

In 3D, for an attractive fine-tuned interaction, the energy of a two-body bound state vanishes, and the scattering length diverges. A gas of spin 1/2 fermions with such a resonant interaction is universal in the low-density limit (*i.e.*, in the zero-range limit). This is the unitary gas.

In this gas, the number of *pairs* of particles separated by a distance  $< \epsilon$  behaves as  $C_2 \epsilon$  for  $\epsilon \rightarrow 0$ , where  $C_2$  is the “2-body contact”.  $C_2$  was the subject of numerous experimental and theoretical studies in the field of cold atoms (with related developments in nuclear physics).

Now consider the number of *triplets* of particles separated by distances  $< \epsilon$ . It behaves as  $C_3 \epsilon^{2s+2}$ , where  $C_3$  is the “3-body contact”, and the exponent  $s = 1.772724267$  comes from the solution of the unitary 3-body problem [1].

We have experimentally determined  $C_3$  as a function of temperature [2]. In the non-degenerate regime, our results agree with the virial expansion [3]. At low temperature, we observe an unexpected strong decrease of  $C_3$ . Understanding this effect and reproducing it by a computation are open theoretical challenges.

I will also present the two ingredients which allowed us to perform this determination of  $C_3(N)$  for a large number of atoms  $N$ :

- the experimental measurement of the 3-body loss rate  $\Gamma_3(N)$  for  $N$  large
- in the case of  $N = 3$  trapped atoms, the measurement of  $\Gamma_3(3)$

and the computation of  $C_3(3)$ , from which we deduce the ratio  $\frac{\Gamma_3(3)}{C_3(3)} = \frac{\Gamma_3(N)}{C_3(N)}$ .

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[1] FW and X. Leyronas, *Comptes Rendus Physique* **25**, 179 (2024)

[2] C. Heintze, P. Lunt, M. Galka, S. Jochim, K. Oi, S. Endo, D. Blume, FW, *in preparation*

[3] X. Leyronas and FW, *in preparation*