

Dynamical Gauge Fields and Broken Scale Invariance with Ultracold Atoms

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I will discuss the close connection between parity order near the superfluid to Mott transition as measured via single-site resolution images of cold atoms in optical lattices and Wilson-Loops in a dynamical gauge theory.

In the second part of the talk, I will present examples of broken scale invariance in atomic physics. In particular, I will discuss the origin of van der Waals universality in the spectrum of Efimov bound states and its limits. Finally, it is shown that the operator product expansion for gases with zero-range interactions leads to universal behavior at short distances and times. This shows up e.g. in the momentum distribution and the dynamical structure factor of strongly interacting Bose gases.