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Forum de Physique Statistique @ ENS

Mercredi 26 Mars 2025, 12 :30
LPENS, 3 rue dUlm College de France(Note the time change !)
Domaines : cond-mat.stat-mech

Titre : *Three-body contact for fermions*

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Résumé : *The resonant Fermi gas, i.e. two-component fermions in 3D interacting by a short-range potential of large scattering length a2 , is a textbook model describing cold atoms near a Feshbach resonance. A key quantity is the 2-body contact C2 , which determines e.g. the number of nearby fermion pairs, the tail of the single-particle momentum distribution, the derivative of the energy with respect to a2 , or the 2-body loss rate [1,2] . Based on the non-trivial power-law scaling of the 3-body wavefunction at short distances, we introduce the three-body contact C3 , in terms of which we express e.g. the number of nearby fermion triplets, or the large-momentum tail of the two-particle momentum distribution. The formation rate of deeply bound dimers by three-body recombination is expressed in terms of C3 and a parameter a3 defined through the asymptotic behavior of the zero-energy 3-body wavefunction at distances between the range and —a2— [3]. We compute C3 to leading order in the non-degenerate limit for the homogeneous gas, using the exact 3-body wavefunction at the unitary limit a2 = infinite ; , and a diagrammatic approach at negative a2 . In the Feynman diagram technique, the three-body short- distance power-law scaling comes from a large-wavevector tail of the 3-body T-matrix [4]. We propose a procedure to experimentally determine C3 in the degenerate regime, whose computation is an open theoretical challenge.*

[1] S. Tan, Ann. Phys. 323, 2952 (2008) ; ibid. 323, 2971 (2008) [2] E. Braaten and L. Platter, Phys. Rev. Lett. 100, 205301 (2008) [3] FW and X. Leyronas, Comptes Rendus Physique 25, 179 (2024) [4] X. Leyronas and FW, in preparation