

Quantum antiferromagnet in a magnetic field on frustrated kagome-lattice bilayer

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We consider the spin-1/2 antiferromagnetic isotropic Heisenberg model on a kagome-lattice bilayer in the presence of an external magnetic field. We include an interlayer frustration term and study the case of ideal frustration when the nearest-neighbor intralayer interactions and the frustrating interlayer interactions are of the same strength. In this case, a completely dispersionless (flat) magnon band may become the lowest-energy one and we can use the localized-magnon picture to examine the system in more simple terms. In the vicinity of the saturation field, we map the low-energy states of the considered quantum system onto the spatial configurations of hard parallelograms on an auxiliary kagome lattice and face a much simpler problem of classical statistical mechanics. It allows us to construct an effective model and study the low-temperature thermodynamic properties of the original quantum model. Also, an effective model was constructed using perturbation theory.

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