FERMI-LIQUID EFFECTS IN SPIN-POLARIZED GASES

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We discuss a Fermi-liquid approach to of spin dynamics and kinetics in spin-polarized Fermi gases at arbitrary temperatures, including the classical temperature region. Such an approach is justified on the basis of diagrammatic kinetic equation in the second order which is applicable at all temperatures. The theory covers both the molecular field and dissipative terms (*i.e.,* line shifts and line widths) important for NMR experiments on spin dynamics.

We obtained a general expression for the *quasi*-particle interaction function and the collision integral valid in the whole temperature range and *not* restricted to the domain of the so-called quantum gases. The imaginary (pole) part of this interaction function at low temperatures describes the recently observed zero-temperature attenuation, and becomes undistinguishable from the collision integral at higher temperatures. The real part of the interaction function reproduces the standard Landau function at low temperatures and, at higher temperatures, the so-called I_2 term. We explain why the I_2 terms disappears within the classical approach to kinetics, and analyze the residual terms.

At low temperatures our results coincide with the results of exact microscopic theory of spin dynamics in Fermi liquids at $T = 0$ when the interaction function can be expressed via exact *irreducible* vertex function. In the Boltzmann region our theory goes beyond the classical kinetic approach; in this region the interaction function can be naturally related to the exact scattering T-matrix.

The results justify the concept of statistical *quasi*-particles and the corresponding Fermi-liquid equations for dilute spin-polarized gases, such as $^3He\uparrow$-^4He mixtures, at all temperatures, from the degenerate up to the Boltzmann region. This allows one to use a unified and rather simple language and comparatively transparent equations for the description of spin dynamics in spin-polarized gases. However, this uniformity in description breaks down completely beyond the second order in density and/or interaction because of temporal non-locality and retardation effects which are different at high and low temperatures. We discuss in detail how to reconcile various physical assumptions inherent to kinetic approaches used previously for different temperature regions.