

"Finite temperature one-dimensional bosons in disorder"

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Abstract:

I will show how the interaction between bosons leads to a finite temperature insulator-fluid transition for one-dimensional disordered bosons, where all single-particle states are localized. This is a true, albeit non-conventional, phase transition. In the fluid phase the mass transport is possible, whereas in the insulator phase it is completely blocked even at finite temperatures, and I will discuss the phase diagram. I then turn to particles in a 1D quasiperiodic potential (Aubry-Azbel-Harper model), consisting of a primary deep lattice and superimposed incommensurate shallow lattice. In this potential single-particle states are localized at any energy if (twice) the hopping amplitude in the primary lattice is smaller than the amplitude of the secondary lattice. The interaction between particles may lead to the delocalization transition, and I will obtain the finite temperature phase diagram for weakly interacting bosons. Counterintuitively, in a wide temperature range an increase in temperature requires a higher interaction strength for delocalization and thus favors the insulator state. In other words, we have an object which "gets frozen" with increasing temperature.