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Magnetic excitations of the S=1/2 square lattice antiferromagnet $CuF_2(H_2O)_2$(pyz) (pyz=pyrazine) CUIHUAN WANG, MARK D. LUMSDEN, RANDY S. FISHMAN, GEORG EHLERS, TAO HONG, Oak Ridge National Laboratory, JOHN A. SCHLUETER, CORTNEY DUNMARS, Argonne National Laboratory, JAMIE L. MANSON, Eastern Washington University, ANDREW D. CHRISTIANSON, Oak Ridge National Laboratory — We have studied the magnetic structure and excitations of the two dimensional S=1/2 square lattice antiferromagnet deuterated $CuF_2(H_2O)_2$(pyz). The neutron diffraction measurements show that the antiferromagnetic structure is collinearly arranged with the estimated magnetic moment of 0.60±0.07 μ_B/Cu. This value is much smaller than the single ion magnetic moment, reflecting the presence of strong quantum fluctuations. The spin wave dispersion from magnetic zone center to the zone boundary point ($\pi/2$ $\pi/2$) can be roughly described by a 2d Heisenberg model with a magnetic exchange constant J_{2d}=1.099 ± 0.002 meV and a tiny contribution from an inter-plane interaction (J_{perp} is about 1% of J_{2d}). This is close to the first principles DFT calculations while about two times larger than the value extracted by fitting of the magnetic susceptibility. Compared to ($\pi/2$ $\pi/2$), preliminary measurements of the spin excitation at the zone boundary point (π 0) shows an obvious suppression of the excitation energy. This suppression is expected on the basis of quantum Monte Carlo and series expansion calculations for the quantum corrections of linear spin wave theory.

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