

# Superfluid density and critical temperature in the two-dimensional BCS-BEC crossover

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In two-dimensional superfluids quantized vortices play a key role in determining finite-temperature properties, as the superfluid phase and the normal state are separated by a vortex unbinding transition, the Berezinskii-Kosterlitz-Thouless transition. Very recent experiments with two-dimensional superfluid fermions [1] motivate the present work: we present theoretical results based on Gaussian fluctuations [2] and renormalization-group equations [3] showing that the universal jump of the superfluid density and the critical temperature crucially depend on the interaction strength. Our predictions provide a benchmark for experimental investigations of the two-dimensional BCS-BEC crossover with ultracold atoms.

- [1] V. Makhlov et al. Phys. Rev. Lett. **112**, 045301 (2014); M.G. Ries et al., Phys. Rev. Lett. **114**, 230401 (2015); I. Boettcher et al., Phys. Rev. Lett. **116**, 045303 (2016).
- [2] L. Salasnich, Phys. Rev. Lett. **118**, 130402 (2017).
- [3] G. Bighin and L. Salasnich, Sci. Rep. **7**, 45702 (2017).