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Fermi-liquid properties of strongly imbalanced Fermi gases KELLY PATTON, DANIEL SHEEHY, Louisiana State University — Recent experiments [Schirotzek et al., PRL **102**, 230402 (2009)] involving highly imbalanced ultracold atomic gases have revealed so-called spin or Fermi polarons. These quasiparticles are composed of spinful atoms correlated with a "cloud" of atoms of opposite spin. These correlations lead to a renormalization of the free or bare atom's properties. Theoretically, these quasiparticles have been well described by a variational wave function consisting of a single impurity atom interacting with the remaining Fermi sea. Using diagrammatic many-body theory we extend these results and investigate the dependence of the polaron's Fermi liquid properties on finite temperature, as well as increased polaron density. Furthermore, we investigate instabilities of this normal Fermi liquid state, such as transitions to a superfluid or phase-separated state, as the temperature is lowered and/or the density of polarons is increased.

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