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Quantum phase transitions of 2-d dimerized spin-1/2 Heisenberg models with spatial anisotropy MING-TSO KAO, DENG-RUEI TAN, FU-JIUN JIANG, National Taiwan Normal University, FU-JIUN JIANG TEAM — Motivated by the unexpected Monte Carlo results as well as the theoretical proposal of a large correction to scaling regarding the critical theory for the staggered-dimer spin-1/2 Heisenberg model on the sqare lattice, we study the phase transitions induced by dimerization of several dimerized quantum Heisenberg models with spatial anisotropy using first principles Monte Carlo method. We focus on investigating the finite-size scaling of the observables $\rho_{s1}2L$ and $\rho_{s2}2L$ since such strategy might reveal the subtlety of determining the corresponding critical theory as suggest in [1]. Here ρ_{si} with $i \in \{1, 2\}$ and L refer to the spin stiffness in the i-direction and the spatial box size, respectively. Surprisingly, similar to the results found in [1], while we do observe a large correction to scaling for $\rho_{s1}2L$ of the staggered-dimer model on the honeycomb lattice, the observable $\rho_{s2}2L$ of the same model receives a negligible correction to its scaling. Further, our simulation data for all the models considered here including the herringbone- and ladder-dimer models are compatible with the established numerical values for $\nu, \beta/\nu$ and ω in the $O(3)$ universality class. To explain the results presented in this study, a deepened theoretical understanding for the critical theories of the models considered here is required.

Deng-Ruei Tan
National Taiwan Normal University

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