



Sonderforschungsbereich TRR 160

Kohärente Manipulation wechselwirkender Spinanregungen
in maßgeschneiderten Halbleitern

Seminarankündigung

Donnerstag 08.12.2022, 12:00 Uhr
P1-02-110

“Switching of Sublattice Magnetization in Quantum Antiferromagnets Described by Schwinger Bosons”

Vortragender: Katrin Bolsmann, MSc
(AG Uhrig)

Abstract:

Harvesting magnetic excitations in antiferromagnets is a promising and fast-growing field in the research of magnetism. The main focus is the readout and manipulation of the Néel vector of antiferromagnetic materials. In this talk, we discuss a theoretical approach to describe a two-dimensional antiferromagnetic square lattice at zero temperature and its non-equilibrium behavior. First, we elucidate the use of Schwinger bosons in equilibrium to describe the elementary excitations, i.e., spin waves, of the isotropic and anisotropic antiferromagnetic square lattice, in mean-field approximation. The Bose-Einstein condensation of Schwinger bosons describes the long-range magnetic order. Then, we apply the Schwinger boson mean-field theory to investigate the switching of the sublattice magnetization on the antiferromagnetic square lattice via an external magnetic field. In the anisotropic system, there is an increase in energy after switching, which depends on the degree of anisotropy. Furthermore, we find a threshold field, below which switching is no longer possible, and investigate its dependence on the anisotropy. It turns out that even for low anisotropy, the threshold for the magnetic field is too large for standard technical applications. Finally, we discuss possible modifications of the protocol to enable switching of the sublattice magnetization with smaller fields.