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Quantum oscillations in a highly renormalized Fermi liquid model of Fermi pockets in underdoped cuprates[1] TUDOR STANESCU, VICTOR GALITSKI, University of Maryland, DENNIS DREW, CNAM, University of Maryland — Motivated by the recent experimental observation of quantum oscillations in the underdoped cuprates, which suggest the existence of small electron pockets characterized by a relatively large cyclotron mass, we address two basic questions: 1) How can one explain the relatively large cyclotron effective mass observed experimentally and its relation with the effective Hall mass? 2) Why the electron pockets are not seen in ARPES experiments? We propose an explanation based on a model of a highly renormalized Fermi liquid characterized by a reconstructed Fermi surface and strongly momentum-dependent quasiparticle properties. We find that the cyclotron mass is enhanced by a factor $< 1/Z >$, while the effective Hall mass is proportional to $< Z > / < Z^2 >$, where $< ... >$ implies an averaging over the Fermi surface. If the Z-factor becomes small in some part of the Fermi surface, the cyclotron mass is enhanced sharply while the infrared Hall mass may remain small.

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