three orders of magnitude.

Figure 2 shows plots of δ_a and δ_b obtained for polycrystalline Ni, Co, and Fe samples. The magnitude of the even effect for polycrystalline Ni in the region 0.5 - 1.1 eV is smaller than in the single crystal, corresponding to averaging over various orientation of the crystallites. The results obtained for polycrystalline Co and Fe show that the effect observed in nickel can be investigated using single-crystals of various ferromagnetic d-metals and alloys. We note that the differences $\delta_a - \delta_b$ reverses sign in the region of the interband transition that leads to a sharp magnetooptic anomaly 0.7 - 1.0 eV in cobalt [4].

It can be assumed that the influence of the orientation of I on the electronic spectrum of the ferromagnet affects directly its optical characteristics. However, our preliminary experiments in this direction (measurements made at normal incidence of light), yielded for the time being a negative result. The fact that the magnetooptic characteristics of the metal are much more strongly affected by this influence is apparently connected with the circumstance that both the magnetooptical effects in ferromagnets and the influence of the orientation of I on the electronic structure of the metal have a common spin-orbit origin.

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INVESTIGATION OF HIGHLY EXCITED LEVELS OF NUCLEI WITH THE AID OF NEUTRON-CAPTURE GAMMA RAYS

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A new method of investigating the nature of highly excited nuclear levels [1] was first used by us to determine the radiative level widths near the neutron binding energy for the nuclei listed in the table.

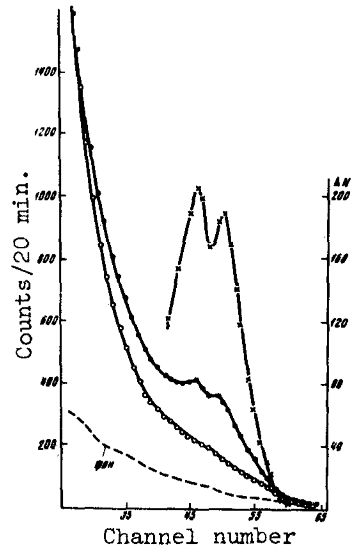
The high-energy states of the nuclei were excited with gamma rays emitted by the nuclei excited upon capture of thermal neutrons. Capture gamma rays have a high monochromaticity compared with gamma-ray sources having a continuous spectrum, such as bremsstrahlung from electron accelerators. This property of the capture gamma rays permits their use for the study of individual high-lying nuclear levels by the method of resonance scattering by the nuclei.

Our experimental setup [2] ensured high gamma-ray intensity and a low background, and made it possible to measure the resonance scattering intensities as functions of the scatterer and absorber temperatures.

In the case when the Doppler width exceeds the natural width $(\Delta_\ell^2 + \Delta_s^2)^{1/2} >> \Gamma_\gamma$, the average resonance-scattering cross section is given by

$$< \sigma_{pp} > = g \pi^{3/2} \lambda^2 \frac{\Gamma_{\gamma_0}^2}{\Gamma_\gamma} (\Delta_\ell^2 + \Delta_s^2)^{-1/2} \exp[- \frac{\delta^2}{\Delta_\ell^2 + \Delta_s^2}] \qquad (1)$$

By experimentally determining $<\sigma_{pp}>$, g and δ it is possible to calculate the ratio $\Gamma_{\gamma 0}^2/\Gamma_\gamma$ from expression (1). The effective cross section $<\sigma_{pp}>$ was calculated assuming a dipole angular distribution $(1 + \cos^2\theta)$. The spin of the excited state was determined by investigating the angular dependence of the resonance scattering of the gamma rays at angles 135 and 90°. The intensity of the resonance scattering was determined by comparing the scattering spectrum in the resonance region from resonant and nonresonant scatterers (see the figure). An analysis of the temperature dependence of the cross sections of the resonance scattering yielded the energy differences $\delta = |E_\ell - E_p|$ between the emission and absorption lines.



Resonance scattering of γ rays Ti(n, γ) by Mo. ● – Mo scatterer, o – Cd scatterer, × – intensity difference $\Delta N = N_{Mo} - N_{Cd}$ (counts/20 min).

Results of determination of the resonance-level parameters

Source-scatterer	E_γ, MeV	$<\sigma_{pp}>$, mb	Γ_{γ_0}, eV	D, keV	Reference
Pb → Zn^{64}	7.38	33±4.5	0.58±0.12	53.70±10.13	This work
Ti → Mo^{96}	6.413	11.2 ±1.4	0.11±0.02	8.68± 1.57	"
Ti → La^{139}	6.413	16.04±2.10	0.28±0.05	8.03± 1.42	"
Ti → Bi^{209}	7.15	1200±230	0.32 ±0.07	1.84± 0.40	"
	6.996	1560	–	–	[1]
	7.15	2600±800	0.42±0.14	–	[5]
Ti → Cu^{65}	6.07	423±108	0.34±0.06	99.1±17.4	This work
	6.07	440±130	0.36±0.07		[5]
Ti → Cu^{63}	6.07	215± 71	0.18±0.04	57.14±12.70	This work
	6.07	200± 60	0.16± 0.03	–	[6]
Cr → Cu^{63}	8.50	22 ± 7	0.26±0.08	130±40	This work
	8.499	35	75	–	[1]
	8.50	19 ±6	0.28±0.09	–	[6]
Cr → Cu^{65}	8.50	36 ±9	0.47±0.10	21.36±4.54	This work
	8.499	80	10.5	–	[1]
	8.50	42 ±13	0.94±0.29	–	[6]
Cu → Sn^{117}	7.01	1150±240	0.15±0.04	0.44±0.12	This work
	7.01	1000	–	–	[1]
	7.01	1200±400	0.3 ±0.3	–	[5]
Hg → Mo^{96}	6.44	201±37	0.12±0.04	0.23±3.07	This work

To determine the partial width of the transition to the ground state, we used a self-absorption method wherein we investigated the absorption of the resonance radiation by a resonant absorber located between the source of the incident beam and the resonant scatterer. By determining experimentally the self-absorption effect K from the expression [1]

$$K = \Gamma_{\gamma_0} g \pi^{3/2} \lambda^2 \frac{nd}{\Delta_i} \left(\frac{1+f}{2+f}\right)^{1/2} \exp\left[- \frac{f \delta^2}{(2+f)(1+f)\Delta_\ell^2}\right] \qquad (2)$$

it is easy to calculate the partial width $\Gamma_{\gamma 0}$ of the radiative transition to the ground state.

Using the experimental value of $\Gamma_{\gamma 0}$, we calculated the average distance between the levels near the initial state, using the following connection [4] between $\Gamma_{\gamma 0}$ and D:

$$\langle \Gamma_{\gamma_0}/D \rangle = 6{,}1.10^{-15} E_\gamma^5 A^{8/3}. \qquad (3)$$

The results are listed and compared in the table. From an analysis of the observed resonance cases it follows that the probability of nuclear resonance scattering increases on approaching nuclei with closed shells.

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QUANTUM YIELD OF GENERATION OF AN $H_2 + F_2$ MIXTURE

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The development of a dissociation laser using the subsequent chemical reactions occurring in a gas mixture has been the subject of a number of investigations. In particular, a laser using the mixture $H_2 + Cl_2$ was investigated in [1, 2].

In [3, 4] they describe a laser based on a mixture of fluorine compounds of the M-F type with hydrogen. When uranium hexafluoride or molybdenum hexafluoride is used the reaction mechanism apparently proceeds as follows:

$$RF_6 + h\nu \to RF_5 + F,$$
$$F + H_2 \to HF^* + H,$$
$$H + RF_6 \to HF^* + RF_5,$$

where R = U or Mo, and * denotes an excited molecule. In the latter case, however, it is clearly seen that the reaction develops spontaneously and no appreciable quantum yield can be expected in this system.

We deemed it most interesting and promising to investigate the mixture $H_2 + F_2$, since it is known [5] that the quantum yield of the reaction $H_2 + F_2 \to 2HF$ equals $\sim 10^5$, i.e., one can expect in principle a generation quantum yield much larger than unity. It must be