Freie Universität Berlin

Colloquium
Dahlem Center for Complex Quantum Systems

Topological superconductivity and unconventional pairing in oxide interfaces

Prof. Dr. Jörg Schmalian
Institute for Theory of Condensed Matter(TKM)
Institute for Solid State Physics (IFP)
Karlsruhe Institute of Technology

Time: **Thursday, May 8, 2014, 14:00 c.t.**

Location: **Hörsaal A (1.3.14)**

Abstract:

To pinpoint the microscopic mechanism for superconductivity has proven to be one of the most outstanding challenges in the physics of correlated quantum matter. Thus far, the most direct evidence for an electronic pairing mechanism is the observation of a new symmetry of the order-parameter, as done in the cuprate high-temperature superconductors. Like distinctions based on the symmetry of a locally defined order-parameter, global, topological invariants allow for a sharp discrimination between states of matter that cannot be transformed into each other adiabatically. Here we propose an unconventional pairing state for the electron fluid in two-dimensional oxide interfaces and establish a direct link to the emergence of nontrivial topological invariants. Topological superconductivity and Majorana edge states can then be used to detect the microscopic origin for superconductivity. In addition, we show that also the density wave states that compete with superconductivity sensitively depend on the nature of the pairing interaction. Our conclusion is based on the special role played by the spin-orbit coupling and the shape of the Fermi surface in SrTiO3/LaAlO3-interfaces and closely related systems.