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Supplemental material

I. FOURIER DECOMPOSITION OF MC SIMULATIONS WITH A $\vec{q} = (0.83, 0, 0)$ PROPAGATION VECTOR

The NN J_i ($i = 1, \dots, 3$) are taken from the DDCI calculations.

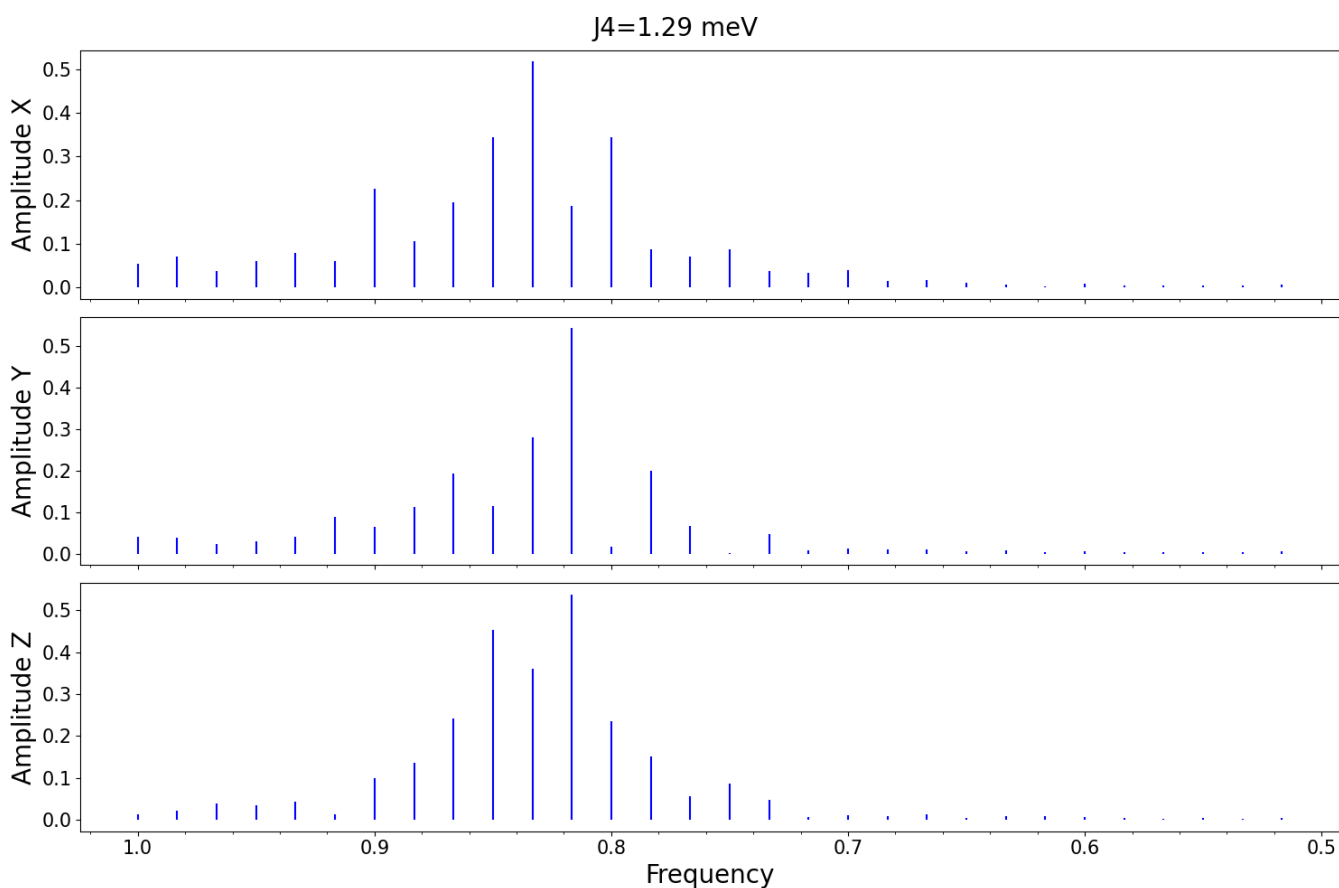


Figure 1: Fourier decomposition of the magnetic structure order obtained from MC simulations within a $60 \times 60 \times 2$ supercell for $J_4 = -1.3$, meV.

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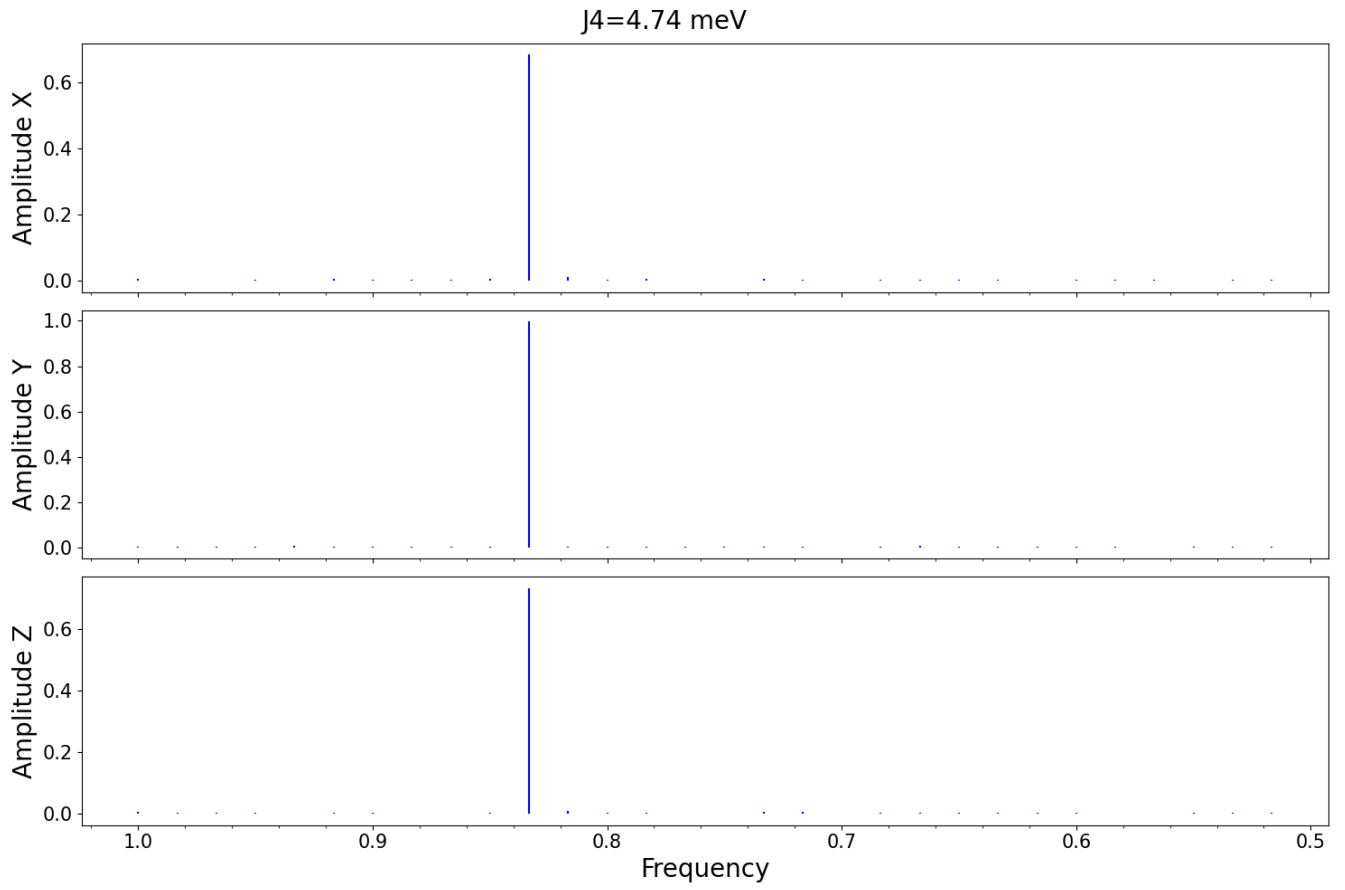


Figure 2: Fourier decomposition of the magnetic structure order obtained from MC simulations within a $60 \times 60 \times 2$ supercell for $J_4 = -4.7, \text{ meV}$.