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Global phase diagram of the stacked frustrated triangular Ising system in a transverse field: a quantum Monte Carlo study HAN MA, JIE LOU, Fudan University, ALEXEI TSVELIK, Brookhaven National Laboratory, NAOKI KAWASHIMA, Institute for Solid State Physics, University of Tokyo, YAN CHEN, Fudan University — The global phase diagram of the stacked frustrated triangular Ising magnet in a transverse field is obtained by using continuous time quantum Monte Carlo method. As the inter-plane interaction is strengthened, an first-order transition from a ferrimagnetic phase with two equivalent sublattices (FR2) to a partially disordered antiferrimagnetic phase (AF) occurs at small transverse field. In the quasi-one dimensional case, i.e. antiferromagnetically coupled transverse Ising chains, which corresponds to the realistic material CoNb2O6, our simulation reveals the existence of the low-field FR2 phase. In contrast, in the quasi-two dimensional limit, i.e. weakly coupled triangular Ising magnet, upon increasing the transverse magnetic field, the FR2 and AF phases successively appear in the order. In the vicinity of the ordered-disordered phase transition, the nature of phases can hardly be identified within our computational ability. At large transverse field, the paramagnetic phase trivially appears. Future experiments on CoNb2O6 at low temperature are expected to evidence the different magnetic patterns of this frustrated magnet based on our results in the quasi-one dimensional limit.

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