THZ ABSORPTION SPECTROSCOPY STUDY OF SPIN WAVES IN ORTHOFERRITE $YFeO_3$ IN A MAGNETIC FIELD

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In $YFeO_3$ iron spins S=5/2 arrange in an antiferromagnetic (AFM) canted state $\Gamma 4(G_a,F_c,A_b)$ well above room temperature. Such high Néel temperature may be a prerequisite for possible future applications. With four spins per unit cell, its spin structure is described by a combination of exchange interactions, Dzyaloshinskii-Moriya (DM) interactions, and single-ion anisotropies (SIA). Since only Fe ions have the non-zero magnetic moment, this compound is a perfect modelling system for spin interactions and a step towards understanding more complex materials, possibly those with multiferroic properties.

We measured absorption of THz radiation in $YFeO_3$ single crystals at the temperature 3 K in the magnetic field up to B = 17 T using a setup consisting of a Martin-Puplett spectrometer with a liquid helium bath cryostat and a superconducting magnet. Two spin wave modes were observed at the Γ-point with zero-field energies 1.2 and 2.4 meV. From the magnetic field dependence of mode energies (Fig. 1), we have quantified the parameters of DM interactions and SIA, and thus refined the earlier proposed models [1,2].

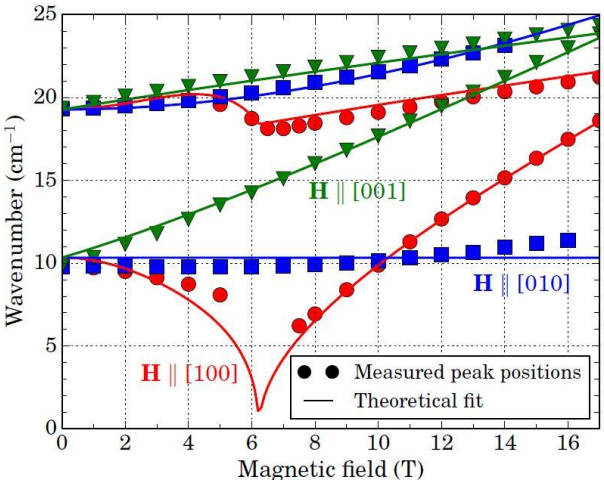

Figure 1: Magnetic field dependence of the spin wave energies (markers) with the field applied along the three crystallographic axes and the theoretical fit (solid lines).

References

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