

Abstract Submitted
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Theory of interaction-induced localization for mobile impurities¹

JIAN LI, Texas Center for Superconductivity and Department of Physics, University of Houston, Houston, Texas 77204, USA, JIN AN, National Laboratory of Solid State Microstructures and Department of Physics, Nanjing University, Nanjing 210093, China, CHIN-SEN TING, Texas Center for Superconductivity and Department of Physics, University of Houston, Houston, Texas 77204, USA, TEXAS CENTER FOR SUPERCONDUCTIVITY TEAM — A phenomenological model is proposed for the interaction-induced localization of mobile impurities in the cold atomic systems. The fundamental properties of the transition between the extended and localized impurity state in one, two and three dimension are investigated with this model. We find that the transition is continuous in one and two dimension while discontinuous in three dimension. We show that the dynamics of single localized impurity is described by a soliton and predict the formation of bipolaron and Wigner lattices for many fermionic impurities. Our theory explains the essential features from specific models in a unified picture and can be used to realize several exotic phenomena with ultracold impurity atoms.

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