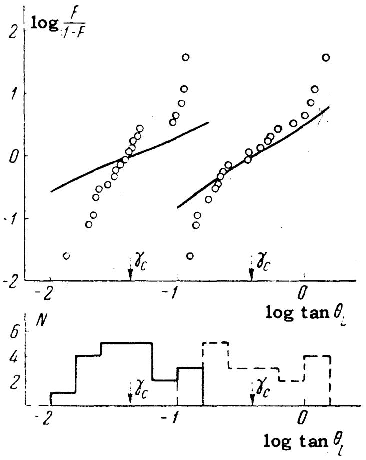


Angular particle distribution (top: integral; bottom: differential) for the event 208a and b.

the majority of cases. In the case 208a and b (see figure), and cases 9 and 227, the difference is even greater than three times the statistical fluctuations. Since the energy per nucleon in the laboratory system should be identical for both incident nuclei, this difference in the values of $\gamma_c$ is the consequence of non-identical effective masses of the interacting nuclei $M_1$ and $M_2$ if we assume that they interact as one body. In the event 208a and b, and for a simplifying assumption $M_1(a)/M_2(a) = M_2(b)/M_1(b)$, we find that the ratio of the effective masses is equal to the ratio of $\gamma_c(a)/\gamma_c(b) = 9$. This corresponds to a small $N_h$ and a large Z for the case 208a, but to a large $N_h$ and a small Z for the case 208b. However, the ratio of the effective masses in the case under consideration is unusually large, so that it is difficult to use the hydrodynamical model[2] represented by the solid curves in the integral distributions shown in the figure (upper part).

Using the values of $\gamma'_c$, we obtain, as a rule, a smaller ratio than when using $\gamma_c$, but the forward-backward symmetry in the number of emitted particles ($n'_1 : n'_2$ or $n'_2 : n'_1$ respectively) increases, especially in cases with a large anisotropy. Such an asymmetry is observed in the interactions 208a, 9, 191, and others. Evidently, the number of emitted particles is proportional to the effective masses of the interacting particles.

A more detailed analysis will be published in the Czechoslovak Journal of Physics.

[1] G. Biczó, G. Bozóki, E. Fenyves, E. Gombosi, J. Pernegr, and J. Sedlák, Internationale Arbeitstagung ueber die Physik hoher Energien, Weimar, 1960, p. 85.

[2] G. A. Milekhin, JETP 35, 1185 (1958), Soviet Phys. JETP 8, 829 (1959).

Translated by H. Kasha
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## *SOUND ABSORPTION IN ROCHELLE SALT CLOSE TO ITS LOWER CURIE POINT*

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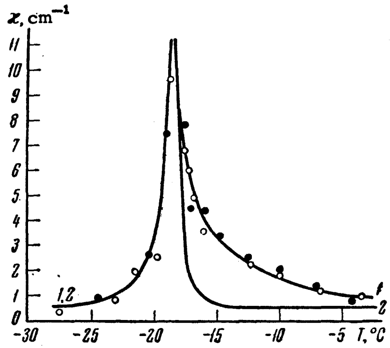
Submitted to JETP editor January 18, 1961

J. Exptl. Theoret. Phys. (U.S.S.R.) 40, 979-980 (March, 1961)

As we have previously reported,[1] there is an anomalously large absorption of transverse elastic waves in Rochelle salt at temperatures close to its upper Curie point ($\Theta = 24°$C); these waves are propagated along the crystallographic z axis and are polarized along the y axis. (The ferroelectric axis of the crystal is directed along x.) Such a sound absorption is the consequence of an increase in the relaxation time which is characteristic of the process of establishing the state of thermodynamic equilibrium in a crystal which is undergoing a second-order phase transition (see below). With the aim of generalizing the result given in reference 1, we carried out measurements of the absorption of a wave of given polarization and frequency $\nu = \omega/2\pi = 5$ Mc/sec in Rochelle salt near its lower Curie point ($\Theta = -18°$C). The results of these measurements are given in the drawing by the curve 1 — 1; the temperature T of the crystal is plotted along the abscissa and the values of the amplitude absorption coefficient $\kappa$ in cm$^{-1}$ along the ordinate.




The theory of this phenomenon was developed by Landau (see reference 2) who showed that*

$$\kappa^2 = \frac{\omega^2\rho}{2}\left(\mu\left[1+\frac{8\pi\lambda^2(\mu/\varepsilon+2\pi\lambda^2)}{\mu^2(\varepsilon^{-2}+16\pi^2\omega^2\gamma^{-2})}\right]^{1/2}-\mu-\frac{4\pi\lambda^2/\varepsilon}{\varepsilon^{-2}+16\pi^2\omega^2\gamma^{-2}}\right), \quad (1)$$

where (near the lower Curie point) $\epsilon = \epsilon_x = 4\pi C/(\Theta - T)$ for $T < \Theta$ and $\epsilon = \epsilon_x = 2\pi C/(T-\Theta)$ for $T > \Theta$ is the dielectric constant of the Rochelle salt, $\rho$ is its density, $\mu = \mu_{zyzy}$ is the shear elastic coefficient for constant induction $D_x$; $\lambda = \lambda_{x,zy}$

is the piezoelectric constant of the crystal, $\gamma$ is the coefficient in the kinetic equation $\partial D_x/\partial t = \gamma\partial\Phi/\partial D_x$, $\Phi$ is the thermodynamic potential of the crystal, which is represented by a function of $D_x$ and the shear stress $\sigma_{zy}$ (on this decomposition of $\Phi$, see reference 3).

The coefficient $\gamma$ can be estimated by substituting the known values of all parameters in (1) and one of the values of $\kappa$ found experimentally. In taking into account the numerical values of the quantities entering into (1), we make use of the approximate formula

$$\varkappa = 8\sqrt{\frac{\rho}{\mu}} \frac{\pi^2\lambda^2\omega^2/\gamma}{\varepsilon^{-2} + 16\pi^2\omega^2\gamma^{-2}} \quad (2)$$

for comparison of theory with experiment.

The theoretical curve 2 — 2 corresponding to Eq. (2) is shown in the drawing. In the scale chosen for the drawing, the lower temperature branch of the curve 2 — 2 coincides with the corresponding branch of the experimental curve 1 — 1. The excellent agreement of the Landau theory with experiment for $T < \Theta$ made it possible for us to estimate the relaxation time $\tau = 4\pi\epsilon/\gamma \approx 3.4 \times 10^{-8}/(\Theta - T)$ sec for $T < \Theta$.

*We note that misprints occurred in Eq. (1) which was given in reference 2 under the number (35), and also in the following Eq. (36).

[1] Yakovlev, Velichkina, and Baranskii, JETP **32**, 935 (1957), Soviet Phys. JETP **5**, 762 (1957).

[2] I. A. Yakovlev, and T. S. Velichkina, Usp. Fiz. Nauk **63**, 411 (1957).

[3] L. D. Landau and E. M. Lifshitz, Электродинамика сплошных сред, (Electrodynamics of Continuous Media), Gostekhizdat, 1957.

Translated by R. T. Beyer
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## *HYPOTHESIS OF CONSERVED VECTOR CURRENT AND GLOBAL SYMMETRY OF WEAK INTERACTIONS*

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Submitted to JETP editor December 26, 1960

J. Exptl. Theoret. Phys. (U.S.S.R.) **40**, 980-981 (March, 1961)

THE existence of divergences among the values of the vector coupling constants in $\beta$ decay (decay of $O^{14}$) and $\mu$ decay, established on the basis of new experimental data, has been reported in recent papers.[1-6]

In the present communication we call attention to the fact that one of the reasons for the difference between the indicated coupling constants may be the nonconservation of the weak vector current, even without allowance for the radiative corrections for the electromagnetic and the weak[8] interactions.

In reference 7 an analogy was developed between the weak interaction and the electromagnetic one, based on the assumption of global symmetry of weak interactions and on the hypothesis of two forms of neutrinos — electron and muon[9,10] (global symmetry in weak interactions was considered also by Treiman[12]). It was assumed here that the properties of Fermi particles in weak interactions can be obtained from the classification of massless fermions with respect to possible values of charges (electric, baryon, and lepton) and the chirality $\gamma_5$, and the mass degeneracy is removed by strong interactions. It is easy to verify that since strong interactions are as a whole not globally symmetrical,[11] the weak vector current obtained in reference 7 is not conserved. We assume that the pion interactions are globally symmetrical and give rise to a mass difference between the leptons and baryons, while K-meson interactions lift the mass degeneracy of the baryon isotopic multiplets. Then the nonconservation of the isovector current will be due only to K interactions. Since the renormalization of even the axial coupling constant is small (0.2), we can expect the renormalization of the vector constant, in which $\pi$ interactions make no contribution, to be even much smaller. An estimate of this reduction is the ratio of the splitting of the masses of the baryons to the mass difference between baryons and leptons (only the $\Sigma$-$\Lambda$ mass difference is of importance here), equal to $\sim 0.1$. This gives a difference in constants of about 0.02 in $\beta$ and $\mu$ decay, which does not contradict the available experimental data.[5,6] It must be kept in mind that strong interactions renormalize the constant $g_\beta$, while weak ones renormalize $g_\mu$. An account of this fact is essential if information is to be obtained on the intermediate heavy vector meson from an analysis of the radiative corrections based on weak interaction (see reference 8).

It is essential to note that in spite of the theoretical attractiveness of the assumption of the global symmetry of the $\pi$ interactions, the estimate obtained here for the difference of the $\beta$- and $\mu$-decay coupling constants is essentially