Finite temperature interacting disordered bosons in two dimensions

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Abstract

In this talk, I will present a study of the phase transitions in a two dimensional weakly interacting Bose gas in a random potential at finite temperatures. It is possible to identify superfluid, normal fluid and insulator phases. The study of the effect of interaction between particles on localization demonstrates that interacting particles can undergo a many-body localization-delocalization transition, that is the transition from insulator to fluid state. I will also discuss the influence of disorder on the BKT transition between superfluid and normal fluid, in order to construct the phase diagram. At T=0 one has a tricritical point, where the three phases coexist. I will give an argument in support of this conclusion. It is shown that the truncation of the energy distribution function at the trap barrier, which is a generic phenomenon in evaporative cooling of cold atoms, limits the growth of the localization length, so that the insulator phase is present at any temperature.

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