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Magnon spectra and strong spin-lattice coupling in magnetically frustrated MnV_2O_4: Inelastic light scattering studies[1] S.L. GLEASON, T. BYRUM, Y. GIM, S.L. COOPER, Dept. of Physics and Frederick Seitz Materials Research Lab, U. of Illinois, Urbana, Illinois 61801, USA, H.D. ZHOU, Dept. of Physics, Florida State U., Florida 32306, USA — The spinel MnV_2O_4 exhibits a series of closely spaced magnetic and structural transitions at low temperatures, reflecting magnetic frustration and strong spin-lattice coupling. MnV_2O_4 has a canted ferrimagnetic ground state with an undetermined orbital configuration. Temperature dependent studies of magnetic and vibrational excitations in MnV_2O_4 are important for determining the role that spin-lattice coupling plays in the low temperature phase transitions of this material and setting constraints on the orbital ground state configuration. We report an inelastic light (Raman) scattering study of the temperature and magnetic field dependences of magnetic excitations in MnV_2O_4. We observe a pair of $\mathbf{q} = 0$ one-magnon modes at 74 cm^{-1} and 81 cm^{-1}, which is in contrast with the single 80 cm^{-1} $\mathbf{q} = 0$ magnon that has been reported for MnV_2O_4 from previous neutron scattering measurements and spin wave calculations. Additionally, we find that the two-magnon energy of MnV_2O_4 decreases with decreasing temperature below T_N, which we attribute to strong coupling between zone-boundary magnons and phonons. These results offer important clues to the orbital ground state and the nature of spin-lattice coupling in MnV_2O_4.

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