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One-Magnon and Two-Magnon Light Scattering in NiF_2 E. MELOCHE, M. G. COTTAM, University of Western Ontario, London, Canada, D. J. LOCKWOOD , V. GNEZDILOV , National Research Council, Ottawa, Canada — New experimental and theoretical results concerning the temperature dependence and polarization dependence of spin waves in the canted antiferromagnet NiF_2 ($T_N = 73K$) are reported. In NiF_2 the $S = 1$ single-ion anisotropy favors alignment of the spins in the ab plane rather than the c axis and leads to a spin canting. The spin wave spectrum is obtained using a Green's function formalism where we treat the exchange terms within the RPA, while the single-ion anisotropy terms are treated exactly. This theoretical approach modifies the canting angle and has a large effect on the lower frequency branch which is extremely sensitive to the choice of anisotropy parameter. The upper branch is similar to that of other rutile antiferromagnets such as FeF_2 and MnF_2. A comparison between theory and experiment for the frequency of the one- magnon branches shows good agreement for temperatures up to 0.3 T_N. At higher temperatures various relaxation mechanisms become important. For the two-magnon light scattering we employ an interacting spin-wave theory to analyse lineshapes, peak frequencies and integrated intensities in the different polarizations and compare results with our previous work on CoF_2 [1]. Results are deduced for the relative values of the magneto-optical coupling coefficients of NiF_2. [1] E. Meloche, M. G. Cottam, D. J. Lockwood, J. Magn. Magn. Mater. 272 (2004) 275.

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