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Quantum Monte Carlo studies of Shannon-Renyi entropies and participation spectra in interacting spin systems DAVID J. LUITZ, FABIEN ALET, NICOLAS LAFLORENCIE, University of Toulouse and CNRS, Toulouse, France — Shannon-Renyi entropies are measures of the participation of basis states in a wave function. Previous work for one dimensional systems showed that they exhibit a subleading scaling behavior with system size that contains universal information, such as e.g. the Luttinger Liquid parameter. Here, we introduce quantum Monte Carlo schemes to calculate these quantities and the related participation spectra for unfrustrated quantum many body systems in any dimension and apply them to interacting spin systems. Our results demonstrate the universality of subleading scaling terms for different kinds of phase transitions with a spontaneous breaking of discrete or continuous symmetries and at quantum critical points. Additionally, we also discuss the signature of quantum phase transitions in the participation spectra of subsystems.

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