Radio frequency spectroscopy in atomic Fermi gases

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Atomic Fermi gases are a rapidly evolving new interdisciplinary field between condensed matter and AMO physics. Using a Feshbach resonance, the pairing interaction strength can be tuned continuously from weak to strong, effecting a BCS--BEC crossover. Unlike an electron system in typical condensed matter physics, experimental probes for atomic Fermi gases are very limited. Radio frequency (RF) spectroscopy is one the few very important experimental techniques. It probes directly the fermionic excitation gap. In this talk, I will introduce experimental progress in this regard and present a theory which addresses various issues related to both momentum integrated and momentum resolved RF spectroscopy measurements in trapped atomic Fermi gases. In this context, we conclude that the previously observed double-peak structure are indeed associated with paired atoms in the trap center and unpaired atoms in the trap edge, respectively. In addition, momentum resolved RF spectroscopy is equivalent to the powerful angle-resolved photoemission spectroscopy (ARPES) in an electron system.

References: