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Strong coupling expansion of the generalized t-V model in one dimension

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We employ a strong coupling expansion - similar to the one used in the lattice field theory studies [1] - to solve the one-dimensional extended t-V model of fermions on a lattice [2]. This model is solved for a range of filling factors, including both commensurate - where a charge density wave is present - and incommensurate densities. The first set consists not only of a trivial case of half filling. The method allows us to trace the transition from a Luttinger liquid phase to a Mott insulating phase and calculate the critical parameter K. This simple yet powerful method is not based on Bethe ansatz and it works for both integrable and non-integrable systems. Furthermore, we investigate how tailoring the interaction can introduce other ordered phases of the system [3].

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