

ESR study of the spin ladder with uniform Dzyaloshinskii-Moriya interaction

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Abstract

©2015 American Physical Society. Evolution of the ESR absorption in a strong-leg spin ladder magnet $(\text{C}_7\text{H}_{10}\text{N})_2\text{CuBr}_4$ (abbreviated as DIMPY) is studied from 300 K to 400 mK. Temperature dependence of the ESR relaxation follows a staircase of crossovers between different relaxation regimes. We argue that the main mechanism of ESR line broadening in DIMPY is uniform Dzyaloshinskii-Moriya interaction ($|D|=0.31$ K) with an effective longitudinal component along an exchange bond of Cu ions within the legs resulting from the low crystal symmetry of DIMPY and nontrivial orbital ordering. The same Dzyaloshinskii-Moriya interaction along with other weaker anisotropic spin-spin interactions results in the lifting of the triplet excitation degeneracy, revealed through the weak splitting of the ESR absorption at low temperatures.

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