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Finite-size scaling of string order parameters characterizing the Haldane phase HIROSHI UEDA, Graduate School of Engineering Science, Osaka University, HIROKI NAKANO, Graduate School of Material Science, University of Hyogo, KOICHI KUSAKABE, Graduate School of Engineering Science, Osaka University — We have developed a numerical procedure to clarify the critical behavior near a quantum phase transition by analyzing a multi- point correlation function characterizing the ground state. The procedure focuses the gradient of the inversed-system-size dependence of the correlation function on a logarithmic plot. It requires only the correlation functions of several finite sizes under the same condition as a candidate for the long-range order. We apply the analysis to the string order parameter of the $S = 1$ XXZ chain with uniaxial single-ion anisotropy obtained by the density matrix renormalization group method. The present analysis gives precise estimates of transition points and critical exponents, ν and η, in Ising transitions, Gaussian transitions, and Berezinskii- Kosterlitz- Thouless transitions are consistent with results obtained from the analysis of the energy-level structure. This method will contributes much for a direct observation of quantum phase transitions.

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