TECHNISCHE UNIVERSITÄT DRESDEN

Institut für Festkörper- und Materialphysik

IFMP Institut für Festkörper- & Materialphysik

IFMP Seminar

Date Monday, June 16, 2025, at 14:50

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Zoom: 688 4227 2214, Passcode: IFMP2024-5

Speaker **Arghya Taraphder**
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Title **Emergent physics at the oxide heterointerface**

Abstract A series of emergent phenomena, unfolding at surprising regularity in oxide heterointerfaces, have captivated a sizeable section of the science community. The highly conductive two-dimensional electron liquid at the heterointerface between two insulating oxides exhibits finite-momentum superconductivity coexisting with inhomogeneous ferromagnetism, gate-voltage-induced SITs and MITs, as well as a complex excitation spectrum. We find [1] the role of disorder on superconductivity and ferromagnetism at the interface to be important as the system breaks up into segregated regions of superconductivity and ferromagnetism, ruling out an FFLO state. The unusual coexistence of superconductivity and ferromagnetism at the interface may have its origin in disorder while O-site vacancy suppresses anti-site disorder and releases the lattice mismatch strain [2]. A perpendicular magnetic field leads to topological superconductivity and possible gapless excitations [3] such as Majorana fermions, at the core of a vortex, which are vulnerable to disorder. The surprising observation of transient superconductivity above the nominal Tc implies a 'hidden' superconducting order [4]. Such a hidden superconducting state [5] and its BKT nature have also been investigated [6]. The Lifshitz transition turns out to be more prominent in the Seebeck coefficient instead of the Hall number [7].

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