

QUANTUM GASES SEMINAR



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Quantum scale anomaly and spatial coherence in a 2D Fermi superfluid

Quantum anomalies are violations of classical scaling symmetries caused by quantum fluctuations. Although they appear prominently in quantum field theory to regularize divergent physical quantities, their influence on experimental observables is difficult to discern. Here, we discovered a striking manifestation of a quantum anomaly in the momentum-space dynamics of a 2D Fermi superfluid of ultracold atoms. We measured the position and pair momentum distribution of the superfluid during a breathing mode cycle for different interaction strengths across the BEC-BCS crossover. Whereas the system exhibits self-similar evolution in the weakly interacting BEC and BCS limits, we found a violation in the strongly interacting regime. The signature of scale-invariance breaking is enhanced in the first-order coherence function. In particular, the power-law exponents that characterize long-range phase correlations in the system are modified due to this effect, indicating that the quantum anomaly has a significant influence on the critical properties of 2D superfluids.

Date:	Wednesday 15 January
Time:	11am
Venue:	L1, Seminar Room 107, 10 College Walk, Clayton

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