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Random field disorder and charge order driven quantum oscillations in cuprates ANTONIO RUSSO, SUDIP CHAKRAVARTY, UCLA — In the pseudogap regime of the cuprates, charge order breaks a Z_2 symmetry. Therefore, the interaction of charge order and quenched disorder due to potential scattering, can, in principle, be treated as a random field Ising model. A numerical analysis of the ground state of such a random field Ising model reveals local, glassy dynamics in both $2D$ and $3D$. The glassy dynamics are treated as a heat bath which couple to the itinerant electrons, leading to an unusual electronic non-Fermi liquid. If the dynamics are strong enough, the electron spectral function has no quasiparticle peak and the effective mass diverges at the Fermi surface, precluding quantum oscillations. In contrast to charge density, d -density wave order (reflecting staggered circulating currents) does not directly couple to potential disorder, allowing it to support quantum oscillations. At fourth order in Landau theory, there is a term consisting of the square of the d -density wave order parameter, and the square of the charge order. This coupling could induce parasitic charge order, which may be weak enough for the Fermi liquid behavior to remain uncorrupted. Here, we argue that this distinction must be made clear, as one interprets quantum oscillations in cuprates.

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