

Abstract Submitted
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strongly interacting fermions and bosons with arbitrary spin in 1D LI YANG, Rice University, LIMING GUAN, Institute for Advanced Study, Tsinghua University, HAN PU, Rice University — Under second order degenerate perturbation theory, we show that the physics of N particles, which can be either fermions or bosons, with arbitrary spin confined in one dimensional trap in the strongly interacting regime can be mapped into an effective spin model with superexchange interaction. An effective spin-chain Hamiltonian can be obtained from this procedure. For spin-1/2 particles, this model reduces to the non-translational-symmetric Heisenberg model, where a transition between Heisenberg anti-ferromagnetic (AFM) and ferromagnetic (FM) states is expected to occur when the interaction strength is tuned from the strongly repulsive to the strongly attractive limit. We study the properties of these magnetic states. We confirm the validity of the spin-chain model by comparison with results obtained from several unbiased techniques. The spin chain model can be easily extended to arbitrary spin dependent interaction, provided the interaction between each components are strong

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