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Exploring low-temperature phases of spin-imbalanced 2D superfluids in box potentials

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In recent years, our group has created homogeneous ultracold Fermi gases in two-dimensional and three-dimensional box potentials. Using Bragg spectroscopy we have determined the dynamic structure factor of spin-balanced superfluids in the BEC-BCS crossover and extracted both the superfluid gap and the critical velocity [1-2]. By directly comparing 2D and 3D superfluids we could directly observe the influence of dimensionality on the stability of these strongly interacting fermionic superfluids [3].

On this poster, I will report on our ongoing effort to study spin-imbalanced homogeneous 2D Fermi gases. Here, many questions concerning the nature of the superfluid phase arise, e.g. whether there is a phase separation into a balanced superfluid and a (partially) polarized normal phase or whether a partially polarized superfluid forms. I will discuss how we prepare the coldest spin-imbalanced Fermi gases yet and present first results of the observed density profiles and Bragg spectra.

[1] L. Sobirey et al., Science 372, 844 (2021)
[2] H. Biss et al., PRL 128, 100401 (2022)
[3] L. Sobirey et al., PRL 129, 083601 (2022)

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