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Spin wave excitations and two sublattice interactions of 153EuMn2Ge2

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The magnetic properties of the ThCr2Si2 type rare earth intermetallics have been shown to display a diverse range of physical properties including superconducting and magnetocaloric behaviour. The europium-based intermetallics are of particular scientific interest due to their intermediate valence, as highlighted by the series EuMn2Ge2 and EuMn2Si2 which demonstrate thermally driven valence transitions3 with EuMn2Ge2 of particular interest due to the intermediate valence and thermally driven valence transition. While neutron diffraction has demonstrated that the Mn sublattice orders at 667(9) K, more recent work has demonstrated that the Eu undergoes a transition to magnetic long range order at 10 K.

Here we report the inelastic neutron scattering investigation of the rare earth intermetallic EuMn2Ge2 carried out at Pelican, ACNS, ANSTO over the temperature range ~1.5 K – 20 K. The spectrum shows a complex temperature dependence with a different spectrum observed at 7 K and above this temperature, despite being in the same ordered phase. These observations have been modelled using linear spin wave theory (LSWT), this has allowed us to parametrise the exchange Hamiltonian and rationalise the observation of a spin gap.

Topics

Magnetism and Condensed Matter

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