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Spectral function and RF spectroscopy of dilute Fermi gases[1]
WILLIAM SCHNEIDER, MOHIT RANDERIA, The Ohio State University — The spectral function $A(k,\omega)$ is a quantity of fundamental interest in many-body physics and its occupied part can now be directly measured in angle-resolved RF spectroscopy experiments. We describe a surprising universal feature [1] in *all* dilute Fermi gases: for $k \gg k_F$, there is incoherent spectral weight centered about *negative* $k^2/2m$ in a range of energies that scales linearly with k. The total weight of this feature is exactly $n(k) \sim C/k^4$, where C is Tan's contact. This "bending back" in the dispersion, while natural for superfluid excitations, is quite unexpected for normal gases, such as the hard-sphere Fermi gas and the Fermi liquid ground state of the highly spin-imbalanced, attractive gas near unitarity. We also argue that in the superfluid, this feature is dominated by interaction effects which do not reflect the pairing gap; e.g., the spectral weight in this feature is not exponentially small in the BCS limit, but rather a power law in $k_F a$. This incoherent spectral feature has observable consequences for both angle-resolved and usual RF spectroscopy. We will also describe observable properties of the low-energy spectral function in both the normal and superfluid ground states. [1] W. Schneider and M. Randeria, arXiv:0910.2693

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