Thermodynamics of the 2D $S = 1/2$ Shastry–Sutherland model and $SrCu_2(BO_3)_2$

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Reliable computation of the low-temperature thermodynamic properties of highly frustrated quantum magnets is on the one hand highly relevant for experiments, but on the other hand a considerable challenge since, e.g., conventional Quantum-Monte-Carlo (QMC) simulations suffer from a severe minus sign problem. $SrCu_2(BO_3)_2$ is famous for its rich physical properties and as a realization of the two-dimensional spin-1/2 Shastry–Sutherland model. Notwithstanding recent progress with QMC simulations in the dimer basis, the parameter regime relevant to $SrCu_2(BO_3)_2$ has remained inaccessible [1]. Here we present accurate results obtained from two other methods, namely Thermal Pure Quantum (TPQ) states and infinite Projected Entangled Pair States (iPEPS). We observe the emergence of a low-temperature peak in the specific heat C and relate it to the large number of bound states that emerge close to the first-order transition from the dimer to the plaquette phase.

1. S. Wessel, I. Niesen, J. Stapmanns, B. Normand, F. Mila, P. Corboz, A. Honecker, Phys. Rev. B **98**, 174432 (2018).