SFB/TRR 21 - Seminar

26. November 2010, Stuttgart

Cheng Chin

(University of Chicago, USA)

Observation of Scale Invariance and Universality in Two-Dimensional Quantum Gases

The collective behavior of a many-body system near a continuous phase transition is insensitive to the details of its microscopic physics. Characteristic features near the phase transition, called critical phenomena, are that the thermodynamic observables follow generalized scaling laws. The Berezinskii-Kosterlitz-Thouless (BKT) phase transition in two-dimensional Bose gases, for example, presents a particularly interesting case because the marginal dimensionality and intrinsic scaling symmetry result in a broad fluctuation regime which manifests itself in an extended range of scale invariant and universal behavior. We report the observation of a global invariance of scale and a universal description of 2D gases based on direct in situ optical imaging. The extracted universal thermodynamic functions confirm the wide critical regime near the BKT phase transition, provide a sensitive test to Monte Carlo calculations, and point toward a growing density-density correlations in the critical regime. Our observation raises new perspectives to explore further universal phenomena in the realm of quantum critical physics near a quantum phase transition.

26. November 2010, 14:00 Uhr

Universität Stuttgart, NWZII, Raum 3.123
Pfaffenwaldring 57, 70569 Stuttgart

CO.CO.MAT