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Full magnetic dispersion relation in the frustrated quasi-1D ferromagnet $Ca_2Y_2Cu_5O_{10}$ M. MATSUDA, J. MA, V. O. GARLEA, Quantum Condensed Matter Division, Oak Ridge National Laboratory, S. NISHIMOTO, S.-L. DRECHSLER, Inst. for Theoretical Solid State Physics, IFW Dresden, Germany, R. O. KUZIAN, Inst. f. Problems of Materials Science NASU, Kyiv, Ukraine, T. ITO, H. YAMAGUCHI, K. OKA, National Institute of Advanced Industrial Science and Technology (AIST), Tsukuba, Japan — $Ca_2Y_2Cu_5O_{10}$ consists of edge-sharing CuO_2 chains, in which Cu^{2+} ions carry spin 1/2. The nearest-neighbor (J_1) and the next-nearest-neighbor interaction (J_2) are ferromagnetic and antiferromagnetic, respectively. For the J_1-J_2 model the theory predicts that when the ratio $\alpha(=|J_2/J_1|)$ becomes larger than 0.25, the ground state becomes a spiral state. For the aforementioned compound, Kuzian et al. determined α to be 0.19, which is close to the critical value [1]. However, the parameters were fitted using the observed data up to ∼10 meV, above which the magnetic excitations were found to be broadened [2]. In order to determine the overall dispersion relation, we performed inelastic neutron scattering experiments using the HYSPEC neutron spectrometer at the SNS. We succeeded in observing the full magnetic dispersion that extends up to ∼55 meV. As previously observed, the magnetic excitations appeared to almost vanish at ∼11.5 meV. We also found another noticeable gap-like behavior at ∼28 meV. We re-evaluate the essential exchange coupling parameters and discuss the origin of gap-like regions in the spin-wave dispersion. [1] R. O. Kuzian et al., PRL109, 117207 (2012). [2] M. Matsuda et al., PRB63, 180403 (2001).

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