We must take $\mathbf{k} = (n, m, r)$ and eliminate the terms $H_{ex}l^2k^2$.† It is clear that the oscillations begin to build up when $H_i < 0$.

Formula (2) is correct if the angle between $\mathbf{H}_0$ and $\mathbf{M}$ is close to 0 or π; however, calculations show that instability appears always whenever φ, the angle between $\mathbf{H}_0$ and $\mathbf{M}$, is greater than $\pi/2$, since the spectrum for an arbitrary φ (but not close to $\pi/2$) has the form (for a spherical sample)

$$\omega_k = \gamma\left[\left(H' - \tfrac{1}{2}4\pi M\cos\varphi\sin^2\theta\right)\right.$$
$$\left.\times\left(H' + \tfrac{1}{2}4\pi M\cos\varphi\sin^2\theta\right)\right]^{1/2},$$
$$H' = H_0 + \left(\cos\varphi + \tfrac{1}{2}\tan\varphi\sin\varphi\right)\left(H_{ex}l^2k^2 - \tfrac{4}{3}\pi M\right)$$
$$+ \tfrac{1}{2}\cos\varphi 4\pi M\sin^2\theta + \tfrac{1}{2}4\pi M\sin\varphi\tan\varphi\cos^2\theta.$$

From the above formula it is clear that it is impossible to have a stable uniform precession of the magnetization of a ferromagnet if the angle between $\mathbf{H}$ and $\mathbf{M}$ is obtuse. In this sense the result of reference 2 on coherent radiation from inverted systems is incorrect when applied to ferromagnets. The same is true of the paper of Morgenthaler,[3] in which the question of ferromagnetic systems (ferrites) especially is discussed.

We notice that the characteristic time of occurrence of spin waves is of the order of $\tau = 1/4\pi\gamma M$.

2. For a ferrimagnet near the compensation point we can find a dispersion relation by using equations analogous to (1) (but with two sublattices). Analysis of this relation shows that the spin waves with $\theta = 0$ build up the fastest; for them

$$\omega_k = \gamma H_0 \pm [2\omega_{ex}K + K^2 + \omega_{ex}^2 l^2 k^2]^{1/2},$$

$$K = \tfrac{1}{2}(\gamma_1 - \gamma_2) H_0 + \tfrac{1}{2}(\gamma_1 + \gamma_2) H_a; \qquad \omega_{ex} \approx \gamma H_{ex}.$$

The instability occurs when

$$2\omega_{ex}K + K^2 + \omega^2_{ex}l^2k^2 < 0. \tag{4}$$

Here γ_1 and γ_2 are the gyromagnetic ratios for the first and the second sublattices, and H_a the effective anisotropy field, which is the same for both sublattices.

We note that in the case of a ferrimagnet at the compensation point the frequency can become complex if condition (4) is fulfilled and $k = 0$, i.e., for uniform precession (with a build-up time smaller than for spin waves). This means that uniform precession predominates in the linear approximation considered here. In reference 4 account is taken of nonlinearity for uniform precession.

3. Suhl[5] has shown that there exists a nonlinear mechanism for the build-up of spin waves as a result of their interaction with the uniform precession. It was shown that for small angles φ, instability appeared if $\sin^2\varphi > \eta/4\pi M\gamma$, where η is the coefficient of relaxation of the spin waves. The characteristic instability time is $\tau \approx (4\pi M\gamma \times \sin^2\varphi - \eta)^{-1}$.

A calculation for a ferromagnet shows that for an arbitrary angle (but not close to $\pi/2$), instability occurs, the spin waves build up exponentially, and $\tau \approx 1/4\pi M\gamma\sin\varphi\tan\varphi$. In making this conclusion it is assumed that there already exists a uniform precession at an angle φ (in general not small) and we investigate its instability. The question considered above will be discussed in the journal Изв. высш. шк., Радиофизика (News of the Colleges, Radiophysics).

*Rough calculations show that the dispersion relation (2) is correct for waves with wavelength ten times shorter than the dimensions of the sample.

†We note that the dependence of the magnetization of the magnetostatic oscillations on the coordinates is not described by the function $e^{i\mathbf{k}\cdot\mathbf{r}}$

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Translated by I. Alexandrov
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THEORY OF THE NONRESONANCE ABSORPTION OF AN OSCILLATING MAGNETIC FIELD BY A FERROMAGNETIC DIELECTRIC

M. I. KAGANOV and V. M. TSUKERNIK

Physico-Technical Institute, Academy of Sciences, Ukrainian S.S.R.

Submitted to JETP editor July 2, 1960

J. Exptl. Theoret. Phys. (U.S.S.R.) **39**, 518 (August, 1960)

In a recently published article[1] we solved the problem of calculating the absorption coefficients of an oscillating magnetic field polarized in a direction perpendicular to the axis of easiest magnetization. Initially we had started with the Hamiltonian of the system which included only the exchange interaction.

Subsequently one of us (Tsukernik) showed that in this case there occurs only resonance absorption of a homogeneous oscillating magnetic field, since the total magnetic moment commutes with the Hamiltonian of the system. The results obtained in reference 1 are, thus, incorrect.

The erroneous result is due to the fact that in calculating the matrix transition elements we had confined ourselves to the first perturbation-theory approximation. Account of the second approximation shows that the matrix element becomes, with corresponding precision, zero.*

Nonresonance absorption of a homogeneous field is connected with relativistic interactions within the system (dipole-dipole interactions, the energy of anisotropy, etc.). This problem is studied in detail in an article which will be published later.

Here we will only cite the value of the absorption coefficient of a transverse magnetic field whose frequency is considerably greater than the frequency of the spin wave with a zero quasimomentum:

$$\Gamma_{\perp} \approx \frac{32\pi^2}{15\sqrt{2}} gM_0 \frac{w}{\Theta_c} \frac{\mu M_0}{\sqrt{\hbar\omega\Theta_c}} \coth \frac{\hbar\omega}{4T},$$

where $w = \mu^2/a^3$ (the notation is the same as in reference 1).

The absorption described by this formula is caused by the dissociation of a photon into two spin waves with opposite quasimomenta.

*For this remark we are indebted to V. G. Bar'yakhtar and S. V. Maleev. We take this opportunity to express our gratitude.

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Translated by Z. Barnea
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