

# Tensor network study of the $m = 1/2$ magnetization plateau in the Shastry-Sutherland model at finite temperature

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The two-dimensional iPEPS tensor network is evolved in imaginary time with the full update (FU) algorithm to simulate the Shastry-Sutherland model in a magnetic field at finite temperature directly in the thermodynamic limit. We focus on the phase transition into the  $m = 1/2$  magnetization plateau, which was observed in experiments on  $\text{SrCu}_2(\text{BO}_3)_2$ . For the largest simulated bond dimension, the early evolution in the high-temperature regime is simulated with the simple update (SU) scheme and then, as the correlation length increases, continued with the FU scheme towards the critical regime. We apply a small-symmetry breaking bias field and then extrapolate towards zero bias using a simple scaling theory in the bias field. The combined SU+FU scheme provides an accurate estimate of the critical temperature, even though the results could not be fully converged in the bond dimension in the vicinity of the transition. The critical temperature estimate is improved with a generalized scaling theory that combines two divergent length scales: one due to the bias and the other due to the finite bond dimension. The obtained results are consistent with the transition being in the universality class of the two-dimensional classical Ising model. The estimated critical temperature is 3.5(2)K, which is well above the temperature 2.1K used in the experiments.

## References:

[1] Phys. Rev. B 103, 075113 (2021)