DAMOP17-2017-000420

Abstract for an Invited Paper
for the DAMOP17 Meeting of
the American Physical Society

Bragg spectroscopy of near-homogeneous Fermi gases

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We have used Bragg spectroscopy to probe the excitation spectra of strongly interacting Fermi gases in the low and high momentum regimes. Using two laser beams focused into the center of trapped clouds we obtain Bragg spectra of systems with near-uniform density. At low momentum, below the superfluid transition temperature, the Bogoliubov-Anderson phonon mode is the dominant feature of the excitation spectra and single-particle excitations become visible for energies larger than twice the pairing gap. The respective frequencies of the phonon mode and the onset of single-particle excitations provide direct measures of the speed of sound and pairing gap. At high momentum, focused beam Bragg spectroscopy allows the determination of Tans universal contact parameter in a homogeneous system. We make use of sum-rules to map the temperature dependence of the contact and internal energy of Fermi gases at unitarity from our Bragg spectra.