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The Hilbert-glass transitions: new universality of temperature-tuned many-body dynamical quantum criticality DAVID PEKKER, Department of Physics, Caltech; Department of Physics and Astronomy, University of Pittsburgh, GIL REFAEL, Department of Physics, Caltech, EHUD ALTMAN, Department of Condensed Matter Physics, Weizmann Institute of Science; Department of Physics, UC Berkeley, EUGENE DEMLER, Department of Physics, Harvard University, VADIM OGANESYAN, Department of Engineering Science and Physics, College of Staten Island, CUNY; The Graduate Center, CUNY — We study a new class of unconventional critical phenomena that is characterized by singularities only in dynamical quantities and has no thermodynamic signatures. Describing this purely dynamical quantum criticality is technically challenging as understanding the finite-temperature dynamics necessarily requires averaging over a large number of matrix elements between many-body eigenstates. Here we develop a real-space renormalization group method for excited state (RSRG-X) that allows us to overcome this challenge in a large class of models. We characterize a specific example: the 1D disordered transverse field Ising model with generic interactions. While thermodynamic phase transitions are generally forbidden in this model, using RSRG-X we find a finite-temperature dynamical transition between two localized phases. The transition is characterized by non-analyticities in the low frequency heat conductivity and in the long-time (dynamic) spin correlation function. The latter is a consequence of an up-down spin symmetry that results in the appearance of an Edwards-Anderson-like order parameter in one of the localized phases.

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