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Inelastic neutron scattering studies of magnons in the conical and field-polarized phase of MnSi

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Various chiral spin structures, stabilized by the antisymmetric Dzyaloshinsky-Moriya interaction (DMI), are known to occur in the cubic chiral magnet MnSi. Strongly coupled, low-energy helimagnon bands are a universal characteristic of chiral systems and were studied in the presence of multiple domains [1] and the single domain phase [2]. Furthermore, a non-reciprocal magnon dispersion $E(\vec{q}) \neq E(-\vec{q})$ was observed in MnSi [3].

We present a comprehensive study of the magnetic field dependence of the magnon dispersion covering the helical phase and the field-polarized phase. The related inelastic neutron scattering experiments have been conducted at the cold triple-axis spectrometer MIRA (FRM2) and TASP (PSI). Our study determines the evolution of the magnetic structure factor across the continuous phase transition at the critical magnetic field H_{c2}, notably its non-reciprocity [4]. Using the theoretical framework [5], developed by M. Garst, we calculated the dispersion and spectral weights of the probed magnon branches. Factoring in the instrument resolution, we achieved excellent agreement between the theoretical predictions and the experimental results [4, 6].

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