

Correlation functions of the Ising model on the stacked pentagon lattice

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Thermodynamic properties of the classical Ising model on a hierarchical lattice is studied by tensor network methods. The lattice consists of pentagons, where 2, 3 or 4 of them meet at each vertex, which is the lattice site. Taking the spin configuration sum other than the lowest spin row, we obtain the boundary state at the bottom of the system. This summation can be performed numerically by means of the TEBD method, since the entanglement of the state is not strong. Power law decay of the correlation function is numerically confirmed in the relatively high temperature region. Besides, from the hierarchical structure of the lattice, it is also possible to take spin configuration sum partially from the bottom of the system, in the manner as the CTMRG or TRG method. Calculated results suggests the presence of the bulk phase transition at the top of the system. Generalization of the lattice can be considered such as the stacked square lattice drawn inside a triangle.

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