

Abstract Submitted
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Vacancy dynamics in the paramagnetic environment JOHAN CARLSTROM, BORIS SVISTUNOV, NIKOLAY PROKOFIEV, University of Massachusetts — We consider the motion of a single vacancy in a magnetic spin-1/2 lattice. Examples of realisations of this model include vacancies in a He3 solid or holes in the t-J model with $J=0$. This motion is ballistic when spins exhibit ferromagnetic order, with $\langle |r(t)| \rangle$ growing linearly with time. However in the disordered paramagnet, the motion of the vacancy becomes highly nontrivial, and no exact solution to this outstanding problem is known. This scenario is known as the Brinkman-Rice problem. We report here numerical results for the spatial probability distribution of the vacancy obtained by integrating the time evolution operator through Monte Carlo and averaging over a large number of random spin realisations. We find highly counterintuitive results, with the probability of finding the vacancy at a given site oscillating in time. These results can be verified in experiments with ultra-cold fermions in optical lattice at a temperature high enough that the spins are disordered.

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