

Constraints of kinematic bosonization in two and higher dimensions

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Contrary to the common wisdom, local bosonizations of fermionic systems exist in higher dimensions. Interestingly, resulting bosonic variables must satisfy local constraints of a gauge type. They effectively replace long distance exchange interactions. In this work we study in detail the properties of such a system which was proposed a long time ago. In particular, dependence of the constraints on lattice geometry and fermion multiplicity is further elaborated and is now classified for all two dimensional, rectangular lattices with arbitrary sizes. For few small systems the constraints are solved analytically and the complete spectra of reduced spin hamiltonians are shown to agree with the original fermionic ones. The equivalence is also extended to fermions in an external Wegner Z_2 field. It is also illustrated by an explicit calculation for a particular configuration of Wegner variables.

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