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Quantum critical dynamics without quasiparticles

WILLIAM WITCZAK-KREMPA, Perimeter Institute for Theoretical Physics

Understanding the real-time behavior of quantum systems without long-lived excitations (quasiparticles) constitutes a challenging problem. I'll discuss recent progress concerning the dynamics of quantum critical systems, in which quantum fluctuations destroy quasiparticles. I'll show concrete results stemming from an interdisciplinary approach combining field theory, quantum Monte Carlo simulations, and the holographic gauge/gravity duality (AdS/CFT). In particular, experimental predictions will be made regarding the charge response near the superfluid-insulator quantum critical transition of bosons on a 2d lattice. Extensions to other observables and universality classes will be discussed.

[1] W. Witczak-Krempa, E. S. Sorensen, S. Sachdev, Nature Physics 10, 361 (2014)
[2] E. Katz, S. Sachdev, E. S. Sorensen, W. Witczak-Krempa, arXiv:1409:3841