

# Two leg bosonic ladder in an external magnetic field at unit filling

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Motivated by the recent experimental realizations of artificial gauge field on optical lattices, we study the two-leg bosonic ladder in an external magnetic field using finite size density matrix renormalization group algorithm. At unit filling, interacting bosons can exhibit a rich variety of phases on ladders. At large interaction, they form a Mott insulator phase while, at smaller interaction, they exhibit a Meissner phase and, more intriguing floating and staggered vortex phases. A weak chiral Mott insulator phase is also found for intermediate interaction strength. We determine the phase diagram and Luttinger parameters from correlations functions and entanglement spectrum. While usually thought to be second order, some of the phase transitions seem to be first order.