

# Exploring quantum criticality in a 4D quantum disordered system

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The localization-delocalization transition in disordered media is ubiquitous in quantum and classical systems. It is one of the rare transitions for which there is no mean-field theory valid in any dimensions. We report the observation and characterization of the Anderson transition in 4D using ultracold atoms as a quantum simulator with synthetic dimensions.

We characterize the universal dynamics in the vicinity of the phase transition and measure the critical exponents describing the scale-invariant properties of the critical dynamics. The critical exponents verify Wegner's scaling relation, and we demonstrate experimentally that the Anderson transition is not mean-field in dimension four.

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