Dynamic Kosterlitz-Thouless transition in 2D Bose mixtures and Bose-Fermi mixtures of ultra-cold atoms

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In this talk, I present two studies in the field of ultra-cold atoms. In the first, we propose a realistic experiment to demonstrate a dynamic Kosterlitz-Thouless transition in ultra-cold atomic gases in two dimensions. With a numerical implementation of the Truncated Wigner Approximation we simulate the time evolution of several correlation functions, which can be measured via matter wave interference. We demonstrate that the relaxational dynamics is well-described by a real-time renormalization group approach, and argue that these experiments can guide the development of a theoretical framework for the understanding of critical dynamics. In the second, I discuss the quantum phases of Bose-Fermi mixtures of 1D and 2D ultra-cold atom systems. These mixtures display a wide range of orders, from density wave order and polaron pairing in the weak-coupling limit, to phases of composite fermions in the strong-coupling limit. I will discuss their properties and ways to detect them.