

Seminar über die Physik der kondensierten Materie (SFB/TRR173 Spin+X und SFB/TR288 Kolloquium, TopDyn-Seminar)

Dec. 13, 2023 at 1 p.m.
01-122 Newton Raum

Note: SFB Sonderseminar

Dr. Jun'ichi Ieda
Japan Atomic Energy Agency (JAEA)

Emergent inductance by dynamical ferromagnetic nanostructures

Emergent inductance appears universally when magnetization dynamics is coupled with conduction electrons based on a sequential action of spin torque and spinmotive force effects under ac currents. An original version of the emergent inductor using

> a spiral magnet[1-4] can be extended to include the spin-orbit coupling effects[5,6]. A striking common feature among emergent inductors is their size dependence of the effect; the inductance is inversely proportional to the sample cross-sectional area, opening

> a way for integrating an inductor element into nanocircuits.

>

> 1. Nagaosa, N. "Emergent inductor by spiral magnets," Jpn. J. Appl. Phys., Vol. 58, 120909, 2019.

> 2. Yokouchi, T. et al., "Emergent electromagnetic induction in a helical-spin magnet," Nature, Vol. 586, 232-236, 2020.

> 3. Ieda, J. and Y. Yamane, "Intrinsic and extrinsic tunability of Rashba spin-orbit coupled emergent inductors," Phys. Rev. B, Vol. 103, L100402, 2021.

> 4. Kitaori, A. et al., "Emergent electromagnetic induction beyond room temperature," Proc. Natl. Acad. Sci. U.S.A., Vol. 118, e2105422118, 2021.

> 5. Yamane, Y., S. Fukami, and J. Ieda, "Theory of emergent inductance with

spin-orbit coupling effects," Phys. Rev. Lett., Vol. 128, 147201, 2022.

> 6. Araki, Y. and J. Ieda, "Emergence of inductance and capacitance from topological electromagnetism," J. Phys. Soc. Jpn., Vol. 92, 074705, 2023.

Contact:

Univ.-Prof. Dr. Jure Demsar

Univ.-Prof. Dr. Hans-Joachim Elmers

Univ.-Prof. Dr. Mathias Kläui

Univ.-Prof. Dr. Thomas Palberg