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Pairing and Superfluid Properties of Dilute Fermion Gases at Unitarity¹

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We study the pairing and superfluid properties of a dilute gas of fermions in 3-dimensions with attractive interactions tuned to the unitarity point [1]. The finite temperature, non-perturbative, Restricted Path Integral Monte Carlo (R-PIMC) method is used for our simulations and tested against previous ground-state Quantum Monte Carlo calculations. From the growth of the density correlations for unequal spins, we identify the pseudogap crossover temperature scale $T^* \approx 0.70 E_f$ below which pairing correlations develop. We estimate the critical temperature for condensation $T_c \approx 0.24 E_f$ from a finite size scaling analysis of the superfluid density. The pseudogap phase is characterised by the spin susceptibility and compressibility. We will also present results for unequal populations of fermions.

[1] V. Akkineni, N. Trivedi, D.M. Ceperley, cond-mat/0608154

¹In collaboration with V. Akkineni and D.M. Ceperley.