Kemmer-Duffin equation. But for reasons that have been considered by the writer in Ref. 3, Eq. (1) is not useful for the description of multiplets of particles.

Let us generalize Eq. (1) in the following way:

$$[B_\nu \partial / \partial x_\nu + k_0 I \exp(aT_3)]\psi = 0. \tag{3}$$

Here the operators B_ν, I, and T_3 satisfy the commutation relations

$$B_\nu B_\rho B_\sigma + B_\sigma B_\rho B_\nu = \delta_{\nu\rho} B_\sigma + \delta_{\sigma\rho} B_\nu,$$
$$B_\nu T_3 + T_3 B_\nu = 0, \qquad IT_3 + T_3 I = 0,$$
$$IB_\nu - B_\nu I = 0. \tag{4}$$

For these operators we can choose the following irreducible representation (notations of Ref. 3):

$$B_\nu = 1^{\mathrm{II}} \times \beta_\nu, \qquad T_3 = \sigma_3 \times \eta_5,$$
$$I = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} \times 1^{\mathrm{V}}. \tag{5}$$

With the choice (5), Eq. (3) describes isotopic spin multiplets of free mesons.

In complete analogy with the case of the fermions,[1] we can introduce here also the isotopic moment operator V_3. Then the mesons will be characterized by the quantum numbers shown in Table II.

TABLE II

Type of meson	K^+	K^0	K^0	K^-	π^-	π^0	π^+
t_3	$-\frac{1}{2}$	$+\frac{1}{2}$	$-\frac{1}{2}$	$+\frac{1}{2}$	1	0	-1
v_3	$-\frac{1}{2}$		$+\frac{1}{2}$		0		

It is interesting to note that the system of mesons coincides completely with the system of baryons; the only thing absent is the isotopic-moment triplet corresponding to the baryons Ω^-, Λ^0, Z^+.

The electric charges of baryons and mesons are expressed by a common formula

$$q = -e(t_3 + v_3). \tag{6}$$

A study of the experimental material[4] gives the following rules: (a) In the strong and electromagnetic interactions there is conservation of both the third component of the isotopic spin and also the third component of the isotopic moment of the system (the electric charge is of course also conserved). (b) In the weak interactions only the charge of the system is conserved, since the third component of the isotopic spin and the third component of the isotopic moment change by $\pm\frac{1}{2}$. All processes that do not satisfy these rules are forbidden.

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CONCERNING AMBIPOLAR DIFFUSION IN A MAGNETIC FIELD

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THE basic characteristics of the low-voltage arc region are determined by ambipolar diffusion both in radial and axial directions, from the region of the cathode spot.[1,2] If the low-voltage region is placed in a homogeneous longitudinal magnetic field of intensity H, the distribution of electron concentration of the current on the wall, and also the dimensions of the low-voltage region, change with the ratio $D_\parallel / B_\perp$ of the diffusion coefficients parallel and perpendicular to the magnetic field. This makes it possible to determine the value of the above ratio for various values of H. In particular, the ion current on the wall varies, within a certain range of z, in accordance with

$$j_w = c \exp\left(-\frac{\mu_1 z}{r_0}\sqrt{\frac{D_\perp}{D_\parallel}}\right), \tag{1}$$

where r_0 is the radius of the tube, z the coordinate along the tube axis, and μ_1 the eigenvalue of the boundary problem, which can be determined from measurements at H = 0.

The author, helped by G. I. Pankova, measured the distribution of the ion-current density on the walls, in the low-voltage arc region, at various values of H. The measurement procedure was analogous to that described in Ref. 2. The general pattern of the observed redistribution, for

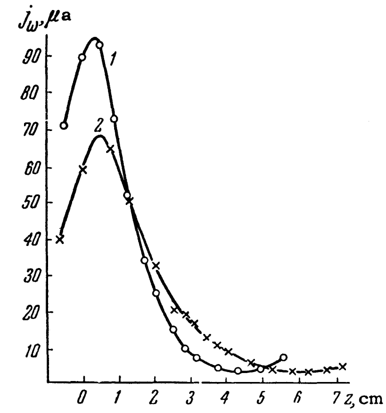

FIG. 1. Distribution of ion current on the walls: 1 — H = 0, 2 — H = 840 oersted.

an argon pressure of 0.7 mm Hg, is shown in Fig. 1. The electrons and ions diffuse farther along the axis, owing to the reduced diffusion towards the walls in the magnetic field. At a certain distance from the cathode, j_ω increases in the magnetic field, since it decreases near the cathode. The total value of the ion current remains almost constant at H = 840 gausses from z = 0 to the minimum, as shown on the curves of Fig. 1, even though the ratio $D_\parallel/D_\perp$ equals 2.5.

The variation of $D_\parallel/D_\perp$ obtained in the first experiments is shown in Fig. 2, where the abscissa

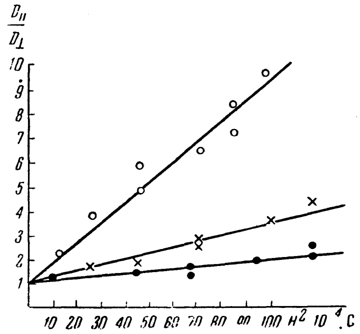

FIG. 2. Dependence of $D_\parallel/D_\perp$ on the square of the magnetic-field intensity. Pressure in argon: o — 0.25 mm Hg, × — 0.7 mm Hg, • — 1.0 mm Hg.

represents the square of the magnetic field intensity. The value of $D_\parallel/D_\perp$ was determined in accordance with (1) from the slope of the lines on the semi-logarithmic graph. Figure 2 agrees fully with the classical formula

$$D_\perp = \frac{D_\parallel}{1 + k(b_e H / c_0)^2}; \qquad (2)$$

where b_e is the mobility of the electrons, c_0 the velocity of light, and k is the ratio of the ion and electron mobilities.

The advantage of the method proposed here over those described in the literature is that there is no need for measuring the electron concentration in the plasma. The results obtained show that when the plasma is no longer longitudinally homogeneous, a decrease in $D_\perp$ is not accompanied by the same decrease in diffusion current on the walls. A frequently-encountered masked case of an inhomogeneous column is a column with moving strata. Here charge diffusion along the tube is characteristic of the strata as well as of the low-voltage arc region.[3-5] Results of measurements in a positive column[6] must therefore be accepted with caution.

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ANOMALOUS GALVANOMAGNETIC PROPERTIES OF METALS AT LOW TEMPERATURES

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In many works devoted to the study of galvanomagnetic properties of metals not enough attention is paid to the technique used to bring in the current and potential leads. In strong effective fields [$H_{ef} = H_0\sigma_0(T)/\sigma_0(300°K)$] this can lead to a distortion of the observed phenomena. Thus, for example, in Refs. 1 to 4 the potential difference V_x, measured across the potential electrodes, increases as usual in weak magnetic field, passes through a maximum, diminishes to zero, and sometimes reverses its sign.