Spin excitation spectrum the S=1/2 square lattice Heisenberg antiferromagnet elucidated with polarization analysis

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Abstract:
Strong quantum fluctuations in the ground state of the S=1/2 Heisenberg antiferromagnet on a square lattice lead to a reduction by 40% in the magnitude of the ordered sublattice moment relative to classical expectations. Using polarized triple axis neutron scattering we have
investigated the fate of this non-classical fluctuating moment in Cu(DCOO)2·4D2O which is an excellent realization of the theoretical model. We find that whereas the long wavelength excitations can be modelled succesfully with linear spin wave theory, the short wavelength excitations can not. The possible implications of the latter finding for the nature of the unknown ground state are discussed.