

SFB 608

Einladung zum Kolloquium

Ort: Universität zu Köln
II. Physikalisches Institut
Seminarraum 201

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Thema: Metal-Insulator transitions in one-dimensional electron system with next-nearest-neighbor hopping

We study the quantum phase transition from an insulator to a metal in the ground state of the half-filled t - t' repulsive Hubbard model, using the continuum-limit bosonization approach and density matrix renormalization group calculations. An effective low-energy Hamiltonian that describes the insulator-metal transition is derived. We find that the gross features of the phase diagram are well-described by the standard theory of commensurate-incommensurate transitions in a wide range of parameters. We also obtain an analytical expression for the insulator-metal transition line. In the presence of a staggered ionic potential we find, that the gross features of the ground state phase diagram and in particular the behavior of the charge sector can be described by a quantum double-frequency sine-Gordon model with topological term. We have shown that with increasing on-site repulsion, for various values of the parameter t' the model shows the following sequences of phase transitions: Band insulator - Ferroelectric Insulator - Mott Insulator, Band Insulator - Nonmagnetic Metal - Ferroelectric Insulator and Non-magnetic Metal - Ferroelectric Insulator.

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