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Delocalized carriers in the t - J model with strong charge disorder

In the first part I will show that electron-magnon interaction delocalizes the particle in a system with strong charge disorder. The analysis is based on results obtained for a single hole in the one-dimensional t - J model. Unless there exists a mechanism that localizes spin excitations, the charge carrier remains delocalized even for a very strong charge disorder and shows subdiffusive motion up to the longest accessible times.

In the second part I will present a study of dynamics of a single hole in one dimensional t - J model subject to a random magnetic field. Strong disorder that couples only to the spin sector localizes both spin and charge degrees of freedom. While we cannot precisely pinpoint the threshold disorder, we conjecture that there are two distinct transitions. Weaker disorder first causes localization in the spin sector. Carriers become localized for somewhat stronger disorder, when the spin localization length is of the order of a single lattice spacing.