FIELD INDUCED STAGGERED MAGNETIZATION IN Cs$_2$CuCl$_4$.

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Introduction

Cs$_2$CuCl$_4$ is a 2D S=1/2 frustrated Heisenberg antiferromagnet on an anisotropic triangular lattice that is believed to exhibits fractional spin excitations, as inferred from neutron scattering measurements$^1$. NMR results$^2$ indicate the importance of anisotropic interactions in the Hamiltonian describing the spin degrees of freedom in this compound.

Experimental

$^{133}$Cs NMR data on single crystals of Cs$_2$CuCl$_4$ were obtained using the top-loading $^3$He/$^4$He dilution refrigerator and 18 T magnet at the miliKelvin facility at NHMFL.

Fig. a) Field dependence of the $^{133}$Cs(A) spectra at T= 50 mK in magnetic field applied transverse to the spin planes (bc). Fig. b) The splitting, defined as the difference between to the two left peaks, as a function of the applied field. The green is the measured splitting. The red line is the NMR artifact due to the orientation of the principal axis of the shift tensor with respect to the crystalline axis. The blue is the splitting after the subtraction of the NMR artifact.

Results and Discussion

In Fig. a) field dependence of the $^{133}$Cs(A) NMR spectra at T=60 mK in magnetic field applied transverse to the Cu spin planes, (bc), is shown. Observed lineshapes are characteristic of the incommensurate spin structure (light and dark green in the figure). In addition, the presence of two distinct magnetic cell is detected. The difference between two left peaks, referred as the splitting, is plotted as a function of the field in Fig. b). The splitting represents the difference in the average magnetization between the two cells. In the field above approximately 9 T, the splitting is caused by misalignment of the sample in the (ac) plane. However, this contribution cannot account of the value of the splitting below the saturation field.

Conclusions

The results indicate the presence of the field induced staggered magnetization induced by a weak anisotropic interaction.

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References