crystalline. In fields up to 270 Oe, this form of splitting undergoes no changes whatever, whereas the single-particle singularity becomes single already in a field ~150 Oe. These results will be reported in greater detail in a separate paper.

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POLARIZATION DEPENDENCE OF THE INTERFERENCE OF NUCLEAR AND ELECTRONIC γ-RAY SCATTERING

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In earlier investigations of interference phenomena in the diffraction of resonant γ rays [1 - 4], no singularities connected with the existence of sharp polarization dependence of the resonant nuclear scattering were observed. In the present investigation we created conditions under which this dependence becomes clearly pronounced, particularly in the fact that different interference lines in the same Mossbauer spectrum have different asymmetry directions.

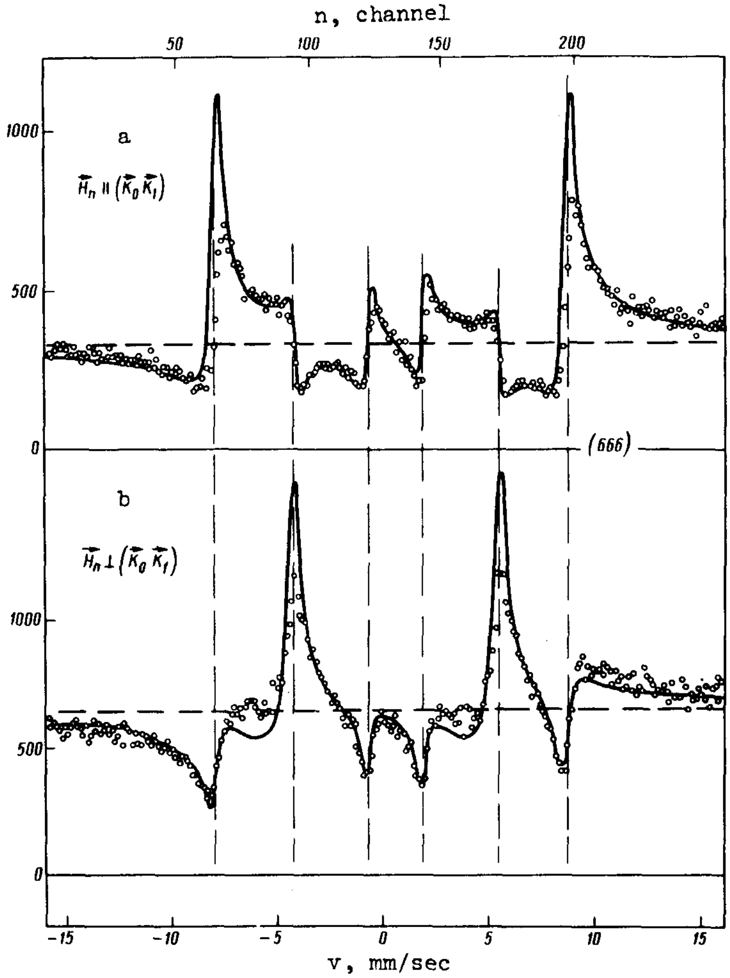
The experiment was performed at room temperature using a Mossbauer diffractometer [5]. A γ-ray beam with divergence 1°, from a Co^{57} source in Cr (100 mCi), was incident on an α-Fe_2O_3 single crystal placed in the symmetrical Bragg reflection position (666), with $2\theta_B = 69°$. The crystal was in a magnetic field of ~1 kOe, which oriented the magnetic fields at the ion nuclei in the different experiments either in the scattering plane or perpendicular to this plane. The source moved with constant acceleration, and the information was accumulated in a multichannel analyzer. The measurement results are shown in the figure. We see that the spectral lines have the clearly pronounced dispersion shape which is typical of the interference of nuclear resonant and Rayleigh scattering, and the direction of the asymmetry of lines 2 and 5 (Fig. a) is opposite to the direction of the asymmetry of the remaining lines. This feature of the spectrum is due, in particular, to the dependence of the amplitude of the coherent nuclear scattering of the crystal unit cell on the magnetic field orientation and on Δm of the nuclear transition.

In our case this amplitude is proportional to the quantity

$$P = \frac{1}{2}(1 - \delta_{\Delta m,0})(\mathbf{h}_0\mathbf{h}_1) + \left(-\frac{1}{2}\right)^{|\Delta m|}(\mathbf{h}_0\mathbf{n})(\mathbf{h}_1\mathbf{n}).$$

Here $\vec{h}_0$ and $\vec{h}_1$ are the magnetic-field polarization vectors of the incident and scattered waves, and $\vec{n}$ is a unit vector in the direction of the magnetic field at the iron nucleus. The values of P for π and σ polarizations of the incident radiation, and for different orientation of the magnetic field $\vec{H}_n$ at the ion nuclei are listed in the table. We see from the table that for transitions with Δm = 0, at both orientations of the magnetic field, only one of the polarizations contributes to the scattered radiation. The fact that P(σ) is negative at $\vec{H}_n \parallel (\vec{K}_0\vec{K}_1)$ causes inversion of the interference curves corresponding to the transitions with Δm = 0 (Fig. a). When $\vec{H}_n \perp (\vec{K}_0\vec{K}_1)$ the values of P for both polarizations have the same signs (or are simply equal to zero). In this case

Fig. 1. Mossbauer spectra measured in Bragg reflection of 14.4-keV γ rays of Fe^{57} from the (666) planes of single-crystal α-Fe_2O_3 (85% Fe^{57}). The vertical lines denote the resonance conditions determined in a transmission experiment: a - magnetic field at the iron nuclei lies in the scattering plane ($\vec{H}_n \parallel (\vec{K}_0\vec{K}_1)$, where $\vec{K}_0$ and $\vec{K}_1$ are the wave vectors of the indicent and scattered radiation); b - the magnetic field at the iron nuclei is perpendicular to the scattering plane.



all the interference curves have the same asymmetry direction (Fig. b). The solid curves were calculated from the dynamic theory of interaction of resonant γ quanta with ideal crystals [6], modified for the case of a scatterer having hyperfine splitting. The observed differences between theory and experiment are due apparently to the fact that the crystal was not perfectly ideal. Indeed, when a mosaic structure appears, the effective depth of penetration of the radiation into the crystal increases and the peaks are "lifted" as a result of the increasing nuclear absorption.

In conclusion we note that our results make it possible to determine directly the phase of the investigated relfection, similar to what was demonstrated for the $K_3Fe(CN)_6$ crystal in [7].

	$H_n \parallel (K_0K_1)$		$H_n \perp (K_0K_1)$	
	$\Delta m = 0$	$\Delta m = \pm 1$	$\Delta m = 0$	$\Delta m = \pm 1$
π	0	1/2	1/2	0
σ	$-\frac{1}{2}\sin^2\theta$	$\frac{1}{2}\cos^2\theta$	0	$\frac{1}{2}\cos 2\theta$

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ANGULAR ANISOTROPY OF THE FRAGMENTS FROM FISSION OF Th^{232} AND Pu^{238} BY 13.40 - 14.80 MeV NEUTRONS

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The energy dependence of the angular anisotropy of fission was described within the framework of the statistical theory in [1] and [2]. A characteristic feature of this dependence is the presence of maxima corresponding approximately to the threshold E_{xnf} for the fission reaction with preliminary emission of X neutrons, or more accurately the energy $E_{max} = E_{xnf} + 2TX$, where $T \approx 0.5$ MeV is the temperature of the neutron evaporation spectrum. The experimental data on the angular anisotropy in the vicinity of the threshold of the reaction (n, 2nf) have a large scatter, and the latest data for U^{234}, U^{236}, U^{238}, and Th^{232} [3, 4] patently contradict the prediction of the theory in [1, 2].

This circumstance has induced us to carry out a detailed investigation of the angular distributions of W(θ) of the fission fragments of a number of nuclei (Th^{232}, U^{233}, U^{235}, U^{238}, Np^{237}, Pu^{238}, and Pu^{239}) near the threshold of the (n, 2nf) reaction, using the 13.40 - 14.80 MeV neutrons from the reaction $T(d, n)He^4$. These were obtained by using deuterons accelerated to 0.2 MeV. At a deuteron energy $E_d \leq 0.2$ MeV, the cross section of the $T(d, n)He^4$ reaction is so large that it practically eliminates the background neutrons from the accompanying reaction $D(d, n)He^3$ (the ratio of the effect to the background is ∿100:1).

We used in the experiment a modification of the multi-angle detector previously described in [5], which made it possible to perform measurements for 11 neutron energies at different angles to the accelerated-deuteron beam. The fragments were detected by cylindrical glasses.

The figure shows the data for Th^{232} and Pu^{238}. For Pu^{238} we present the results of two independent pairs of measurements, thus demonstrating their accuracy. In the lower part of the figure we show the ratio of the fission cross sections σ_f of these isotopes.

Data on the angular anisotropy $A = W(0°)/W(90°) - 1$ of the fission of Th^{232} lie appreciably below the data [3, 4] and behave in a manner expected from the theoretical considerations.