SFB 767
Colloquium

Universität Konstanz

Thu Dec 5, 2019
Coffee and tea 15:15
Talk 15:30
P 603

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Engineering topological phases: magnetism, superconductivity and geometry

Topological states of matter are at present one of the most challenging and active fields in condensed matter physics due to the richness of physical phenomena they display, and the foundational topological concepts on which they are built-in. In this talk I will present various routes for designing and exploiting topological phases in solid state quantum platforms by combining magnetism, superconductivity and geometry. Within superconducting systems, a notable case with non-trivial topological number are spin-triplet superconductors. In this context, I will highlight various remarkable effects: i) the spin-orbital coupling emerging at the interface with magnets [1], ii) magnetic Andreev states at their edge if the system allows for mixed parity [2], iii) magneto-electric effects [3], iv) synthetic Weyl phases in Majorana devices [4].
Concerning the role of geometry and nanoscale shaping, I will firstly discuss how geometric effects in low-dimensional nanomaterials can lead to topological states of matter by considering the paradigmatic example of quantum wires with inversion asymmetry, which are periodically corrugated at the nanometer scale [5], and in the presence of an applied magnetic field to be employed to measure the fundamental electronic charge thus providing a quantum standard for dc current [6]. Here, the geometric spin torque is a key concept to realize such effects.

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