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Detecting Quantum Phase Transitions using Classical Noises YAN CHEN, YINCHEN HE, Fudan University — We theoretically propose that the classical noise spectra provide an efficient and straightforward way to detect the quantum phase transition points in low-dimensional quantum spin systems. By using Ornstein-Uhlenbeck noise, we employ both a quadratic response theory and time-dependent density matrix renormalization group method to study the quantum system. In the non-Markovian region, the time evolutions of physical observables exhibit distinct behaviors for different quantum phases. In addition, we have the freedom to choose various noises to detect peculiar quantum phases. This method can be used to measure the three body correlation function directly. We demonstrate that the method can determine faithfully the quantum transition points of the transverse Ising model as well as spin-1 bilinear-biquadratic Heisenberrg model. The possible experimental realizations of noise detection are discussed.

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