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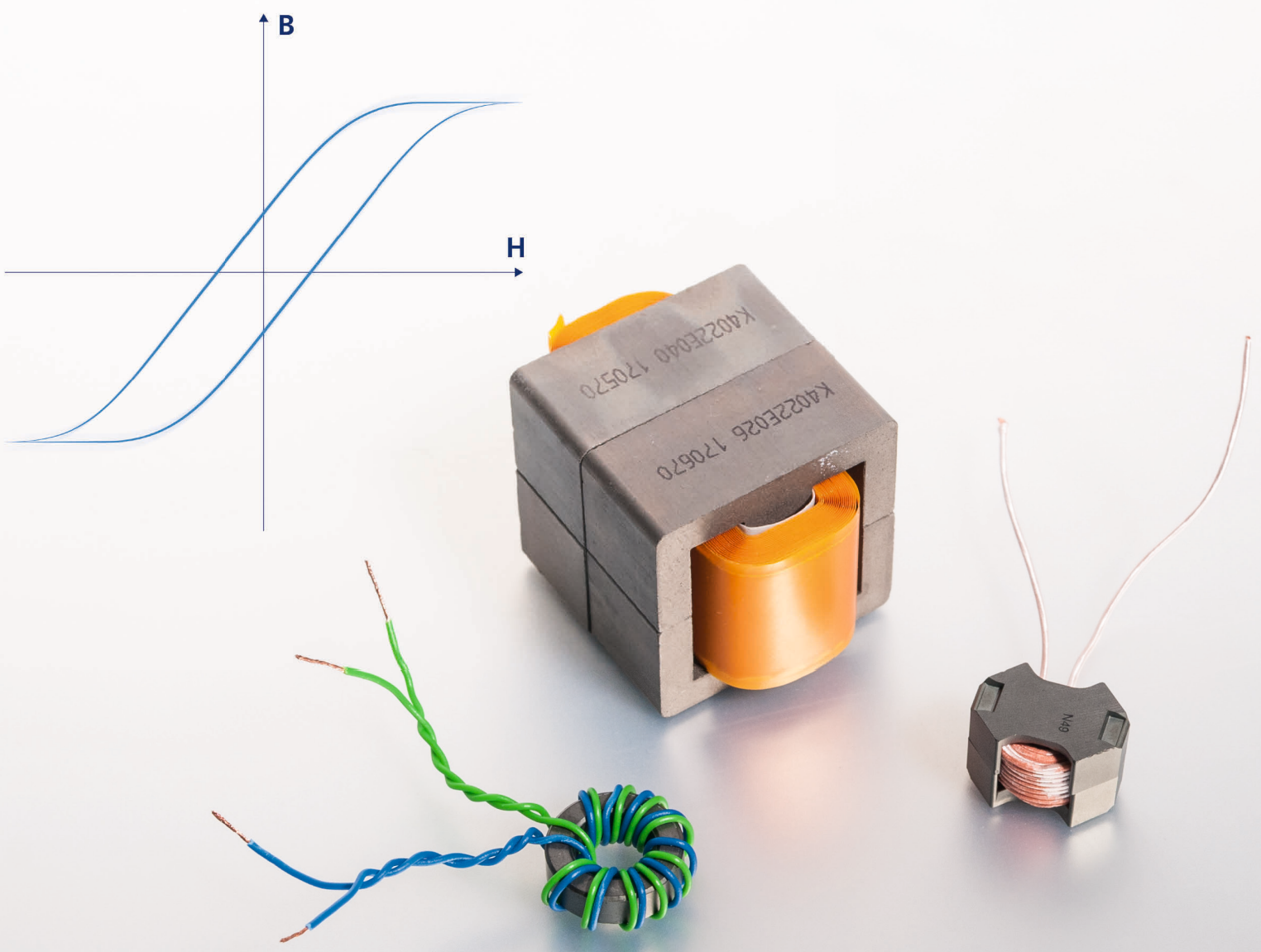
Characterization and Modelling of Inductive Components for Virtual Prototyping



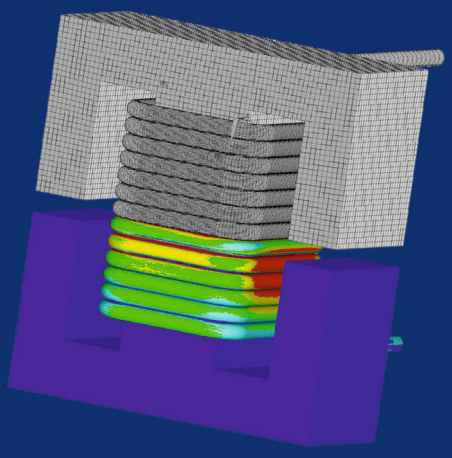


Fig. 1: Visualization of the loss density in the winding of an inductor with FEM

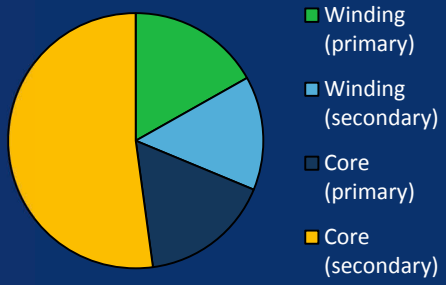


Fig. 2: Simulated loss distribution of a transformer based on real material data

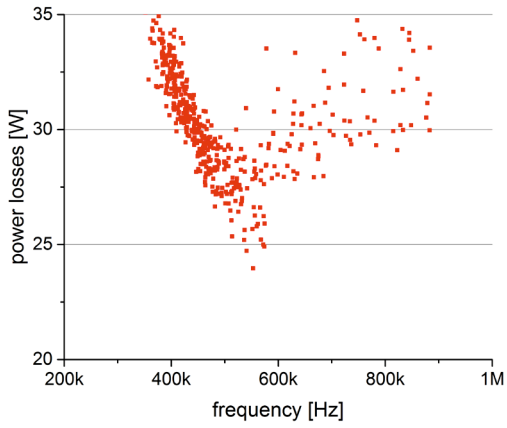


Fig. 3: Minimization of losses of the inductive component

Motivation

SiC and GaN power devices are enablers to increase power density or efficiency of next generation power electronic systems. However, inductive components might be a show stopper, as they make up a large space and involve huge costs in current systems.

You may ask yourself, where are the limits of inductive components regarding higher switching frequencies and power densities? We are your partner, who evaluates and designs inductors and transformers for customized power electronic systems.

Our objectives are:

- Application-related component characterization
- Performance evaluation of novel ferrite materials for power electronics
- Component modelling for computer-based system design
- Improvement of system performance considering objectives such as component losses, space or weight

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Characterization

In current data sheets of ferrite materials values to design high performance referring to inductive components are inadequate.

Therefore, we offer standardized material measurements of

- **material specific losses with DC-bias**
- **permeability**
- **hysteresis**
- **and saturation flux**

for different temperatures.

On component level we perform measurements of

- **magnetic parameters (e.g. inductance, coupling, saturation current)**
- **power losses**

for different temperatures and with large signal excitations.

Simulation & Optimization

The measured material data and the CAD component models are imported into FEM-tools. With these advanced models including the main parasitics we perform:

- **FEM-simulations and power loss calculations**
- **Multi-criterial parameter optimization on component and system level.**

Furthermore, we extract parameterized low or high level SPICE-Models for simulations of electric circuits .

Fig. 4: Test bench for testing inductive components and soft magnetic materials