# TRANSVERSE ACOUSTIC IMPEDANCE OF A FERMI-LIQUID FILM

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We have studied the transmission of transverse oscillations through a thin Fermi liquid film using Landau's Fermi liquid theory. Fermi liquid theory describes the dynamics of interacting, degenerate fermion systems, for example non-superfluid, i.e. normal state $^3$He at millikelvin temperatures. These conditions give rise to a type of collisionless sound-like oscillation called zero sound that is unique to Fermi liquid. The presence of zero sound can be probed by measuring the liquid's acoustic impedance.

The response of a Fermi liquid to the transverse oscillations of a planar substrate has previously been calculated for a fluid layer of infinite thickness[1]. The equations in Ref. 1 take into account contributions to the acoustic impedance from both the collective transverse zero sound mode, as well as the incoherent single-quasiparticle excitations. We have modified these equations for application to a film of finite thickness, either with a specularly reflecting free surface, or as confined between two parallel substrates. The presence of the fluid surface results in behavior very distinct from the infinite fluid layer solution. Among these is an increased sensitivity to the Landau Fermi liquid parameters. We study the effect of different levels of surface roughness of the substrates by altering the boundary conditions accordingly. The equations are solved using numerical methods and will be compared to earlier experimental results[2, 3].

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