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Coexistence and phase separation of pairs and fermions in a one-dimensional model with pair-hopping (ONSITE presentation)

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We consider a simple model of spinless fermions in which the kinetic energy competes with a pair-hopping term. We show by means of numerical calculations that there exists a phase in which part of the fermions are paired while the others remain unpaired. These elementary components makes two mixed Luttinger liquids, one for pairs and one for fermions. A simple two-fluid model accounts remarkably well for the observed numerical data [1]. Adding nearest-neighbour interaction leads to a rich phase diagram [2] in which we observe a regime in which the two previous Luttinger liquids get phase separated. In the context of impurity physics, this model on a finite size chain allows for the creation of a single pair interacting with a fermionic bath or a single fermion interacting with a paired fermions bath.

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