

Second sound and the superfluid fraction in a resonantly interacting Fermi gas

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‘Second sound’ is a striking manifestation of the two-component nature of a superfluid, well known in context with liquid helium II. This form of sound, which only exists below the critical temperature, corresponds to an entropy wave, where the superfluid and the non-superfluid components oscillate in opposite phase. This is different from ordinary sound (‘first sound’), where the two components oscillate in phase. In this talk, I would report on the first observation of second sound in an atomic Fermi gas. Our results can be interpreted in terms of Landau’s famous two-fluid theory, and the measured second-sound speeds allow us to extract the temperature dependence of the superfluid fraction, which in strongly interacting quantum gases has been an inaccessible quantity so far.

[1] L. Sidorenkov, M. K. Tey, R. Grimm, Y-H. Hou, L. Pitaevskii, S. Stringari, *Nature* **498**, 78 (2013).

[2] Y-H. Hou, L. Pitaevskii, S. Stringari, *Phys. Rev. A* **88**, 043630 (2013).