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2nd International Conference on

PHYSICS August 28-30, 2017 Brussels, Belgium

Bose condensation of multi-electron bound states: composite order in Kondo-Heisenberg models

Alexei M Tsvelik Brookhaven National Laboratory, USA

Composite order is defined as the one which emerges as a result of Bose condensation of N-electron bound states (N>2). In this presentation I discuss the microscopic models giving rise to such type of bound states. All given examples correspond to the models where conduction electrons coexist with localized spins and the composite order emerges due to their interactions. It is shown that composite order is related to the formation of a spin liquid with gapped excitations carrying quantum numbers which are a fraction of those of the electron. These spin liquids are special in the sense that their formation necessarily involves spin degrees of freedom of both the conduction and the localized electrons and can be characterized by nonlocal order parameters. A detailed description of such spin liquid states is presented with a special care given to a demonstration of their robustness against local perturbations preserving the Lie group symmetry and the translational invariance.

tsvelik@gmail.com