ter of the process is indicated by its distinct threshold observed by us. For ordinary Rayleigh scattering (and outside the resonance region), such an effect was first observed by Fabelinskii and co-workers in liquid substances [5] and was later investigated elsewhere. We propose that the line wing appears in our experiment as a result of rotational vibrations about the center of gravity of the molecules in solid vitrifying systems. A change of the polarizability anisotropy of anharmonic electronic oscillators under the influence of a powerful inhomogeneous field is perfectly possible [6]. Stokes broadening of SRS lines, which have the same nature, was recently observed by the authors of [7] in liquid substances, but with the spectra excited by picosecond pulses. Obviously, there should be no broadening of the line wing in crystallized matrices, in view of the fact that the molecules are rigidly secured. This was observed in experiment (Fig. 3), in full agreement with the expectations.

Thus, the following new phenomena were observed in the described experiments: resonant stimulated Raman scattering, and resonant stimulated Rayleigh scattering of the line wing in electron-excited states of molecules, realized via a nontrivial scheme of transitions "from the top down."

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POSSIBLE CASE OF VIOLATION OF THE INDEPENDENCE OF COMPOUND NUCLEUS DECAY OF THE INPUT CHANNEL SPIN

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Measurements of the angular distributions of reactions on nuclei with nonzero spin uncover new possibilities of verifying the independence of the compound-nucleus decay method of the input channel of the reaction.

Let us consider the case of a sell-insulated solitary resonance with angular momentum nad parity J^{π}, produced by interaction between a nucleon (it does not matter whether it is a proton or a neutron) with a target nucleus having a spin I. In this case the differential cross section of the reaction (a, b) is an incoherent mixture of two parts corresponding to two input channels with spins I - 1/2 and I + 1/2 [1].

The angular distribution of this reaction is given by the expression

$$W^{(b)}(\theta) \sim \frac{\Gamma_{a,I-1/2}\Gamma_b}{\Gamma^2} W^{(b)}_{J^{\pi},I-1/2}(\theta) + \frac{\Gamma_{a,I+1/2}\Gamma_b}{\Gamma^2} W^{(b)}_{I^{\pi},I+1/2}(\theta).$$

Here $\Gamma_{a,l-1/2}$ and $\Gamma_{a,l+1/2}$ are the partial nucleon widths corresponding to the tow input channels, Γ_b is the partial width of the output channel, and Γ is the total resonance width.

$$W^{(b)}_{J^\pi,\, l-1/2}(\theta) \text{ and } W^{(b)}_{J^\pi,\, l+1/2}(\theta)$$

are the angular distributions corresponding to the capture of a nucleon with spin antiparallel and parallel to the spin of the target nucleus.

If one more channel, say c, is open in the reaction, then the angular distribution of this reaction is given by a similar expression

$$W^{(c)}(\theta) \sim \frac{\Gamma_{a,l-1/2}\Gamma_c}{\Gamma^2} W^{(c)}_{J^\pi,\, l-1/2}(\theta) + \frac{\Gamma_{a,l+1/2}\Gamma_c}{\Gamma^2} W^{(c)}_{J^\pi,\, l+1/2}(\theta).$$

If it is assumed that the widths Γ_b and Γ_c do not depend on the input channel, then we can obtain for the angular distributions the formulas

$$W^{(b)}(\theta) \sim t\, W^{(b)}_{J^\pi,\, l-1/2}(\theta) + (1-t)\, W^{(b)}_{J^\pi,\, l+1/2}(\theta),$$

and

$$W^{(c)}(\theta) \sim t\, W^{(c)}_{J^\pi,\, l-1/2}(\theta) + (1-t)\, W^{(c)}_{J^\pi,\, l+1/2}(\theta),$$

where $t = (\Gamma_{a,l-1/2})/\Gamma_a$ is the spin mixing parameter.

Thus, an analysis of these two independently-measured angular distributions of the same resonance should yield strictly identical values of the parameter t.

Consequently, similar measurements can be used to verify the assumed independence of the widths Γ_b and Γ_c of the input-channel spin. It should be noted that in the general case the "partial" angular distributions $W_{J^\pi,l-1/2}(\theta)$ and $W_{J^\pi,l+1/2}(\theta)$ include other parameters (for example, the parameters of orbital mixing in the input and output channels, of the phase difference, etc.), so that an unambiguous analysis may be very difficult or even impossible. In some simple cases, however, such an analysis can be performed and two values of t can be determined.

Let us consider, for example, one of the simplest cases, when the bombarding particles are protons, the spin and parity of the target nucleus is $1/2^+$, and the produced state of the compound nucleus has an angular momentum and parity 1^-. This state can be produced only by capture of protons with orbital angular momentum $\ell_p = 1$. Consequently, in this case there is no orbital mixing in the input channels of the reaction. We assume also that this state has three decay modes, viz., proton, alpha, and gamma, and that the spin and parity of the resultant nuclei produced after the alpha and gamma decays is 0^+.

The angular distributions of the α particles and γ rays include only one parameter, t, and this parameter can be easily determined separately for each case. Figure 1 shows the angular distributions of the α particles and γ rays at different values of t. We see that they depend strongly on the value of t. Consequently, this case is very convenient for veri-

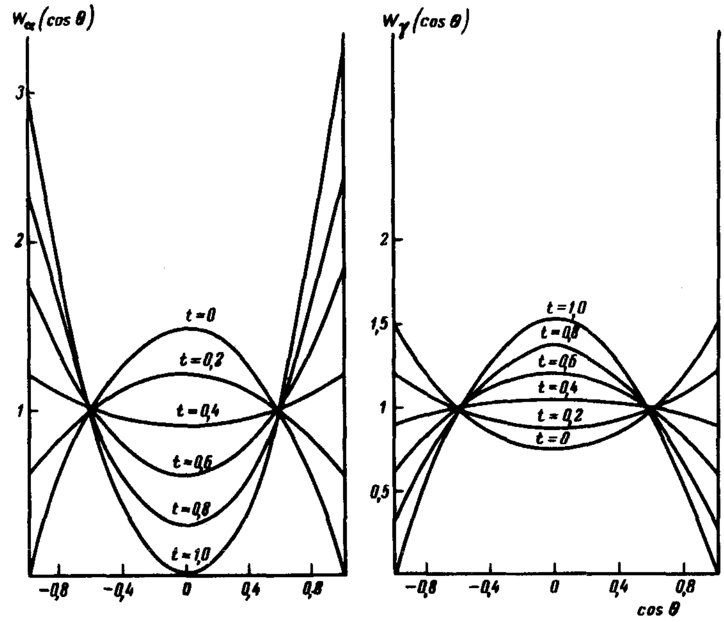

Fig. 1. Angular distribution of α particles (right) and γ rays (left) for different t.

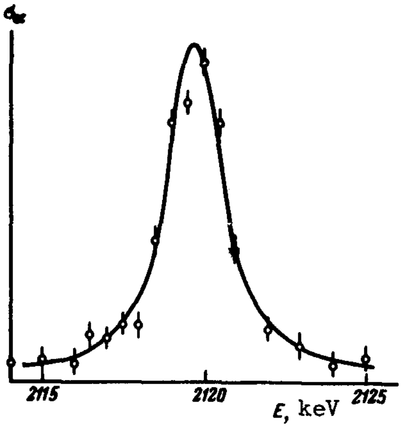

Fig. 2. Energy dependence of the cross section of the reaction $P^{31}(p, \alpha)Si^{28}$ in the region of the 2114-keV resonance.

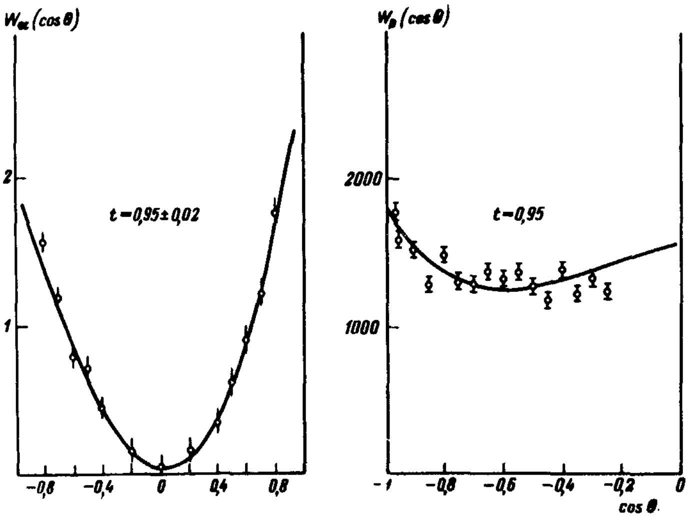

Fig. 3. Angular distributions of α particles (right) and γ rays (left) for the 2114-keV resonance.

fying the independence of the nuclear decay of the input-channel spin. Several nuclei can serve as convenient targets for these experiments, for example C^{13}, N^{15}, F^{19}, and P^{31}. In the reactions (p, p), (p, α), and (p, γ) on the P^{31} nucleus, a single isolated narrow resonance was observed, with spin and parity 1^-, at an incident-proton energy $E_p = 2114$ keV (level of compound nucleus S^{32} with excitation energy 10911 keV [2 - 4]). Figure 2 shows the energy dependence of the cross section of the reaction $P^{31}(p, \alpha)Si^{28}$ in the region of this resonance.

Figure 3 shows the angular distributions of the p and α output channels. The solid curves are theoretical. The values of t determined from these distributions are $t_p = 0.95 \pm 0.05$ and $t_\alpha = 0.95 \pm 0.01$. The latter value is in splendid agreement with the value obtained by us earlier [2], and with the value determined in [3], namely $t = 0.96 \pm 0.01$.

The angular distribution of the γ_0 rays (γ transition to the ground state of the S^{32} nucleus) was obtained in [4]. The value of t obtained there equals 0.72 ± 0.04. Thus, there is a patent discrepancy between the quantities t_p, t_α, and t_γ. If the value of t_γ has been correctly determined, this may mean that the decay of the compound nucleus depends on the input channel.

This may mean, in particular, that the widths of the decay are different in the cases of level production with input-channel spins S = 0 and S = 1. Comparing the values of t_p, t_α, and t_γ for the 2114-keV resonance, we get $\Gamma^{(1)}_{\gamma 0}/\Gamma^{(0)}_{\gamma 0} = 7$. Here $\Gamma^{(0)}_{\gamma 0}$ and $\Gamma^{(1)}_{\gamma 1}$ are the γ widths corresponding to input-channel spins S = 0 and S = 1, respectively.

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CURRENT-VOLTAGE CHARACTERISTIC OF AN IRRADIATED SUPERCONDUCTING POINT CONTACT

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It is known at present that point contacts between superconductors have properties analogous to the properties of Josephson tunnel junctions [1 - 3]. However, the existence of such an outward analogy with the tunnel junction, the properties of which have been well investigated both experimentally and theoretically, has not clarified fully the mechanism of the effect observed in superconducting junctions. A superconductiong-contact model proposed and investigated theoretically in [5] has made it possible to explain the main observed features. This theory explained, for example, the presence of a vertical section (stp) on the current-voltage characteristic I(V) at a voltage $V = \hbar\omega/2e$ under the influence of weak microwave radiation. It can be shown that the formula obtained in [5] for I(V) under irradiation is valid only when $V = \hbar\omega/2e$, and the question of the form of the current-voltage characteristic near the step remains unclear. In particular, according to [5], V(I) is not a single-valued function in the case of irradiation, i.e., the form of the measured current-voltage characteristic near the step should depend on the measurement conditions (either the current through the contact or the voltage on it is specified).

In this paper we calculate on the basis of the model proposed in [5] the I(V) characteristic under irradiation, particularly near the step, and compare the result with experiment. We have found that V(I) is a single-valued function and therefore the form of the observed current-voltage characteristic is independent of the measurement conditions.

We write down the equation for the phase difference ϕ of the ordering parameter in the presence of external radiation, in terms of dimensionless variables [5]:

$$\phi + \sin\phi = j + j_1 \sin(\Omega\tau) \quad , \tag{1}$$

Here $\tau = t/t_0$, $t_0 = \hbar/2eI_cR$, I_c - critical current of the contact, $j = I/I_c$ - current through the contact (assumed constant). The last term in the right side of (1) corresponds to an external signal with amplitude $I_1 = j_1 I_c$ and frequency $\omega = \Omega/t_0$. To determine the current-voltage characteristic from (1), it is necessary to find the voltage $v(\tau) = d\phi/d\tau$ and to average it in time. Equation (1) can be investigated under the assumption $\Omega >> 1$