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Towards an FRG study of many-body localization

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Disorder is known to induce a localized phase in a 1D Bose gas at zero temperature. It has been predicted that this insulating phase can survive at low temperatures, but the possible existence of such many-body localized phases in 1D quantum systems is a controversial issue. We discuss the finite-temperature phase diagram of a 1D disordered boson system using bosonization, the replica formalism and FRG. While the derivative expansion indicates that localization effects are still important at non-zero temperatures, it fails at low temperatures and we argue that a final answer regarding the existence of a true many-body localized phase can only be obtained from the BMW approximation.

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