$$\left.\frac{\partial G(x,\ y;\ J_\mu)}{\partial J_\mu}\right|_{J_\mu=0} = i\langle 0 \mid T\{\tau^+ x_\mu \psi(x),\ \bar{\psi}(y)\} \mid 0\rangle$$

$$- i\langle 0 \mid T\{\psi(x), \bar{\psi}(y)\tau^+ y_\mu\} \mid 0\rangle. \quad (3)$$

However, this quantity, when viewed as a matrix in isotopic spin space, should be of the form $F(x,y)\tau^+$. Taking this into account one may bring (3) into the form

$$\left.\frac{\partial G(x,\ y;\ J_\mu)}{\partial J_\mu}\right|_{J_\mu=0} = i(x_\mu - y_\mu)\langle 0 \mid T\{\psi(x),\quad \bar{\psi}(y)\} \mid 0\rangle\tau^+$$

$$= i(x_\mu - y_\mu)\,G(x,\ y)\tau^+$$

and, consequently,

$$\Gamma_\mu^+(x,\ y;\ \xi) = -i(x_\mu - y_\mu)\,G^{-1}(x-y)\,\delta(\xi)\,\tau^+. \quad (4)$$

Going over to the momentum representation, we obtain a relation analogous to the Ward theorem in quantum electrodynamics:

$$\Gamma_\mu^+(p,\ p;\ 0) = \tau^+\partial G^{-1}(p)/\partial p_\mu. \quad (5)$$

The remainder of the proof of the absence of charge renormalization is the same as in quantum electrodynamics when vacuum polarization is ignored.

If, in addition to the π meson — nucleon interactions, it is also desired to take into account the interactions of nucleons with K mesons and hyperons, the group of transformations (2) must be extended to include the strange particles, so as to have no renormalization of the vector coupling constant of the β-interaction. This can be achieved by assuming that the K meson and Ξ hyperon wave functions transform as the nucleon wave function, the Σ hyperon wave function transforms as the π meson wave function, and the wave function of the Λ^0 particle remains unchanged. The existence of such a group of transformations of the strange particles requires that the vector part of the β-interaction Hamiltonian of K mesons and hyperons be of the form

$$H = G_V[2\bar{\psi}_\Sigma\gamma_\mu T^+\psi_\Sigma + i(\varphi_K^+\tau^+\nabla_\mu\varphi_K - (\nabla_\mu\varphi_K^+)\tau^+\varphi_K)$$

$$+ \bar{\psi}_\Xi\gamma_\mu\tau^+\psi_\Xi]\,J_\mu + \text{Herm. conj.} \quad (6)$$

The Hamiltonian (6) describes β-decays of strange particles in which strangeness does not change* (e.g., $\Sigma^- \to \Sigma^0 + e^- + \nu$, $K^- \to K^0 + e^- + \nu$). The constant G_V in the Hamiltonian (6) corresponds to the constant in the Hamiltonian (1) and, just like the latter, does not get renormalized by strong interactions.

We note that radiation corrections due to the electromagnetic field have been neglected in the present proof. The interaction of the particles with the electromagnetic field is not invariant under the group of transformations (2) and should, in general, lead to a renormalization of the constant G_V.

*Processes involving a strangeness change, cannot, clearly, influence the magnitude of the renormalization in processes in which strangeness does not change.

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LOWER EXCITED (ROTATIONAL) LEVELS OF T^{234}

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USING an ionization chamber with grid,[1] we investigated the energy spectrum of α-particles from U^{238}. The spectrum obtained is shown in Fig. 1

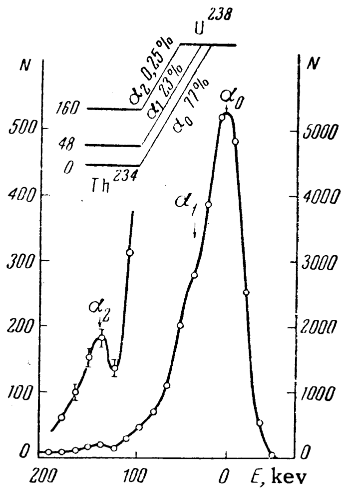

FIG. 1

where α_0 is the ground-state group of 4.182-Mev α particles from U^{238}. In our opinion, α_2 is the group of particles corresponding to the transition

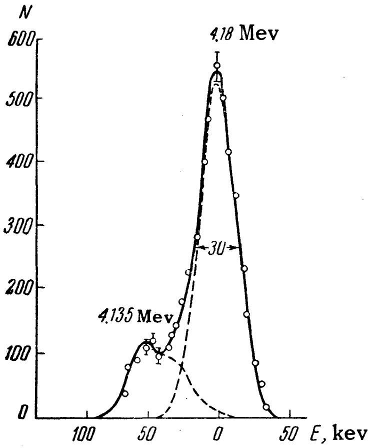

FIG. 2

to the Th^{234} second level. The transition intensity is $(0.25 \pm 0.1)\%$. The level energy is approximately 160 kev. The second to first level energy ratio coincides with the theoretical value obtained using the generalized model of the nucleus. It is most probable that this is the +4 level.

The α_1 group corresponds to a transition of the daughter nucleus to the +2 level. This group of particles is readily separated in the α-particle spectrum by using electric collimation and a narrower analyzer channel (Fig. 2). The intensity of transition to the +2 level is 23%.

This intensity value is in good agreement with the results of Refs. 2 to 5. The decay scheme of U^{238}, plotted in accordance with the results of this work, is shown in Fig. 1.

At the present time further measurements are being made with a view towards a better separation of the α_2 group, so as to increase the accuracy of the results obtained.

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ANISOTROPY OF THE EVEN PHOTOMAGNETIC EFFECT

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KIKOIN and Bykovskii[1] have recently observed the presence of a clearly pronounced anisotropy in an investigation of the even photomagnetic effect in semiconductors with cubic lattice. By "even photomagnetic effect," first discovered by I. K. Kikoin,[2] is meant the appearance of a potential difference in a direction perpendicular to the incident light, independent of the direction of the magnetic field.) In this communication we give a purely phenomenological description of the character of this anisotropy.

The problem under consideration is characterized by three vectors: the magnetic field **H**, the outer normal **n** to the illuminated surface of the semiconductor (along which the liberated carriers diffuse), and the resultant electric field **E**. Let the magnetic field be sufficiently small. Then, with accuracy to terms quadratic in **H**, one can write the following general expression

$$E_i = L_{ik} n_k + L_{ikl} n_k H_l + L_{iklm} n_k H_l H_m. \qquad (1)$$

Let the Cartesian coordinate axes coincide with the axes of the cubic crystal. From the symmetry properties of this crystal it follows that

$$L_{ik} = L_1 \delta_{ik}, \quad L_{ikl} = L_2 e_{ikl},$$

where δ_{ik} is the unit tensor of second rank and e_{ikl} is the unit totally-antisymmetrical tensor of third rank.

As is known (see, for example, Ref. 3) the fourth-rank tensor will have only three independent components in a cubic crystal.

$$L_{aabb} = L_{bbaa} \equiv L_3,$$

$$L_{abba} = L_{abab} = L_{baba} \equiv L_4, \quad L_{aaaa} = L_5.$$

As a result the expression for E_i is transformed into

$$E_i = L_1 n_i + L_2 e_{ikl} n_k H_l + L_3 n_i H^2 + 2L_4 H_i n_k H_k + L_5' n_{\underline{i}} H_{\underline{i}}^3,$$

$$L'_5 = L_5 - L_3 - 2L_4 \qquad (2)$$

(there is no summation over the underscored indices).