Phase Transitions and Pairing in Strongly Attractive Fermi Atomic Gases

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Recent progress in manipulating quantum gases of ultracold atoms is opening up many exciting possibilities for the experimental study of quantum effects in low-dimensional many-body systems. Among these developments the experimental observation of superfluidity and phase separation in imbalanced Fermi atomic gases has stimulated great interest in exploring exotic quantum phases of matter with two mismatched Fermi surfaces. In this talk I will describe exact results obtained with Xiwen Guan and Chaohong Lee for the 1D two-component strongly attractive Fermi gas of cold atoms with external fields. Results obtained using the thermodynamic Bethe Ansatz include the critical fields, magnetization and local pair correlation function. This model is seen to exhibit a phase diagram reminiscent of type II superconductors. Below the degenerate temperature, bound pairs of fermions behave like hard-core bosons obeying generalized exclusion statistics.