TECHNISCHE UNIVERSITÄT CHEMNITZ

Institut für Physik

Physikalisches Kolloquium

- Online-Veranstaltung -

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Artificial magnetoception enabled by wearable magnetic field sensors

Electronics of tomorrow will be mechanically compliant and will form a seamless link between biological and digital worlds by not only mimicking extero- and interoceptive senses of humans but also extending our perception beyond modalities prescribed by the evolution. Synthetic receptors would offer complimentary information on the surrounding and enable novel means of manipulating physical or even virtual objects.

In contrast to the state-of-the-art portable gadgets, the prospective augmented reality devices will rely on compliant on-skin integrated interactive electronics. For this concept, we put forth an approach towards the realization of magnetoreceptors – mechanically imperceptible electronic skins with magnetic functionality [1]. The magnetosensitive smart skins allow digitizing the bodily motion and offer new means of touchless manipulation of virtual objects based on the interaction with magnetic stray fields of small permanent magnets [2-4] but also with geomagnetic field [5].

The key enabler of this technology is shapeable magnetoelectronics [1], which relies on the use of geometrically curved magnetic thin films. We perform fundamental studies of the effects of geometrical curvature on magnetic thin films [6-10]. The lack of an inversion symmetry and the emergence of a curvature induced anisotropic and chiral magnetic responses modifies the magnetization reversal processes of thin ferromagnetic films [8] leading to a strong impact of geometrical bends and twists on the sensitivity of mechanically compliant magnetic field sensors. By adjusting the topology of magnetic textures to the geometrical shape of the curved object, it is possible to overcome this effect [9].

In this talk, we will review the fundamental and application-relevant aspects of curved magnetic thin films with the emphasis on artificial magnetoception.

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