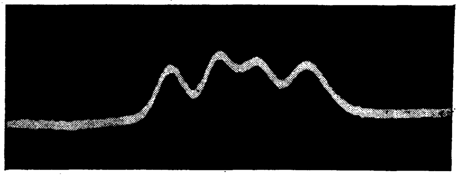

FIG. 2

enriched in the mass 53 isotope.

Figure 2 shows the oscillogram of the line $M = ½ \leftrightarrow -½$ in the case for a constant external magnetic field parallel to the axis of symmetry of the crystal. The hyperfine structure, consisting of the four lines, confirms the nuclear spin of Cr^{53} as equal to 3/2. The uneven spacing between the hyperfine components is caused by second order displacements. The hyperfine structure is described by the terms

$$AS_zI_z + B(S_xI_x + S_yI_y)$$

in the spin Hamiltonian, where S is the electron spin, I is the nuclear spin, A and B are hyperfine structure constants. From the experimental data we obtain the following values of the constants

$$|A| = (17.0 \pm 0.5) \cdot 10^{-4}\text{cm}^{-1}, \quad |B| \approx |A|.$$

Notice that the constant A of the hyperfine structure of Cr^{53} in corundum is near that observed in alums, but greater than that of cyanide.[2,3]

A detailed account of the results of the investigation of the fine and hyperfine structure of Cr^{3+} in corundum will be published later.

The authors wish to thank A. A. Popova for growing the single crystals, studied in the present work.

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Correlative Phenomena in K-Meson Capture

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THE process of capture of a K-meson by a proton, followed by a decay with emission of a hyperon, i.e., the reaction

$$K^- + p \rightarrow \Lambda^0 + \pi^0 \rightarrow p + \pi^- + \pi^0,$$

can be used to determine the spin of the Λ-particle from the angular correlation of the π-mesons.

If the spin of the K-meson is equal to zero, then the momentum of the initial system is equal to ½ (if the K-meson is captured in a S-state). The angular distribution $I_j(\theta)$ is given as a function of j and of the angle θ between the directions n_1 and n_2 of the relative momenta of the systems (Λ, π^0) and (p, π^-) $(I_{1/2}(\theta) = 1)$

$$\begin{aligned} I_{3/2}(\theta) &= 1 + P_2(\cos\theta) \sim 1 + 3\cos^2\theta; \\ I_{5/2}(\theta) &= 1 + {}^8/_7 P_2(\cos\theta) + {}^6/_7 P_4(\cos\theta) \\ &\sim 1 - 2\cos^2\theta + 5\cos^4\theta \end{aligned} \tag{1}$$

(to be compared with the analogous formula for the decay of the Ξ-particle[1]). If the spin of the K-meson is 1, then the momentum of the initial system can be ½ as well as 3/2, and, therefore, the formula for the angular correlation are not unique.

If the system is in an external magnetic field, the dependence of the angular distribution on the field H can be used to determine the magnetic moment of the Λ-particle. In the presence of a magnetic field the correlation function has the form (see, e.g., Ref. 2):

$$\Omega = -kT \ln \sum_{n,N} \exp\left\{\frac{\mu N - E_{nN}}{kT}\right\}, \tag{2}$$

where ω is the appropriate Larmor frequency, τ the lifetime of the Λ-particle and A_n the coefficient of P_n in Eq. (1). If the gyromagnetic ratio for the Λ-particle is equal to that of the proton, then $\omega\tau$ reaches the value ≈ 0.3 for $H = 3 \times 10^4$ G.

For the $j = 3/2$, Eq. (2) takes the form

$$\begin{aligned} I = {} & 1 + P_2(\cos\theta_1) P_2(\cos\theta_2) \\ & + {}^3/_4 \sin 2\theta_1 \sin 2\theta_2 [\cos(\varphi_1 - \varphi_2) \\ & - \omega\tau \sin(\varphi_1 - \varphi_2)] / (1 + \omega^2\tau^2) \\ & + {}^3/_4 \sin^2\theta_1 \sin^2\theta_2 [\cos 2(\varphi_1 - \varphi_2) \\ & - 2\omega\tau \sin 2(\varphi_1 - \varphi_2)] / (1 + 4\omega^2\tau^2), \end{aligned} \tag{3}$$

where θ_1, φ_1, θ_2, φ_2 are the angles of the vectors $\mathbf{n}_1$ and $\mathbf{n}_2$ in a system of spherical coordinates, when the z-axis is along the magnetic field.

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Nonlinear Theory of Longitudinal Plasma Oscillations

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IN Refs. 1 and 2 there was considered the one dimensional oscillations of the electronic plasma, without taking into account the temperature effects, on the assumption that the electron density n, the electrical field E and the electron speed v are linear functions of the combination $x - Vt$, where V is the velocity of the wave, propagating along the x-axis. In the present note we obtain a fundamental result of this work —a relation between the frequency of the longitudinal wave and the amplitude for a more general assumption, namely, for an arbitrary relation between the quanttities n, E and v and x and t. The entire derivation is very much simplified if the basic equations are transformed from the Eulerian to the Lagrangian form.

We write the equation of motion of the electron and Maxwell's equations

$$dp/dt = eE, \qquad (1)$$

$$dE/\partial x = 4\pi e\,(n - n_0), \qquad (2)$$

$$0 = (1/c)\,(\partial E/dt) + (4\pi/c)\,env, \qquad (3)$$

where n_0 is the ion density, which is assumed to be fixed; e, m and p are the charge, mass and momentum of the electron. From (2) and (3) follow

$$dE/dt = \partial E/\partial t + v\partial E/\partial x = -4\pi e n_0 v. \qquad (4)$$

Differentiating Eq. (1) with respect to time and comparing with (4), we obtain

$$d^2p/dt^2 + \omega_0^2 mv = 0, \quad \omega_0^2 = 4\pi^2 n_0/m. \qquad (5)$$

In the non-relativistic case $p = mv$ and, consequently $(d^2 v/dt^2) + \omega_0^2 v = 0$, i.e., the frequency of the plasma oscillation does not depend on the amplitude.[1]

In the relativistic case we express the velocity in terms of the momentum,

$$\frac{d^2p}{dt^2} + \frac{\omega_0^2}{\sqrt{1 + p^2/m^2c^2}}\,p = 0,$$

from which the dependence of the frequency on amplitude follows directly, as was obtained in Ref. 2.

In conclusion the author wishes to thank Ia. B. Fainberg for valuable suggestions and Prof. A. I. Akhiezer and G. Ia. Luibarskii for discussions.

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A Note on Mixed Meson Theory

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FEYNMAN[1] has made the statement that in a mixed theory of scalar and vector mesons with vector coupling, nonrenormalizable infinities cancel if the coupling constants are equal. Reference 2 is devoted to the application of this theory. Such a statement also occurs in Ref. 3. Actually, however, the cancellation of nonrenormalizable infinities is equivalent in this case to the fact that the equation for the vector meson

$$(p^2\delta_{\nu\mu} - p_\nu p_\mu)\,\varphi_\mu = -s_\nu$$

is transformed into

$$p^2\varphi_\nu = -s_\nu.$$

In this case the field φ_ν describes particles with spin one and zero, where components with spin zero correspond to a negative energy (see Ref. 4). This circumstance is also noted in Ref. 1.

Starting from a Hermitian Lagrangian for two fields with spin zero and one, interacting with the

ERRATA TO VOLUME 4

	reads	should read
P. 218, column 2, Eq. (10)	$\dots \xi(\sqrt{3}+2)(2-\sqrt{3})$	$\dots \xi(\sqrt{2}+2)/(2-\sqrt{3}) \dots$
P. 219, column 1, Eq. (11)	$\dots (t\xi)^{\sqrt{3/2}} \dots$	$\dots (t\xi)]^{\sqrt{3/2}} \dots$
P. 219, column 1, Eq. (12)	$y^2 = \rho^{2/3}$	$y^2 - \rho^{2/3} >> 1$
P. 223, column 1, Eq. (45)	$\dots (E_0\mu^{3/4})^{\sqrt{3/4}}$	$\dots (E_0\mu^{3/4})^{\sqrt{3}/4}$
P. 223, column 2, Eq. (46)	$\dots \mu^{3\sqrt{3/4}} \dots$	$\dots \mu^{3\sqrt{3/4}} \dots$
P. 225, column 1, 3 lines above Eq. (1.1)	transversality	cross section
P. 225, column 1, 3 lines above Eq. (1.2)	transversality	cross section
P. 256, column 1, Eq. (37)	$\dots \frac{55\sqrt{3}}{48} \dots$	$\dots \frac{55}{\sqrt{3}\,48} \dots$
P. 289, column 2, Eq. (2)		$I = \sum_n \frac{1}{2n+1} A_n \sum_{\nu=-n}^{n} \frac{1}{1+i\omega\tau} Y_{n\nu}(n_1) Y_{n\nu}(n_2)$
P. 377, column 1, last line	$\delta_{35} = \eta - 21 \times \eta^5$	$\delta_{35} - 21\eta^5$
P. 436–7	Figures 2 and 3 should be exchanged.	
P. 449, column 1, last Eq.	$\dots Y_{lm}\ \varphi\sigma\ \alpha$	$\dots Y_{lm}\ \varphi_{\sigma}\ \alpha$
P. 449, column 2, Eq. (12)	$\dots W(l, j, \sigma 1; j) \dots$	$\dots W(l, j, \sigma 1; \sigma j) \dots$
P. 451, column 1, Eq. (7)	$\dots D_{\alpha\beta}^{(1)}(p, 0, \lambda' \lambda) = \dots$	$\dots D_{\alpha\beta}^{(1)}(p, \omega_0, \lambda', \lambda) = \dots$
P. 541, column 1, Eq. (28)	$M^{*\,\mathrm{monex}}_{++}$	$M^{*\,\mathrm{monex}}_{+}$
P. 543, column 2, Eq. (35)	$\dots \int_{\rho^2 - \tau^2 + l_0^2}$	$\dots \int_{\rho^2 < \tau^2 + l_0^2} \dots$