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Spin Wave Theory of Antiferromagnetic Resonance in the System of Spins Canted by External Magnetic Fields*

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Abstract

The temperature dependence of antiferromagnetic resonance (AFMR) frequency, with an external field in the easy plane, is studied on the basis of spin wave theory. It is shown that in this system at low temperatures, the temperature dependence is caused by the following three effects in the same order of $1/S$ expansion; (i) the temperature dependence of the angle of sublattice moments canted by the external field, (ii) the first order effect of four magnon processes, and (iii) the second order effect of three magnon processes. The contributions of these effects to the frequency of the lower (field-sensitive) mode are calculated. The two effects, (i) and (ii), almost cancel out each other. The third effect leads to a strong temperature dependence. Such a strong temperature dependence has not been expected by the conventional molecular field theory. Numerical calculations of the AFMR frequency shift of EuTe are carried out on the basis of our theory. The calculations are in agreement with the experimental results obtained by Nakai and Hirahara.