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Derivation of invariant Gibbs measures for nonlinear Schroedinger equations from many body quantum states.

We prove that Gibbs measures of nonlinear Schroedinger equations of Hartree-type arise as high-temperature limits of appropriately modified thermal states in many-body quantum mechanics. In dimensions $d=2,3$ these Gibbs measures are supported on singular distributions and Wick ordering of the interaction is necessary. Our proof is based on a perturbative expansion in the interaction, organised in a diagrammatic representation, and on Borel resummation of the resulting series.