New excitations in Spintronics



Contribution ID: 23

Type: Contributed talk

$\begin{array}{l} \mbox{Magnetic order and single-ion anisotropy in} \\ \mbox{Tb}_3 \mbox{Ga}_5 \mbox{O}_{12} \end{array}$

Terbium gallium garnet (TGG), Tb₃Ga₅O₁₂, is well known for its applications in laser optics, but also for its puzzling low-temperature physics. Its low-temperature ordered structure consists of anisotropic magnetic moments, originating from Tb³⁺ ions sitting on interpenetrating hyperkagome lattices. In this talk we revise these findings thanks to recent time-of-flight neutron powder diffraction experiments, and we contrast them to the picture of the single-ion environment measured via inelastic powder neutron scattering. From a theoretical perspective, we discuss the projection over the effective quasi-doublet ground state of the crystal-field exploiting the general relationship between the local anisotropy and the time-reversal properties of non-Kramers magnetic ions [1]. More specifically for TGG, the structure of the crystal-field states will be analysed with respect to the role they can play in hyperfine-driven phenomena of magnetic ordering [2] as well as in spin-phonon coupling for the thermal Hall effect [3,4].

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