cryostat and the thermopile, these filters passed radiation with wavelength shorter than approximately 40 microns. Signals up to 1 μV were registered with different crystals and filters, and with different laser powers. No signal was observed at a 90° scattering angle.

When a transparent glass plate opaque to IR radiation was added to the filter of black paper, no signal was observed. When a paraffin plate (2.5 mm thick), having a transmission in the visible less than 1%, was added to the same filter, the signal decreased to 30 - 40% of the initial value. This is in accord with the transmission of paraffin in the 40 - 100 μ region. When the black paper was replaced by black polyethylene, the singal increased by 3.5 times, this being close to the ratio of the transmission coefficients of these filters at a wavelength ∿75 μ. These experiments confirm that long-wave IR radiation was registered.

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LINE SHAPE OF NONLINEAR FERROMAGNETIC RESONANCE OF SECOND ORDER

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The phenomenon of nonlinear ferromagnetic resonance (NFMR) was observed in [1] in the microwave band. A similar problem was solved using the phenomenological equation of motion for the magnetization vector, with a damping term in the combined Bloch-Wangsness form [2], for the concrete case of a ferrite sphere in a resonator (Fig. 1).

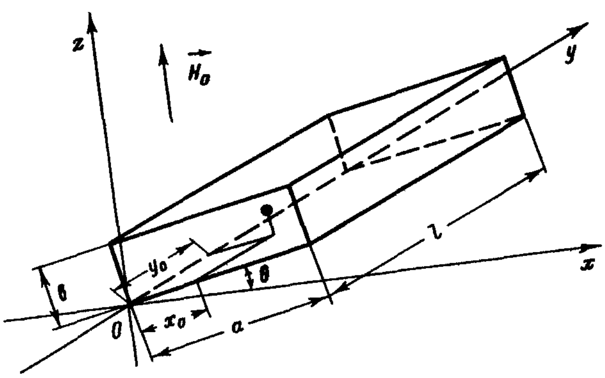

Fig. 1. Resonator with ferrite sphere

The absorbed power in NFMR of second order is given by

$$P_{abs.} = \frac{\gamma^2 \mu_0 T_2}{\omega_0} V h_z^2 (h_x + h_y^2) \times$$

$$\times \frac{\gamma \mu_0 M_s \left(1 + \frac{4\pi\chi_{st}}{3\mu_0}\right) - \frac{\chi_{st}}{\mu_0}(\gamma \mu_0 H_0 - 2\omega_0)}{\left(1 + \frac{4\pi\chi_{st}}{3\mu_0}\right)^2 + T_2^2(\gamma \mu_0 H_0 - 2\omega_0)^2},$$

where γ is the gyromagnetic ratio, μ_0 the magnetic permeability of vaccum, h and ω_0 the amplitude and frequency of the microwave radiation, V the volume of the ferrite, χ_{st} the static magnetic susceptibility, T_2 the relaxation time, H_0 is the intensity of the slowly-varying magnetizing field, and M_s the saturation magnetization.

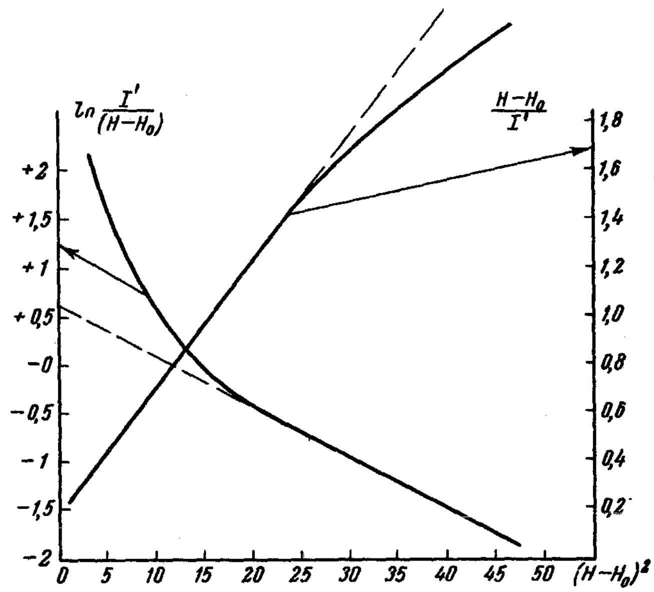

Fig. 2. Linear anamorphoses of NFMR curve (ΔH_L = 1.3 Oe, ΔH_G = 3.2 G, I' = 42, one division of H - H_0 equals 0.74 Oe).

It is seen from (1) that the shape of the absorption curve is determined by two terms, one of which is negligibly small in the case of narrow absorption curves ($\gamma\mu_0 M_s T_2 >> 1$).

The remaining term is Lorentzian. If it is recognized that the FMR line shape is described by the same expression as the shape of the NFMR curve, we can expect the experimental absorption curves to be Lorentzian in both cases.

The NFMR line shape was investigated experimentally by the linear-anamorphose method [3]. Figure 2 shows the anamorphoses of the investigated line. It is seen that near resonance the line is described by a Lorentz shape ($2\Delta H_L$ = 2.6 Oe), and on the wings by a Gauss curve ($2\Delta H_G$ = 6.4 Oe). This result agrees with the experimental results of investigations of the linear FMR line shape [4], in the sense that a similarity is observed between the FMR and NFMR line shapes. These investigations show, however, that the phenomenological equations of motion for the magnetization vector, which predict a Lorentz absorption line shape, describe only approximately the behavior of a ferromagnetic medium in the resonance region, and are not applicable to a description of the line wings.

The experiment was performed with a standard RE-1301 radio spectrometer at 9350 MHz. The microwave radiation power was of the order of 16 W, and the Q of the reflex cavity at the H_{130} mode was 1000. The investigations were performed on a single-crystal yttrium iron garnet sphere of 2.4 mm diameter. To reduce the time needed to record the derivative of the absorption curve, the radio spectrometer was coupled to the "Promin'" digital computer. The time required to plot the curve was 20 sec; during that time, the temperature changes of the sample and the radiation-frequency drift could not distort the shape of the recorded line, as followed from the good reproducibility of the results.

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INVESTIGATION OF THE REACTIONS $He^4(\gamma, p)H^3$ AND $He^4(\gamma, n)He^3$

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An experimental investigation of the photodisintegration of He^4 is of considerable interest in connection with the problem of a consistent description of the static and dynamic properties of light nuclei, namely the binding energy, the nuclear radii, and the effective cross sections of the nuclear reactions.

We investigated the photodisintegration of the He^4 nucleus at energies up to 260 MeV with a cloud chamber in a magnetic field of 10.5 kG, operating in a synchrotron beam. The energy of the photon producing the reaction was determined from the emission angle and the momentum of one of the two particles emitted in the reaction. The absolute intensity of the synchrotron emission was measured accurate to approximately 6%.

The effective cross section of the (γ, p reaction), obtained by measuring 2920 events, is shown in Fig. 1 (histogram). It agrees well with the results of Perry and Bame [1] and of Gemmell and Jones [2] below 28 MeV (curve 1), results obtained by investigating the inverse reaction. An estimate of the total cross section of the (γ, p) reaction, obtained by multiplying the experimental cross section $(d\sigma/d\Omega)_{90°}$ by a factor $8\pi/3$ under the assumption that the reaction is connected only with electric dipole transition, in accord with the data of Clerc et al. [3] (curve 2), is also in satisfactory agreement with our results. A similar estimate based on the data of Denisov and Kul'chitskii [4] (curve 3) agrees with our data if $E_\gamma > 30$ MeV.

The effective cross section of the (γ, n) reaction, obtained from measurements of 1980 events, is denoted in Fig. 1 by triangles. The circles designate the results obtained by Livesey and Main by an emulsion method.

It is seen from Fig. 1 that the effective cross sections of the reactions (γ, p) and (γ, n) reactions on He^4 agree within the limits of statistical errors. A similar conclusion is arrived at by comparison of the integral cross sections σ_0 and σ_{-1}, obtained in the energy region from the reaction threshold to 170 MeV:

	(γ, p)	(γ, n)
σ_0, MeV-mb:	40.1 ± 0.9	42.5 ± 1.1
σ_{-1}, mb:	1.13 ± 0.02	1.09 ± 0.03

The effective cross section of two-particle photodisintegration of the He^4 nucleus, calculated by Bransden et al. [6] with allowance for tensor forces with a variational wave function taken