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Quantum phase diagram of the spin ladder model with next-nearest neighbor interactions YANCHAO LI, HAIQING LIN, Beijing Computational Science Research Center, Beijing 100084, People's Republic of China — By using the density matrix renormalization group technique, we investigate the quantum phase diagram of a two-leg spin-1/2 ladder with diagonal and in-chain next-nearest neighbor interactions for both anti-ferromagnetic and ferromagnetic frustrated cases. Through analyzing the correlation function and four-site entropy, the existence of the controversial columnar dimer phase is confirmed, and the phase transitions caused by the in-chain next-nearest neighbor interaction are presented for the anti-ferromagnetic frustrated case; meanwhile, for the ferromagnetic frustrated case, we find that the system possesses a tetramer phase, a ferromagnetic phase, and the states I and II, and the spin arrangements for I and II are determined.

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