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Lifetimes of spin excitations with three-axis spin-echo

Special care is needed for spin echo spectroscopy of spin excitations. Even in the case of antiferromagnets (AF), which do not depolarize the neutron beam, the scattering on spin excitations induces neutron spin flips that affect the spin echo signal. We review three cases from TRISP at the FRM II. The first case is a straightforward example of magnons in the uniaxial AF MnF₂, where by proper choice of the scattering plane the well known exponential decay of the spin echo polarization vs. τ is observed. The second example involves critical scattering in the classical AF RbMnF₄, where the interference of different spin flip channels leads to a complicated oscillations of $P(\tau)$, such that the simple exponential analysis fails. The third example, critical fluctuations in close to quantum criticality in CeCu_{5.8}Au_{0.2} is more challenging. In this case, in addition to the neutron spin flips from the critical scattering, a strong incoherent background originating from the Cu moments obscures the signal further. There is no analytical expression for $P(\tau)$ for the latter two cases. However, incorporating a ray-tracing model of the spectrometer and the sample into the fit makes the analysis straightforward and transparent.

Session

Magnetism

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