If we assume that the type II scattering at $T < T_c$ and $T > T_c$ is scattering by spin waves excited within the correlation region with nonzero magnetization, then this scattering is expected to exist also at $T \approx T_c$. From curve 1 and 2 (Fig. 3) we can conclude that the maximum of such a scattering will coincide with T_c at angles $\theta = \theta_s \approx 2^\circ$ for iron and $\theta_s \sim 70$ min for nickel. This means that near these observation angles it is necessary to approach the results of an analysis of the critical scattering of neutrons with caution.

The inelasticity of the critical scattering at $T \approx T_c$, which was observed in many investigations [2, 11, 12], can apparently be due, to a considerable degree, to an admixture of spin-wave scattering. To the contrary, our experiments [13] and the data of [14] point to a quasielastic character of the scattering in the immediate vicinity of T_c. In [13] this result was obtained by analyzing the polarization of the neutron scattered through an angle $\theta = 10.2$ min, which is far from θ_s for nickel. In [14], such a result was obtained from an energy analysis of the scattered neutrons in terbium, where the spin-wave excitations are apparently insufficiently well developed, owing to the strong anisotropy of this ferromagnet.

In conclusion, the authors are grateful to S. V. Maleev for useful discussions and advice.

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MOSSBAUER EFFECT IN INDIUM-GALLIUM IRON GARNET

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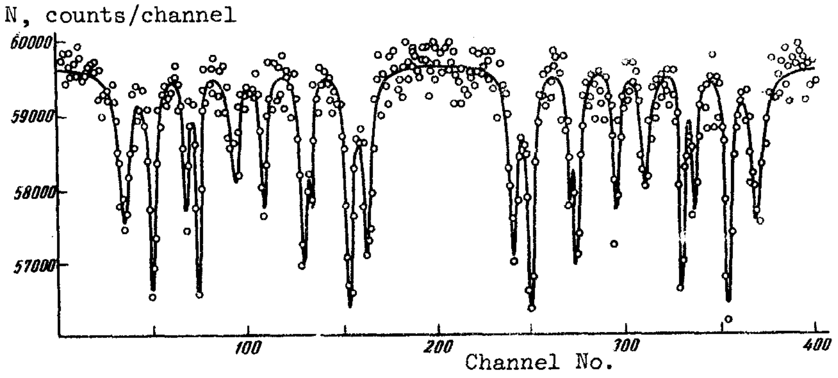
In a recent interesting paper [1], Gruzin and co-workers reported observation of four magnetic sublattices in indium-gallium iron garnet. We have investigated a garnet of similar composition, obtained from the same laboratory as in [1].

The NGR spectra were plotted with an electrodynamic setup in which the absorber was moved sinusoidally relative to the source. The detector was a proportional counter. The spectra were registered with a 400-channel analyzer and reduced by an electronic computer with a program based on SP-123 [2] and developed by Yu. M. Ostanevich.

Our source was Co^{57} in Pd. For calibration we used an absorber of Fe_2O_3 enriched to 80% Fe^{57}, with thickness 2.9 mg/cm^2 of Fe^{57}. The values of the effective magnetic field H_{eff} were calculated from the formulas $H_{eff} = 0.311 (\Delta v_{1.6}\ mm/sec) \times 10^5$ G and $H_{eff} = 0.537 (\Delta v_{2.5}\ mm/sec) \times 10^5$ G, where $\Delta v_{1.6}$ is the distance between the first and sixth peaks of the sublattice. The parameters for obtaining the numerical coefficients were taken from [3].

The quality of the operation of the setup and the results of the measurements of one of the samples of the mixed garnet $Y_5Fe_{4.7}Ga_{0.15}O_{12}$ are illustrated in Table I. The NGR spectra were plotted at temperatures 78 and 300° K. The results averaged over all the measurement runs are given in Table II. The errors listed in the table indicate that the results are reproducible and are much larger than the errors of reduction of a single individual spectrum.

The figure shows a typical NGR spectrum of the garnet of the indicated composition as



Mossbauer spectrum of mixed garnet, taken at 80°K.

Table I

	Fe_2O_3	$Y_3Fe_{4,7}Ga_{0,15}In_{0,15}O_{12}$		Fe_2O_3
		sublattice *a*	sublattice *d*	
v_1, mm/sec	8.41	8.89	7.46	8.44
v_2, mm/sec	5,18	5.20	4.22	5.17
v_3, mm/sec	1,63	1,58	1.24	1.63
v_4, mm/sec	−0.98	−1.21	−1.21	−0.98
v_5, mm/sec	−4.52	−4,89	−4.32	−4.52
v_6, mm/sec	−8.22	−8.44	−7.48	−8.20
Γ_1, mm/sec	0,63	0,54	0.59	0.61
Γ_2, mm/sec	0,54	0.43	0,46	0,51
Γ_5, mm/sec	0,55	0,45	0.56	0.55
Γ_6, mm/sec	0,63	0,40	0,57	0.54
H_{eff}, 10^3 g	–	541	462	–
Δ, mm/sec	0,21	0,19	−0,03	0.22
eqQ, mm/sec	0.46	−0,14	−0,08	0,41

ν and Γ - position and width of NGR lines, Δ - chemical shift.

Table 2

	Temperature, °K	
	80	300
H_{eff}, kG	541 ±3	471 ±3
H_{eff}, kG	463 ±3	385,5 ±3,5
Δ_{a-d}, mm/sec	0.22 ±0,02	0.260 ±0,020
$(eqQ)_a$, mm/sec	−0,15 ±0,02	0,06 ±0,03
$(eqQ)_d$, mm/sec	−0,07 ±0,02	−0,020 ±0,020

Δ_{a-d} - shift of center of gravity of Mossbauer spectrum of Fe^{57} in the a-sublattice relative to the Fe^{57} spectrum in the d-sublattice.

obtained with our setup. As seen from the figure, the observed spectrum is a superposition of two six-line spectra due to the iron atoms in the a and d sublattices of the garnet. The shapes of the NGR spectra taken at 80 and 300° K are similar.

A simple comparison of our measurements with the data of [1], reveals some disparity between the results. However, a detailed discussion of this question is impossible, owing to the evident defects of the illustrations (Figs. 1a and b) of [1]. It is not clear how the statistical errors were estimated; if we are to trust the scales on the ordinate axis, these errors are clearly underestimated (much lower than the standard deviation $\sqrt{N}$). If suitable corrections are introduced, then the spectrum represented in Fig. 1a changes noticeably, since it does not permit separation of a number of peaks, and it turns out to be similar to the ordinary NGR spectrum of iron garnets.

The essential parameters of the NGR spectra of mixed garnets are the line widths. The point is that replacement of the iron atoms by nonmagnetic atoms leads to a decrease of the values H_{eff} and to a lowering of the Curie temperature. All this should lead to a decrease of H_{eff} and to a broadening of the NGR lines in the mixed garnets compared with the pure garnets. The line broadening should increase with increasing temperature of the sample. This was indeed observed by us. At 80° K the width of the NGR lines of the mixed garnet are hardly broader than the corresponding values for the pure garnet. The widths of the lines of $Y_3Fe_{4.7}Ga_{0.15}In_{0.15}O_{12}$ increase appreciably at 300° K. The extreme lines in the a-sublattice now have a width 0.6 - 0.7 mm/sec, and the corresponding lines in the d-sublattice have a width of 0.75 - 1.00 mm/sec. It should be noted that in NMR experiments also revealed an appreciable broadening of the lines in mixed yttrium-gallium garnets with increasing sample temperature [4].

Thus, our results offer no proof of the existence of four magnetic sublattices in $Y_3Fe_4Ga_{0.15}In_{0.15}O_{12}$. Replacement of the iron atoms by gallium and indium atoms leads to a decrease in the effective magnetic fields, from values $H^a_{eff} \approx 551$ kG and $H^d_{eff} \approx 470$ kG for $Y_3Fe_5O_{12}$ at T = 78° K to the values given in Table II. The widths of the NGR lines greatly increase with increasing temperature, and this can be due to the presence of a number of local

Curie temperatures. Very interesting is the observed change in the sign of the value of the quadrupole interaction as a function of the temperature. This is particularly clearly seen with the octahedral sublattice as an example. On this basis it can be assumed that the Morin temperature of the garnet under consideration lies in the region 220 ± 50° K.

The NGR spectra obtained by us for the mixed indium-gallium garnet in a parallel magnetic field on the order of 3000 G also point to the existence of only two magnetic sublattices.

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STABILIZATION OF POTENTIAL OSCILLATIONS OF A PLASMA IN A Q-MACHINE BY MEANS OF A HIGH FREQUENCY MAGNETIC FIELD

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356 - 360

Experimental investigations of thermally ionized plasma in Q machines reveal oscillations of the charged-particle density and of the potential. These oscillations are due to the development of drift-type instabilities in the plasma column, with which the anomalous diffusion of the plasma across the magnetic field is connected [1 - 3]. This explains the recent interest in the possibility of suppressing oscillations of this type. The described method of stabilization with the aid of shear [4] and a high frequency electric field [5] have significant shortcomings. The former calls for the production of a very large azimuthal magnetic field, which is difficult to realize technically. The second calls an appreciable deviation of the plasma parameters, due to the electron heating, making it difficult to interpret the results correctly.

The theory of stabilization with a high frequency magnetic field of potential plasma oscillations was developed in [6, 7], where we investigated the stabilization of drift kinetic instabilities, particularly the instability that exists when $\eta = (d \ln n/d \ln T_e) = 0$ and builds up in Q-machines in the collisionless regime $(k_z v_{Te} \gg \nu)$ [8]. The conditions for a noticeable decrease of the increment are $\Omega > \omega^*$ and $H_1/H_0 > \max\,[L/m_\pi a;\ \Omega/k_y v_{Te}]$, where m - number of mode, H_0 - amplitude of the constant magnetic field, H_1 - amplitude of the alternating magnetic field, v_{Te} - thermal velocity of the electrons, n - concentration of the plasma charged particles, L - length, and a - radius of the plasma column. In the collision regime [3, 9] there is also a drift-dissipative instability. The influence of the high-frequency magnetic field on this instability can be investigated by the methods developed in [7].

We present the results of the calculation:

The conditions for stabilization is the inequality $H_1/H_0 > 2^{3/2}\sqrt{\nu\Omega}\ k_y V_{Te}$ and $\mu > 1$,