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Protecting clean critical points by local disorder correlations[1] J.A. HOYOS, Universidade de São Paulo, NICOLAS LAFLORENCIE, Universite Paris-Sud, ANDRÉ VIEIRA, Universidade de São Paulo, THOMAS VOJTA, Missouri University of Science and Technology — We show that a broad class of quantum critical points can be stable against locally correlated disorder even if they are unstable against uncorrelated disorder. Although this result seemingly contradicts the Harris criterion, it follows naturally from the absence of a random-mass term in the associated order-parameter field theory. We illustrate the general concept with explicit calculations for quantum spin-chain models. Instead of the infinite-randomness physics induced by uncorrelated disorder, we find that weak locally correlated disorder is irrelevant. For larger disorder, we find a line of critical points with unusual properties such as an increase of the entanglement entropy with the disorder strength. We also propose experimental realizations in the context of quantum magnetism and cold-atom physics.

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