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Interaction as a UV-regulator for entanglement in Bose-Einstein condensates.

Monday, 28 June 2021 12:00 (30 minutes)

The entanglement between spatial regions in an interacting Bose-Einstein condensate is investigated using a quantum field theoretic formalism. Regions that are small compared to the healing length are governed by a non-relativistic quantum field theory in the vacuum limit, and we show that the latter has vanishing entanglement. In the opposite limit of a region that is large compared to the healing length, the entanglement entropy is like in the vacuum of a relativistic theory where the velocity of light is replaced with the velocity of sound and where the inverse healing length provides a natural ultraviolet regularization scale. We show these results, by calculating the von Neumann and Rényi entanglement entropies for a one-dimensional quasi-condensate.

Presenter: SANCHEZ KUNTZ, Natalia (Heidelberg University)

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