



4 PhD positions in *Green IT: Skyrmionics* **– low-power neuromorphic computing & sensing** **(Johannes Gutenberg University Mainz &** **Infineon Technologies Austria AG & Singulus Technologies)**

In an EU-funded Doctoral Network with six leading European Universities and two major Industrial Partners, four PhD positions are available starting in 2023/2024 in the **field of topological spin structures for unconventional computing and sensing**. In particular, we are studying the use of skyrmions, magnetic whirls with enhanced stability and dynamics for novel unconventional logic and computing as well as integrated sensor-logic applications.

Magnetic skyrmions can be stabilized in thin film multilayers, as we have demonstrated (Nature Mater. (2016)). These layered structures stabilize chiral skyrmions with diameters in the nanometer to micrometer range at ambient conditions. The skyrmions in these heterostructures are essentially 2D objects exhibiting topological phase transitions (Nature Nanotech. (2019)). Such two-dimensional magnetic skyrmions can be manipulated by electrical currents (Nature Phys. (2017), Nature Electron. (2020)) and the topological stabilization combined with thermal spin dynamics makes them useful as ideal information carriers for non-conventional neuromorphic computing (Nature Nano. (2019), Nature Commun. (2022), Adv. Mater. (2023)).

During the PhD, the successful applicants will perform **experiments in a collaboration with a network of leading academic and industrial partners** to understand the fundamental static and dynamic properties of spin structures with a particular topology and tune their properties for selected low-power unconventional computing approaches. The network in this burgeoning field of skyrmionics offers ideal possibilities for scientific exchange with leading groups in the field and secondments are planned at selected partners. Two PhD positions are jointly offered with an industrial partner. The one with Infineon Austria will involve a one-year stay at Mainz, followed by stays in Austria with secondments to other network partners to enhance the learning experience. The one with the industrial partner Singulus will involve frequent visits at the JGU as the company and JGU are both within Rhine-Main area.

The network brings together the leading groups in high-quality materials discovery and deposition, advanced fabrication techniques, and leading-edge characterization techniques combined with state-of-the-art theory.

Infineon Technologies is a world leader in semiconductor solutions that make life easier, safer, and greener. Our solutions for efficient energy management, smart mobility, and secure, seamless communications link the real and the digital world. [Click here](#) or [here](#) for more information about working at Infineon and Villach.

SINGULUS TECHNOLOGIES develops and assembles innovative machines and systems for efficient thin-film coating and surface treatment processes, which are used worldwide in the Photovoltaics, Semiconductor, Medical Technology, Packaging, Glass & Automotive as well as Battery & Hydrogen markets. [Click here](#) for more information on Singulus.

The **Physics Department at Johannes Gutenberg University Mainz** has been consistently ranked as one of the leading physics departments in Germany. In the recent Shanghai and CHE rankings it was selected for the excellence group in Europe and in 2018 and 2021 Physics in Mainz was ranked #1 in Germany by the German Research Foundation. It is particularly strong in condensed matter physics / materials sciences and houses the Excellence Research Centre TopDyn and the national German Collaborative Research Centre on Spintronics "Spin+X". Excellent students can additionally apply to the Max Planck Graduate Centre that provides an interdisciplinary Graduate Education experience with tailor-made training and a range of additional support measures.

For enquiries and applications including a full CV contact Prof. Dr. M. Kläui

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