Abstract Submitted
for the DAMOP16 Meeting of
The American Physical Society

Path integral Monte Carlo determination of the fourth-order virial coefficient for unitary two-component Fermi gas with zero-range interactions[1] YANGQIAN YAN, D. BLUME, Washington State University — The unitary equal-mass Fermi gas with zero-range interactions constitutes a paradigmatic model system that is relevant to atomic, condensed matter, nuclear, particle, and astro physics. This work determines the fourth-order virial coefficient b_4 of such a strongly-interacting Fermi gas using a customized *ab inito* path integral Monte Carlo (PIMC) algorithm. In contrast to earlier theoretical results, which disagreed on the sign and magnitude of b_4, our b_4 agrees with the experimentally determined value, thereby resolving an ongoing literature debate. Utilizing a trap regulator, our PIMC approach determines the fourth-order virial coefficient by directly sampling the partition function. An on-the-fly anti-symmetrization avoids the Thomas collapse and, combined with the use of the exact two-body zero-range propagator, establishes an efficient general means to treat small Fermi systems with zero-range interactions.

[1]We gratefully acknowledge support by the NSF.

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Date submitted: 28 Jan 2016 Electronic form version 1.4