**Anomalous Spin Dynamics of the Coupled Spin-Tetramer Compound CuSeO3**

Lee, S.; Lee, W.-J.; Choi, K.-Y. (Chung-Ang U., Korea, Physics); van Tol, J.; Ozarowski, A. (NHMFL) and

Berger, H. (École Polytechnique Fédérale de Lausanne, Switzerland, ICMP)

**Introduction**

 Coupled spin-tetrahedral systems continue to receive a high level of interest as they host localized and collective magnetism in a single compound. The former is related to an isolated spin tetrahedron while the latter intercluster interactions control a collective magnetic behavior [1]. The particularly prominent example is the linear spin tetramer compound CuSeO3 [2]. CuSeO3 has two inequivalent intratetramer interactions, J1 and J2 and exhibits antiferromagnetic (AFM) long-range order below *T*N = 8 K. X-band electron spin resonance (ESR) and torque magnetometry studies [3] showed a rotation of the magnetic principal axis above 50 K and a strong temperature dependence of the effective g-factor along specific crystallographic directions. However, little is known about spin dynamics through *T*N.

**Experimental**

 High-frequency ESR experiments were performed at 240 GHz using a home-built superheterodyne spectrometer equipped with a sweepable 12.5 T superconducting magnet at the EMR Facility.

**Results and Discussion**

  

**Fig. 1** (Left panel) Temperature dependence of ESR spectra at 240 GHz. (Middle panel) Temperature dependence of peak-to-peak linewidth, ∆*H*pp and g-factor. (Right panel) Temperature dependence of ∆*H*pp plotted on a log-log scale. *T*\* denotes the magnetic anomaly.

In **Fig. 1** we present the temperature dependence of the ESR spectra and their parameters. With decreasing temperature both the ESR linewidth Δ*H*pp and g-factor decrease monotonically down to 50 K, and then show the respective critical broadening and upturn at *T*N = 9 K. For temperatures below *T*N, a sharp antiferromagnetic resonance (AFMR) mode is observed. As shown in the right panel of **Fig. 1**, the AFMR linewidth changes its power-law behavior Δ*H*pp ∝*T*n from n = 7.2(4) to 2.3(3) around *T*\* = 6.5 K. The determined exponents deviate from n = 4 expected for a classical antiferromagnet, signifying persisting quantum fluctuations. The varying exponent through *T*\* suggests the presence of magnetic anomaly in the magnetic ordered state. Possibly, this is linked to the rearrangement of an ordered moment, which should be confirmed by future neutron experiments.

**Conclusions**

 ESR measurements of CuSeO3 unveil a magnetic anomaly at *T*\* = 6.5 K. This is tentatively ascribed to a spin reordering and highlights a role of intertetramer interactions which control low-energy and -temperature magnetic properties.

**References**

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[3] Herak, M., *et al*., Phys. Rev., B **89**, 184411 (2014).