

Rare Earth iron Garnets from the neutron scatterer viewpoint

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Yttrium iron garnet ($\text{Y}_3\text{Fe}_5\text{O}_{12}$) has, since its discovery in 1957, fundamentally contributed to the development of important research fields such as spintronics, magnonics and hybrid quantum information systems. Iron garnets incorporating magnetic rare-earth ions are relatively less well-known, but have also been studied for their interesting spin transport phenomena, magnetoelectric properties and magneto-optical effects. Using extensive inelastic neutron scattering measurements, we show how the spectrum and the microscopic magnetic properties of the compound can be understood [1]. We extend our study to understand the effect of magnetic fields on the low energy magnetic excitations of the compound. A notable observation is a magnetic phase transition that takes place when the field is applied along the $\langle 111 \rangle$ crystallographic directions relative to the cubic unit cell. Moreover, we show how magnetic fields up to 7 T influence the hybridised $4f-3d$ magnetic excitations of the compound, and describe how the new experimental findings may be interpreted within the magnetic model we recently developed for $\text{Yb}_3\text{Fe}_5\text{O}_{12}$ [1].

[1] V. Peçanha-Antonio *et al.* Physical Review B **105**, 104422 (2022)