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μSR on a Driven Helimagnet

To extend μSR to driven samples, we employ a microwave stimulus to excite the sample by ferromagnetic resonance (FMR) and probe the resultant effect with the muon. The experiments were performed on the helimagnet Cu_2OSeO_3, which exhibits distinct FMR and μSR signatures throughout its magnetic phase diagram. FMR excitations in the helical state cause precession, which is characterized by a dynamic component M_{uw} and an associated reduction in static moment ΔM (Fig. 1a). Both LF- and TF-μSR data exhibit a reduction in the frequency ν_{fast} of the fast-oscillation component, which we attribute to the reduction of the static moment ΔM (Fig. 1b for LF).

Besides ΔM and M_{uw}, a MHz precession of the entire magnetic helix akin to a screw has been predicted theoretically under FMR excitation [1]. While invisible in ordinary FMR, our combined FMR-μSR approach is well suited for detection of this technologically relevant mode. Our preliminary LF data indicate a small change in the damping rate σ_{slow} of the slow decay component (see Fig. 1c). Further experiments at lower temperature and stronger microwave drive were, however, not supportive of such a screw mode.

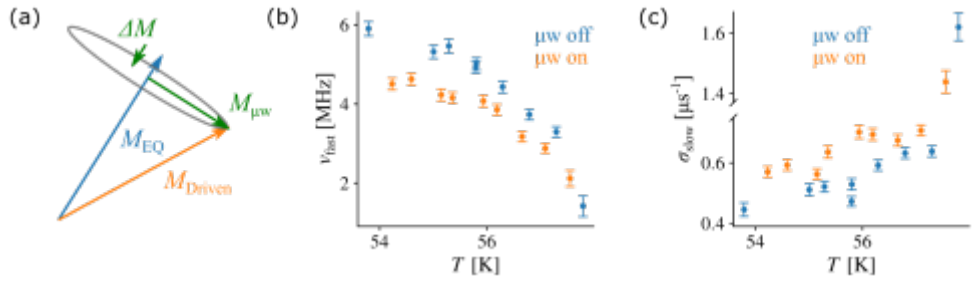

Figure 1: (a) Dynamic M_{uw} and ΔM of static component (b,c) ν_{fast} and σ_{slow} from LF data

[1] N. del Ser, L. Heinen, A. Rosch, SciPost Phys. 11, 009 (2021).

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