the dispersion $\omega_2(\vec{k})$ must be determined from the dielectric constant ε without allowance for the damping [6, 9].

The frequency and angular dependences of $dP/d\Omega$ in the polariton region[1)], where $u_2 \ll u_1$, is determined mainly by the last factor in (2) (if ω_2 coincides with the longitudinal-oscillation frequencies, this factor must be replaced by $2c\chi^2(\omega_2 \partial\varepsilon/\partial\omega)^{-1}$). Owing to the characteristic dependence of χ on the direction of $\vec{k}_1$, the effect of the Raman scattering at small angles makes it easy to determine the type of polarization of the longitudinal or transverse lattice vibrations.

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INFLUENCE OF EXTERNAL ELECTRIC FIELD ON QUADRUPOLE SPIN ECHO

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Superposition of a constant electric field E on a quadrupole spin system leads to a shift of the resonant frequency of the nuclear quadrupole resonance (NQR). In the case when the nuclear spin is I = 3/2, first-order perturbation theory leads to the following simple expression for single crystals [1]:

$$\frac{\Delta\nu_E}{\nu_0} = \frac{R_{zzz}E}{eq_0}\cos\theta = \frac{\Delta\nu_E^{max}}{\nu_0}\cos\theta \qquad (1)$$

where ν_0 is the NQR frequency without the field E and θ is the angle between the field E and the z axis, q_0 is the unperturbed component of the gradient of the electric field of the crystal along this axis, and R_{zzz} is the component of the (third-rank) tensor of the influence of the electric field.

In polycrystalline samples, a broadening takes place in the NQR lines, the shape of which depends on the mutual orientation of the constant electric and radio-frequency magnetic fields. The values of the parameter R_{zzz}, estimated from the measured width or from the second moment of the NQR lines [2] in the stationary method, are quite inaccurate, especially

[1)] These dependences are considered in detail in [11].

at low values of E, when the electric broadening lies within the limits of the width of the unperturbed NQR line.

We succeeded in observing the influence of the electric field on the amplitude of the quadrupole spin echo. However, as shown by physical considerations [3] and by a mathematical calculation, it is necessary to apply in this experiment the electric field in the form of broad pulses, either in the interval between the first and second radio-frequency pulses (time interval τ), or between the second pulse and the spin-echo signal (Fig. 1).

The spin-echo signal envelope exhibits in this case "slow beats." A calculation of the quadrupole-echo signal amplitudes by the density-matrix method, similar to the calculation described in [4], leads to the following expression for the quadrupole-echo signal envelope:

$$A = A_0 \cos(2\pi \Delta\nu_E \tau), \qquad (2)$$

where A_0 is the amplitude of the echo in the absence of an electric field.

We note that the vanishing of the echo amplitude beats when a constant field E is applied follows already from the fact that the phase differences of the individual spin packets accumulated during the interval τ (in a rotating coordinate system) are compensated in the second interval τ as a result of the electric shifts of the NQR frequency ($\pm 2\pi\Delta\nu\tau$), and the echo signal remains insensitive to the frequency shift. At the same time, following such a stationary action of the external electric field, the induction-signal attenuation time T_2^* is decreased [5] in accord with the broadening of the NQR lines, observed in [6], whereas T_2 remains practically insensitive to such an action.

Averaging expressions (2) over a powder does not change the form or the period of the beats, except that $\Delta\nu_E$ is replaced by $\Delta\nu_E^{max}$. Thus, we obtain the relation $\Delta\nu_E^{max} = 1/2\Delta\tau_n$, where $\Delta\tau_n$ is the period of the echo-signal beat envelope.

The experiment was performed on Cl^{35} nuclei (I = 3/2) in polycrystalline chlorine-substituted hydrocarbons. The pulse sequence indicated in Fig. 1a was used. The source of the high-voltage pulses was tirggered by the leading or trailing edge of the second radio-frequency pulse. The duration of the high-voltage pulse ranged from 10 μsec to 5 msec. The pulse repetition frequency was chosen such as to avoid saturation effects. The electric field, ranging from 0 to 50 kV/cm, was applied to the sample perpendicular to the magnetic component of the radio-frequency field H_1. The signal was recorded with an oscilloscope or an automatic plotter.

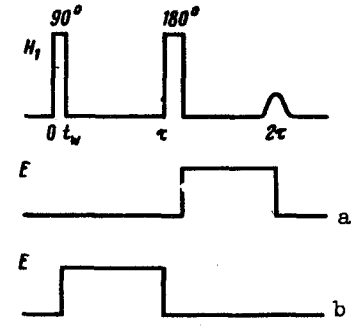

Fig. 1. Sequence of radio-frequency and electric pulses employed in the pulse series acting on a quadrupole spin system to obtain spin-echo signals; a - high-voltage pulse applied in the interval (τ, 2τ), b - in the interval (0, τ).

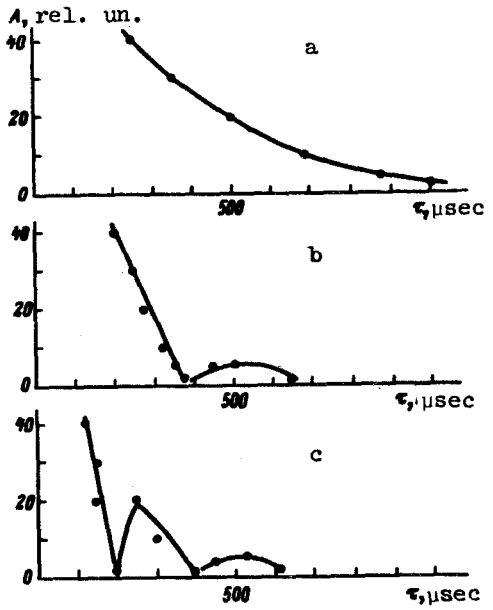

Fig. 2. Envelope of quadrupole-echo signals of Cl^{35} nuclei in polycrystalline transdichlorethane (ν_0 = 34.36 MHz, T = 77°K); a - in the absence of a high-voltage pulse, b - at E = 25 kV/cm, c - at E = 50 kV/cm.

The form of the signal envelope of the spin echo in polycrystalline transdichlorethane is shown in Fig. 2 for three values of the electric field (0, 25, and 50 kV/cm). The values of the phase shifts $\Delta\nu_E$ and of R_{zzz} for the series of crystals CCl_4, $CHCl_3$, C_2Cl_6, $C_2H_4Cl_2$, CH_5Cl, and Cl_2 are in good agreement with the data obtained by the stationary NQR method [2].

In conclusion, we point out the advantages of the nonstationary procedure: First, the interpretation of the experimental data is much simpler in the pulsed procedure than in the stationary measureemnts. Second, in the pulsed procedure there is no need for exact measurements of the absolute NQR frequencies. Finally, in the proposed method the frequency shifts can be measured even in weak electric fields, where these shifts lie within the limits of the line width, something quite difficult to do in the stationary case.

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CONCERNING THE ABSENCE OF EXACT MIRROR EQUALITY BETWEEN OPTICAL ANTIPODES

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It was shown in [1] that irreversible radiation damage is produced in many solid organic substances by powerful flashes of ultraviolet light (with energy of several hundred Joules per