

Master thesis



TECHNISCHE
UNIVERSITÄT
DARMSTADT

„Measurement of high-frequency complex permeability of iron cores under DC-bias current “



Fachgebiet
Elektrische
Antriebssysteme

Background

The iron core is the core component for magnetic coupling within the electric machines. In machine performance simulations, the material properties of the iron cores are typically derived from B–H curves measured at low frequencies using an Epstein frame or similar devices. However, as the frequency increases, the magnetic properties of the iron cores exhibit different characteristics compared to the low-frequency case. Accurately obtaining the high-frequency characteristics is crucial for studying the high-frequency characteristics of machines in modern high-frequency switching devices, such as SiC MOSFET. The main content of this thesis is to measure the nonlinear frequency characteristics of the existing iron core samples with minimal error.

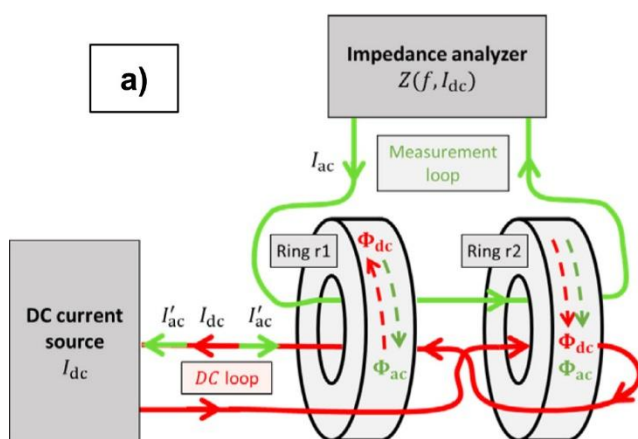


Figure: Principle of measurement [Kutorasiński *et al.*, 2023]

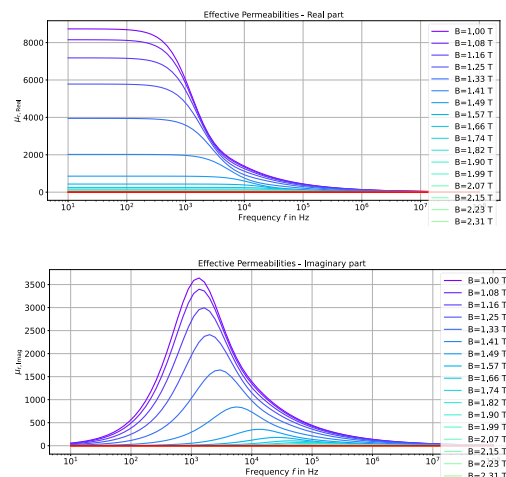


Figure: Effective complex permeability

Task description

- **Literature Study:** Investigation of the high frequency properties in iron cores.
- **Experimental Design:** Verification of the feasibility of the existing test plan and completion of the experimental measurements.
- **Data Fitting:** Processing measurement results to derive a general formula for complex permeability.

Requirements

Good knowledge of electric motors, knowledge of measurement of electronic system is helpful.

Dates and organization

Processing period: 2026
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