

Abstract Submitted
for the DAMOP15 Meeting of
The American Physical Society

Universal high-momentum behaviors and thermodynamic relations in a spinless Fermi gas with a resonant p-wave interaction SHUHEI M. YOSHIDA, MASAHITO UEDA, The University of Tokyo — A series of universal relations, which include high-momentum or short-range behaviors of correlation functions and thermodynamic relations, have attracted great attention, especially in studies of the unitary regime of the BCS-BEC crossover. So far, most studies of the universal relations have been conducted within the regime in which a contact interaction model and a local effective field theoretical approach are available. What remains elusive is a spinless Fermi gas with a resonant p-wave interaction, in which a strong singularity due to the centrifugal barrier precludes a contact interaction description. We study high-momentum or short-range behaviors in such a gas and show several relations which are insensitive to its short-range details. We find universal asymptotes in the momentum distribution and the density correlation function, which originate from the two-body collisions. We also find a common coefficient on them which we call a p-wave contact and discuss its physical interpretation. We show that the p-wave contact is proportional to the number of closed-channel molecules, and derive an adiabatic sweep theorem, which states that the p-wave contact is the adiabatic derivative of the energy with respect to the scattering volume.

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Date submitted: 28 Jan 2015

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