

Fakultät 1
Institut für Physik

Invitation to Physics Colloquium

Lecturer:

***Doktorand Frederik Roemer
Microsensorsystems / Robert Bosch GmbH***

Topic:

***"Fabrication, Simulation, and Characterization of a novel piezoelectric
ultrasonic Modulation Loudspeaker for In-Ear Applications"***

Conventional electrodynamic in-ear drivers reach fundamental limits in miniaturization. MEMS-based micro speakers, by contrast, offer low chip size, the possibility of low total harmonic distortion (THD), and cost-effective batch fabrication. Micro speakers usually have a lower maximum Sound Pressure Level (SPL) in the low-frequency range. We introduce a piezoelectric ultrasonic modulation loudspeaker that generates audible sound via ultrasonic actuation and demodulation, yielding a $\text{SPL} \propto 1/f$ response. This scaling enables high SPL at low frequencies from a sub-mm² active area. We outline the device's operating principle, design, fabrication, simulation, and experimental characterization. Measurements in a IEC60318 ear coupler demonstrate 117 dB SPL at 20 Hz from a 0.55 mm² active surface, with THD of 2%, while confirming the predicted $1/f$ SPL behavior.

Date: Thursday, 22.01.2026
Time: 03:30 p.m.
Location: Webex Meeting

Im Auftrag von Prof. Flege - Stefanie Jannasch

*FG Angewandte Physik und Halbleiterspektroskopie
Prof. Dr. rer. nat. habil. Jan Ingo Flege
Konrad-Zuse-Straße 1, 03046 Cottbus
Tel. 0355 69 5352 / E-Mail: flege@b-tu.de*