Masuda *et al.* Reply: In our original work [1], we reported the observation of an incommensurate ordered state in the frustrated quasi-one-dimensional antiferromagnet $LiCu_2O_2$. The Comment by Drechsler *et al.* [2] challenges our conclusions regarding the hierarchy of relevant exchange interactions in the system and the microscopic origin of frustration. In Ref. [1] we postulated a simple model that seemed to explain the available data with only two antiferromagnetic (AF) exchange constants $J_1 > J_2 > 0$ (see inset in Fig. 1). Drechsler *et al.* point out that structural arguments and local density approximation (LDA) calculations [3] favor a totally different picture [4]: $J_4 > -J_2 > 0$ and $J_1 \sim 0$.

A determination of exchange parameters from bulk data is notoriously ambiguous. To resolve the controversy we have instead performed three-axis inelastic neutron scattering experiments [5]. Figure 1 (symbols) shows the spin wave dispersion measured along the $(0.5, k, 0)$ reciprocal space rod at $T = 1.7$ K. Additional data (not shown) were taken along $(h, 0.827, 0)$ and reveal a sinusoidal dispersion with maxima at integer h values and a bandwidth of 7.5 meV. The measured dispersion curves can be analyzed in the framework of linear spin wave theory (SWT) [6]. It can be shown that in the generalized J_1-J_2-J_4 model with interchain coupling $J_\perp$, there are *exactly two* sets of SWT coupling constants that fit the data: (i) $J_1 = 105$ meV, $J_2 = 34$ meV, $J_4 = -2$ meV, and $J_\perp = 0.2$ meV and (ii) $J_1 = 6.4$ meV, $J_2 = -11.9$ meV, $J_4 = 7.4$ meV, and $J_\perp = 1.8$ meV. In the energy range shown in Fig. 1, the spectra calculated from these two models (solid line) are indistinguishable. Solution (i) almost exactly corresponds to our original J_1-J_2 model. Note, however, that the fitted effective J's are unrealistically large. The alternative model (ii) appears to be a more likely candidate for $LiCu_2O_2$. It incorporates a ferromagnetic J_2 bond, just like the LDA-based model of [3]. However, it involves only *weak* frustration and requires a strong AF J_1 bond, as originally proposed in our work. In addition, the estimated interchain coupling constant is smaller than the LDA result by half an order of magnitude. These two discrepancies will have opposite effects on the Curie-Weiss temperature, which could in turn explain why the LDA-based model still yields reasonable estimates of this quantity.

Trying to reconcile the result by Drechsler *et al.* with the measured dispersion of spin waves, we note that *just the data taken along* $(0.5, k, 0)$ can be also perfectly reproduced by $J_1 = 0$, $J_2 = -10$ meV, $J_4 = 7$ meV, and $J_\perp = 8$ meV. This set of parameters is at least qualitatively consistent with their model. However, with these numbers SWT gives an a-axis bandwidth of 13 meV, almost twice as large as observed. One possibility is that Drechsler's model is actually correct, but SWT breaks down *qualitatively*, and cannot give correct excitation energies in the entire Brillouin zone *even using some effective set of renormalized coupling constants*. This intriguing possibility deserves a closer theoretical investigation, but seems unlikely. Indeed, in $LiCu_2O_2$ the suppression of T_c is not too pronounced, and a renormalized quasiclassical picture should work rather well.

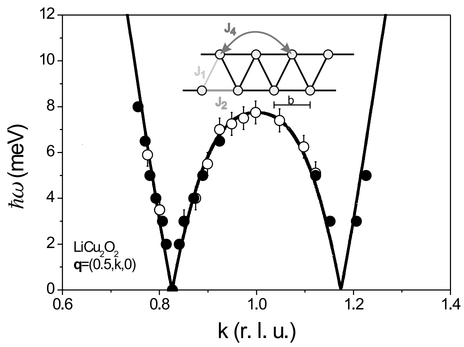

FIG. 1. Spin wave dispersion in $LiCu_2O_2$ measured using constant-E (solid symbols) or constant-Q scans (open symbols). Lines are as described in the text.

In summary, the frustration mechanism in $LiCu_2O_2$ is more complex than we originally thought, and involves a *ferromagnetic* J_2 bond. However, our present understanding of the inelastic neutron scattering results suggests a strong "rung" interaction J_1 and weak interchain coupling, in contradiction with the model of Drechsler *et al.*

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