i and e correspond to the ions and electrons ($\alpha = i, e$).

1. When $k_z^2 \gg (m/r)(\partial \ln n/\partial r)(\Omega/\omega_{Be})$, Eq. (1) describes unstable oscillations (cf. [2]) whose maximum increment is reached when $k_z/k_\perp \sim (M_e/M_i)^{1/2}$ and $m/r \simeq \omega^*/(v_i - v_o)$, and has an order of magnitude ω^*, where $\omega^* = \omega_{Pi}(1 + \omega_{Pe}/\omega_{Be})^{-1/2}$. For these solutions to be valid it is necessary that the density gradient be not too large, $|v_i - v_o|(\partial \ln n/\partial r) < \omega_{Bi}$.

2. $k_\parallel^2 < (m/r)(\partial \ln n/\partial r)(\Omega/\omega_{Be})$, $|v_i - v_o| \sim v_o$. This is the case of a strong plasma inhomogeneity and a strong electric field. Here, too, Eq. (1) admits of unstable solutions whose increment, depending on the ratio m/r, lies in the interval from ω_{Bi} to ω^*.

Our analysis shows that the interpretation of the ion heating in the experiments of [1] can be as follows. Owing to the centrifugal force resulting from the finite mass of the ions, the electrons and ions drift in the crossed electric and magnetic field with different velocities. The relative motion of the plasma components leads to an instability, whose increment is comparable with or larger than the ion-cyclotron frequency, and has a maximum of the order of the ion Langmuir frequency. The instability develops until the ion velocities due to the fluctuating fields become of the same order as the difference between the electron and ion drift velocities. Owing to the random phases of the fluctuations, the energy acquired in this manner has the same character as thermal energy. It is therefore retained by the particles even after the electric field that had initiated the instabilities is switched off. The ion energies can reach values of the order of $M_i v_o^2/2$. Substitution of the concrete values of B and E_r characteristic of the conditions of [1] leads to an ion energy that agrees in order of magnitude with those observed.

At the same time, one cannot exclude the possibility that the mechanism of ion acceleration in [1] is connected with some other instability which lies beyond the scope of the theoretical model assumed here. On the other hand, the instability considered here can have a bearing also on other experiments, in which the radial electric field is produced specially or spontaneously.

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INVESTIGATION OF HIGH-FREQUENCY OSCILLATIONS IN SINGLE-CRYSTAL MAGNESIUM MANGANESE FERRITE

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It is known that nonlinear processes in yttrium iron garnets (YIG) are accompanied by oscillations [1-3]. It can be shown that the oscillations due to nonlinear ferromagnetic resonance should be observed in all ferrites. We have experimentally observed and investi-

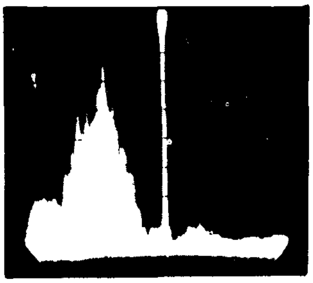

Fig. 1. High-frequency oscillations in MgMn ferrite as seen on the spectrum-analyzer screen (the thin line is the frequency marker).

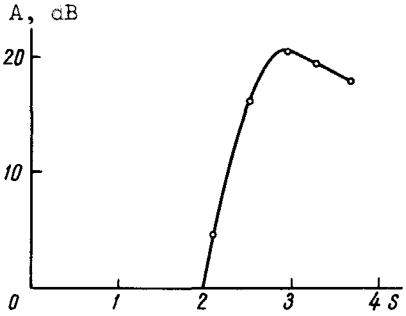

Fig. 2. Amplitude of hf oscillations in MgMn ferrite vs. the parameter $S = h/h_{YIG}$ (h = pump field, h_{YIG} = YIG threshold field).

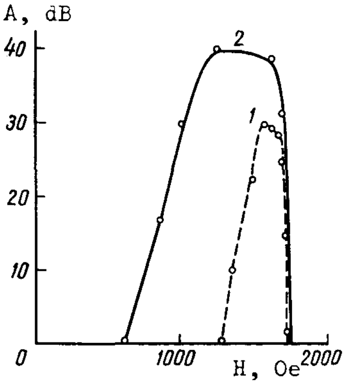

Fig. 3. Amplitude of hf oscillations in MgMn ferrite vs. constant magnetic field at different pump powers: 1 -- $S = 6$, 2 -- $S = 10$.

gated the high-frequency oscillations in single-crystal MgMn ferrite (ΔH = 80 Oe). The experiments were carried out at a frequency 9300 Mc with the microwave field transversely polarized and the constant magnetic field ranging from 700 to 3000 Oe. The sample was placed in a resonator, and was close in shape to a plate 0.5 mm thick. The high-frequency oscillations were detected with an S4-V spectrum analyzer using the reflected microwave power.

The main characteristics of the oscillations in MgMn ferrite are shown in Figs. 1 - 3. We see from the figures that:

1) The oscillations have a threshold, at which the pump power is double that of YIG. The dependence of the amplitude on the constant magnetic field is reminiscent of the dependence of the additional-absorption curve. It is obvious that the observation of the oscillations can be used to determine certain characteristics of the nonlinear resonance, for example the width ΔH_c of the spin-wave resonance curve.

2) The amplitude of the oscillations saturates with increasing pump power, and its value is 20 - 30 dB lower than in YIG.

3) The oscillation spectrum extends over a certain frequency region.

As the pump power increases from the threshold value $S = 2$ to $S = 10$, the entire frequency region shifts from 0.5 - 0.9 to 1.8 - 2.2 Mc. It must be noted that the threshold pump power increases with increasing sample dimensions, owing to the deterioration of the thermal conditions in the sample. The values of S for different samples may therefore differ from those given above by a factor 1.5 - 2. It is also observed that the intensity of the hf oscillations depends markedly on the sample orientation.

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