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Low-energy theory of the spin-1/2 Heisenberg antiferromagnet on the Kagome strip[1] AMIR M-AGHAEI, University of California, Riverside, RYAN V. MISHMASH, California Institute of Technology, BELA BAUER, Station Q, Microsoft Research, KIRILL SHTENGEL, University of California, Riverside —
We study the ground state properties of the spin-1/2 Heisenberg antiferromagnet on the Kagome strip, a quasi-1D ladder of corner-sharing triangles. We use the density matrix renormalization group (DMRG) to explore the phase diagram numerically by calculating several physical quantities, including the energy gap, entanglement entropy, and various spin and bond correlation functions. In the fully frustrated regime of our model, we find a gapless state characterized by power-law decaying correlation functions at incommensurate wavevectors. Guided by this observation, we analytically consider a two-band system of fermionic spinons coupled to a U(1) gauge field using Bosonization. This approach suggests a potentially stable two-band spin Bose metal (SBM) phase, as well as other possible phases derived from its instabilities. Furthermore, we construct variational wavefunctions inspired by this theory and measure physical observables using variational Monte Carlo (VMC). The VMC-DMRG agreement indicates that the two-band SBM is a good starting point to understand the low-energy physics of the Kagome strip antiferromagnet.

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