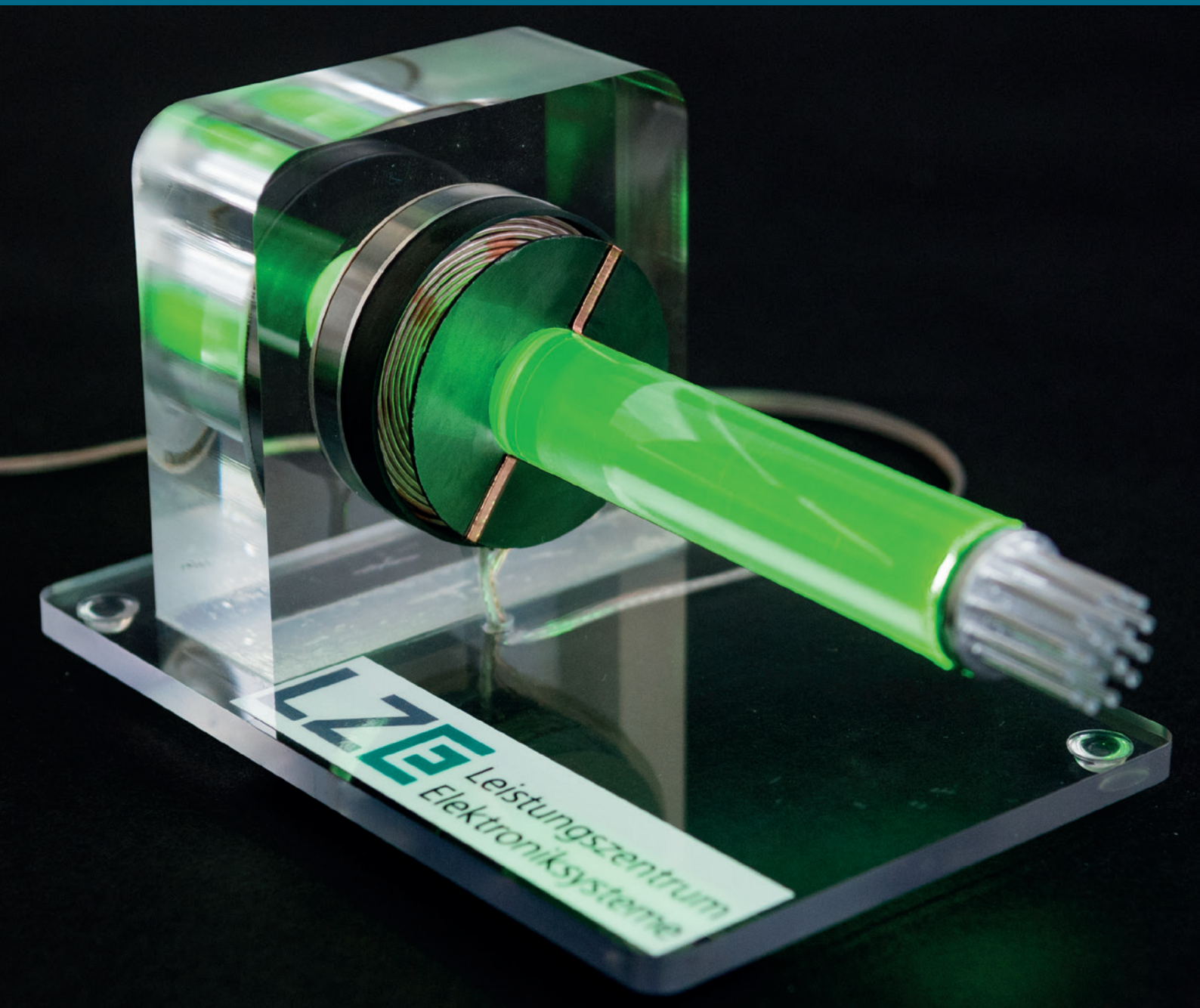
LZE Leistungszentrum Elektroniksysteme

A JOINT INITIATIVE OF FRAUNHOFER IIS, FRAUNHOFER IISB, AND FRIEDRICH-ALEXANDER UNIVERSITY ERLANGEN-NÜRNBERG (FAU)

Wireless power and data transfer in systems with fast-moving parts



Wireless energy and data transfer through a ball bearing

DESCRIPTION

The ability to transfer power in small moving systems is required for a wide range of applications such as wind power systems with electronics integrated in the rotor blades or highly-automated Industry 4.0 production platforms. The goal of the project is to develop a technology for the contactless transfer of power and data in small moving components in harsh environments that will offer advantages such as:

- Bidirectional **power and data transfer**
- **Wear-free alternative to failure-prone cable-based solutions**
- **Improved safety** for manufacturing systems, the chemicals industry and medical technologies
- Specifications that are **closely aligned with the application** through active involvement of the **industry partners**
- **International** visibility through **scientific publications**

TECHNICAL DATA

The research was carried out at the example of a widely used ball bearing, while the application-relevant specification was defined in collaboration with industry partners.

Ball bearing (diameter, axial length)	52 mm, 15 mm
Axial construction space of inductive coupler	7 mm
Nominal power	20 W
Bidirectional data transfer for sensors and control	> 300 kBit/s
Additional robust data transfer for safety	✓

PROJECT PARTNERS

This project is part of the „Leistungszentrum Elektroniksysteme (LZE)“, a joint initiative of the Fraunhofer-Gesellschaft, Fraunhofer IIS, Fraunhofer IISB, and Friedrich-Alexander University Erlangen-Nürnberg (FAU), in addition to other non-university research institutes and various industry partners:

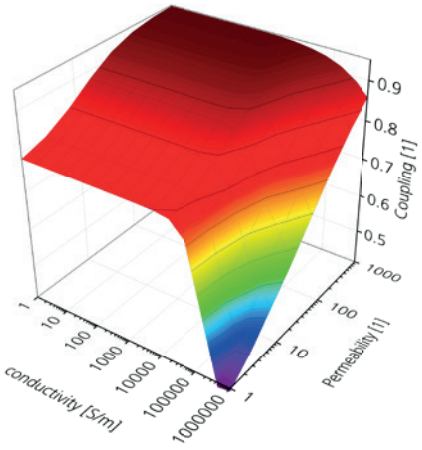
- Fraunhofer Institute for Integrated Systems and Device Technology IISB
- Fraunhofer Institute for Integrated Circuits IIS
- Institute for Electronics Engineering (LTE), FAU
- Chair of Electron Devices (LEB), FAU

FEATURES

- ✓ **Freely scalable mechanical dimensions and power transfer for adoption to other ball bearings**
- ✓ **Resistant to environmental influences (oil, moisture, dirt)**
- ✓ **Comprehensive system approach: Optimization of inductive coupler and power electronic system**

SIMULATIVE INVESTIGATION OF MATERIAL PARAMETERS ON INDUCTIVE COUPLING

One major challenge is the selection of appropriate material compositions for the coil retainers. Figure shows the influence of the magnetic permeability and the electrical conductivity on the magnetic coupling of the transformer. It has to be noted that even low permeabilities yield a high coupling. Furthermore, the electrical conductivity must be kept at relatively low levels. Beside state of the art ferrite cores, plastics with magnetic properties offer an interesting alternative.



Magnetic coupling of transformer as a function of material parameters

CONTACT US

We develop and realize complete inductive power transfer systems. From FEM Simulation over power electronics analysis / simulation and mechanical integration to the realization of complete demonstrators.

Fraunhofer Institute for Integrated Systems and Device Technology IISB
Schottkystrasse 10
91058 Erlangen, Germany

Contact
Thomas Heckel
Tel. +49 (0)9131 761-436
thomas.heckel@iisb.fraunhofer.de

www.iisb.fraunhofer.de
www.lze.bayern