Low-Temperature Specific Heat of Quantum sine-Gordon Spin System $KCuGaF_6$

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One dimensional quantum spin system has been of great interest for both experimenters and theorists for more than a half of a century. Most of physical quantities for spin-1/2 uniform Heisenberg antiferromagnetic chain (AFHC) were calculated accurately. Now, low energy excitations driven by anisotropy and frustration are being actively studied. $KCuGaF_6$ is spin-1/2 AFHC characterized by staggered field that induced perpendicular to applied magnetic field due to its low symmetric crystal structure. Because staggered field plays as anisotropy of exchange interaction in the system, the low energy excitation has a finite gap. It was shown that the excitation energy of the gap is described by elementary excitations in quantum sine-Gordon (SG) spin system.[1],[2] We measured specific heat of $KCuGaF_6$ to investigate the thermodynamics governed by elementary excitations, solitons and breathers, characteristic of quantum SG model. Results will be discussed comparing with results of ESR measurement[3] and neutron scattering.

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