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Spatial Dependence of Entropy in Trapped Ultracold Bose Gases¹ LINCOLN D. CARR, Colorado School of Mines, MARKUS K. OBERTHALER, Kirchhoff Institute for Physics, University of Heidelberg — We find a new physical regime in the trapped Bose-Hubbard Hamiltonian using time-evolving block decimation. Between Mott-insulating and superfluid phases, the latter induced by trap compression, a spatially self-organized state appears in which non-local entropy signals entanglement between spatially distant superfluid shells. We suggest a linear rather than harmonic potential as an ideal way to observe such a self-organized system. We also explore both quantum information and thermal entropies in the superfluid regime, finding that while the former follows the density closely the latter can be strongly manipulated with the mean field.

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