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BCS to BEC Quantum Phase Transition in Spin Polarized Fermionic Gases SERGIO BOTELHO, CARLOS SA DE MELO, Georgia Institute of Technology — Recent experiments in cold fermionic gases have shown that s-wave magnetic field induced Feshbach resonances can be used to form diatomic molecules of ^{40}K and ^{6}Li, which undergoe Bose-Einstein condensation (BEC) on the lower magnetic field side of the resonance. On the higher magnetic field side of the resonance, it has also been established that Cooper pairing takes place and a BCS condensate is formed. We discuss the possibility of a quantum phase transition in ultracold spin polarized fermionic gases which exhibit a p-wave Feshbach resonance. We show that when fermionic atoms form a condensate that can be externally tuned between the BCS and BEC limits, the zero temperature compressibility and the spin susceptibility of the fermionic gas are non-analytic functions of the two-body bound state energy. This non-analyticity is due to a massive rearrangement of the momentum distribution in the ground state of the system. Furthermore, we show that the low temperature superfluid density is also non-analytic, and exhibits a dramatic change in behavior when the critical value of the bound state energy is crossed.

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