which the masses $M_{\Lambda\pi}$ and $M_{K\pi}$ lie in the intervals $1.34 \leq M_{\Lambda\pi} \leq 1.42$ GeV/c^2 and $0.83 \leq M_{K\pi} \leq 0.93$ GeV/c^2, the anomaly in the mass region 1.61 - 1.96 GeV/c^2 still remains (shaded spectrum).

The summary effective-mass spectrum of ΛK^0 and ΛK^+, based on the data from both laboratories, is shown in Fig. 3a. The total excess of the number of events over the background, in the mass interval 1.61 - 1.96 GeV/c^2, is 114 ± 13. If this anomaly is due to the existence of only one resonance, then its mass is M = 1736 MeV/c^2 and its approximate width is 300 MeV/c^2. It is seen, however, from Fig. 3b, which shows the spectrum obtained after subtracting the background curve from the histogram, that the experimental data agree with the assumed existence of two resonances with masses near 1685 and 1935 MeV/c^2 and widths on the order of 150 MeV/c^2. A second less reliable peak is also observed in the ΛK^0 spectrum obtained with a freon chamber in a beam of 3.86-GeV/c π^- mesons [9]. The ΛK^0 spectrum obtained with the freon chamber is shown for comparison in Fig. 3c.

An analysis of the angular distributions of the ΛK system, for events with effective masses in the interval (1.61 - 1.76) GeV/c^2, shows that the first peak at M = 1685 MeV/c^2 can hardly be related with the decays of the isobars $N^*_{5/2}(1680)$ and $N^*_{5/2}(1688)$ with spin 5/2.

Thus, the anomaly observed by us in the ΛK effective-mass spectrum can be attributed either to the decay of the isobars $S_{11}(1710)$ and $P_{11}(1750)$ (and, less likely, $D_{13}(1730)$) [10] in the $N^* \rightarrow \Lambda + K$ channel, or to the existence of a new resonance with mass near 1685 MeV/c^2, which is indicated also by the data of [6].

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MOSSBAUER EFFECT ON ^{121}Sb NUCLEI IN YTTRIUM IRON GARNET

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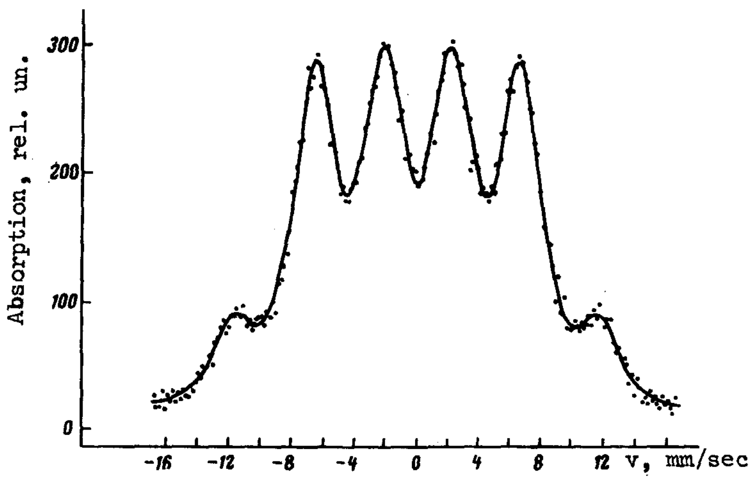
We report here the results of an investigation of nuclear gamma resonance in yttrium iron garnet on ^{121}Sb nuclei for the Mossbauer transition with energy 37.2 keV [1]. The investigation revealed a superexchange induction of magnetic fields on the diamagnetic Sb atoms.

The Mossbauer spectra were measured with a setup of the electrodynamic type, operating in the time mode with parabolic motion. The 37.2-keV gamma quanta were registered with a scintillation counter with NaI(Tl) crystal 0.2 mm thick, using the emission peak. The source was radioactive ^{121}Sb in SnO_2.

The figure shows the Mossbauer spectrum of the substituted yttrium iron garnet $Y_{2.5}Ca_{0.5}Sb_{0.25}Fe_{4.75}O_{12}$, obtained at a temperature 100°K. The purely magnetic hyperfine interaction causes splitting of the ground state of ^{121}Sb into 2J(5/2) + 1 = 6 levels and of



Mossbauer spectrum of $Y_{2.5}Ca_{0.5}Sb_{0.25}Fe_{4.75}O_{12}$. Solid line - theoretical curve calculated for a field of 290 kOe.

the excited state into 2J(7/2) + 1 = 8 levels, and the selection rules allow 18 transitions between them. The experimentally observed spectrum constitutes a group of four lines of approximately equal intensity and two pairs of weaker lines on each side of the group, the intensity of the outer lines of each pair being very low.

The magnetic field was determined from the following data concerning the characteristics of the transition: The ratio of the g-factors of the excited and ground states was 0.534 [2], the widths of all 18 lines were assumed equal to each other, and their intensities were assumed to be determined by the squares of the Clebsch-Gordan coefficients. The obtained value of the internal magnetic field was 290 ± 10 kOe.

The isomer shift of the iron garnet absorption line relative to Sb_2O_3 is zero, within the limits of the experimental errors, thus indicating equality of the electron densities at the ^{121}Sb nuclei in the iron garnet and in the Sb_2O_3. This allows us to conclude that the field at the ^{121}Sb nuclei is due to the polarization of the electron shell of the Sb atoms by the exchange field of the 3d electrons of the iron via the oxygen ions [3].

It follows from the study of the isomer shift [4] that the electron density at the Sb nucleus in yttrium iron garnet is $|\psi(0)|^2/a_0^3 \approx 5$, where a_0 is the Bohr radius[1)].

It is of interest to compare the obtained data with the results of a study of tin-substituted yttrium iron garnet [6, 7]. In this case the electron density $|\psi(0)|^2/a_0^2$ amounts to approximately 2.

Since the values of the effective magnetic fields in these ferrites are approximately equal, this indicates that the polarization of the tin atoms is double the polarization of the electron core of the Sb atoms.

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1)The isomer shift of InSb relative to Sb_2O_5 obtained by us, -8.4 ± 0.3 mm/sec, coincides with the value given in [5], but not with the data of [4]; this uncertainty is therefore included in the estimate of the electron density.