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Disorder-induced Superconductivity in Two-Dimensional Fermionic Model JI-WOO LEE, SHAILESH CHANDRASEKHARAN, HAROLD U. BARANGER, Duke University — We study the possibility of inducing superconductivity by introducing a disordered chemical potential in a strongly interacting model of fermions. We work at half filling in two dimensions with a Hamiltonian that has the same symmetries of the Hubbard model. By increasing the on-site attraction we can convert the fermionic model into a Heisenberg spin model. It is well known that at half filling the enhanced SU(2) symmetry of the Hubbard model prevents superconductivity at finite temperatures - a uniform chemical potential is necessary to induce superconductivity. In our previous work, we have used our model to induce superconductivity using such a uniform chemical potential and have studied how disorder uppresses this superconductivity (cond-mat/0411306). Here we study if a disordered chemical potential with zero mean can also induce superconductivity. Our results show that this is indeed possible. While the winding susceptibility decreases monotonically as a function of system size in the absence of a chemcial potential, it flattens out in the presence of disorder. Interestingly, there is more structure to the functional dependence of the susceptibility on system size indicating the existence of a length scale related to the disorder in the problem. This work was supported in part by NSF (DMR-0103003).

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