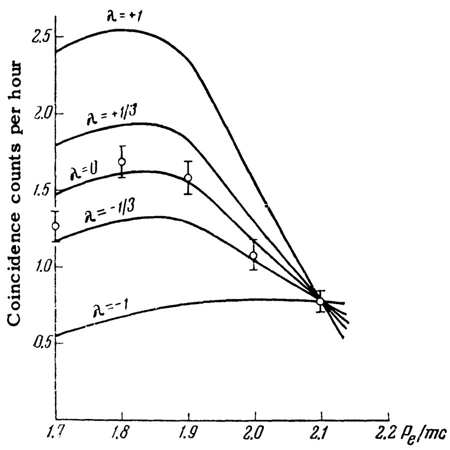

FIG. 2

tions are from the axial vector and vector interactions,[4-7] then our value for λ corresponds to

$$R = g_A^2/g_V^2 = 1.3^{+1.5}_{-0.53}.$$

The large statistical errors do not make it possible to state with assurance that the value R = 1.4 is confirmed, which would follow from the measurements of the neutron lifetime.[8]

In conclusion the authors consider it their duty to express their gratitude to the Academician A. I. Alikhanov for his valuable advice; to E. K. Tarasov for the theoretical calculations; to a group of co-workers, D. P. Zharkov, G. K. Tumanov, and N. I. Afanas'ev for their help in carrying out the experiment; to V. E. Nesterov for help in setting up the equipment; and to the chief engineer of the heavy-water reactor, S. A. Gavrilov, and his co-workers for the uninterrupted operation of the reactor.

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Translated by Genevra Gerhart

THE PERMANENT STRUCTURE OF SHOCK WAVES WITH JOULE DISSIPATION

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Submitted to JETP editor December 30, 1958

J. Exptl. Theoret. Phys. (U.S.S.R.) **36**, 1316-1317 (April, 1959)

If the only factor which changes the entropy of a composite medium is the Joule heat, then the equations of magnetohydrodynamics describing the time-independent uniform flow across magnetic lines of force (see reference 1) determine the evolution of the thermodynamic parameters in accordance with the continuity of mass and momentum flow

$$d(RT/V + H^2/8\pi)/dV \equiv dp/dV = -(\rho u)^2 = -(\rho u)^2_{\pm\infty} \qquad (1)$$

and the condition for heat balance is

$$\rho u T\, dS/dx = (c^2/16\pi^2\sigma)(dH/dx)^2 \geqslant 0. \qquad (2)$$

Magnetohydrodynamic shock waves, in their proper coordinate system, always represent a transition from hypersonic flow at $x = -\infty$ to a flow at $x = +\infty$ which is moving more slowly than adiabatic sound.[2] A trivial consequence of this is the fact that uninterrupted evolution of the thermodynamic parameters within the shock wave according to Eq. (1) would imply a maximum in the entropy within the compression wave, since at some points the speed of flow will be equal to the local adiabatic speed of sound; on the (p, V) diagram the isentropic lines, which are convex downward, will be tangent to the straight lines (1) at these points for any arbitrary amplitude. Any subsequent decrease in the entropy $S_{max} \rightarrow S_{+\infty}$ is impossible in view of (2). More than this, the whole region where $S \geq S_{+\infty}$ along the line (1) turns out to be forbidden, since in this region it is not possible to reach the final state. On the other hand, it is noteworthy that an attempt to construct a continuous solution would lead to a so-called "backlash" of the wave: (1) and (2) give

$$-(u/V)^3 T\, dS/dV = (c^2/16\pi^2\sigma)(dH/dV)^2\, dp/dx. \qquad (3)$$

When $dS/dV > 0$, i.e., when the entropy decreases as the material is compressed, the pressure tends to its final value with a negative gradient, implying an absurd triple-valued nature for the parameters of the flow in space.

In view of the absurdity of a continuous solution, we consider it unavoidable to postulate a Riemann "isentropic discontinuity"[3] in the flow parameters within a compression wave of any amplitude, by analogy with the isothermal discontinuity for purely heat-conducting gases.[4] At such a discontinuity, those gradients whose effect on the dissipation can be ignored must become infinite; i.e., at the discontinuity only the entropy and the magnetic field strength may not change abruptly. Inclusion of the thermal conductivity can smooth out the discontinuity only at sufficiently small amplitudes, above which an isothermal discontinuity sets in,[5] abruptly lowering the entropy. (The isomagnetic discontinuity is discussed in a number of papers,[2,5,6] which show that it must occur for sufficiently large amplitudes; the relationship between the field discontinuity and the entropy discontinuity is discussed in the work of Golitsyn and Stanyukovich,[7] but only in connection with the variation of the shock-front thickness.) If dissipation occurs by way of viscosity in addition to Joule heating, then the isentropic discontinuity mentioned above will be smoothed out for all amplitudes, since for vanishing viscosity the curves for continuous evolution of the flow parameters pass arbitrarily close to the isentropic line S_{max}, coinciding with it only in a single point, at $+\infty$. Even if there is no viscosity, structural continuity is still guaranteed in a shock wave in a heat-conducting medium if there is a sufficiently high density of radiation after the liquidation of the isothermal discontinuity.[8] For discussions of the present work the author is indebted to his co-workers in the Theoretical Section of the Institute of Chemical Physics, in particular to K. E. Gubkin.

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Translated by D. C. West
250

THE K_{e3} AND $K_{\mu 3}$ DECAYS

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Submitted to JETP editor December 31, 1958

J. Exptl. Theoret. Phys. (U.S.S.R.) **36**, 1317-1319 (April, 1959)

THE A-V interaction scheme[1,2] has recently had a series of experimental confirmations in the phenomena of β decay, μ and π decays, and decays of strange particles (decay of the Λ^0 hyperon, $K_{\mu 2}$ decay).[3-5] In connection with this, it is of interest to investigate the three-particle lepton K decays $K \rightarrow l + \nu + \pi$, where l denotes the electron or μ meson.

The matrix element for this process in the theory of universal A-V interaction, in which the electron and μ meson have the same status, has the following form (in the rest system of the K meson):

$$M^{-3/2}E_\pi^{-1/2}\left\{\frac{m_l}{M}X(\bar{l}(1+\gamma_5)\nu)+Y(\bar{l}\gamma_4(1+\gamma_5)\nu)\right\}, \quad (1)$$

where E_π is the total energy of the π-meson, m_l and M are the mass of the lepton and K meson, respectively, while X and Y are real functions of the π-meson energy E_π, and are identical in K_{e3} and $K_{\mu 3}$ decays. If we neglect dependence of X and Y on E_π, assuming that X = const and Y = const, then it is possible to determine these quantities from experiment.

Such considerations were carried out by Gatto.[6*] Calculating the probabilities of $K_{\mu 3}$ and K_{e3} decays from Eq. (1) and comparing them with experimental values for the decay probabilities, Gatto obtained two possible pairs of values for X and Y, for which the ratio was either $X/Y = 4.2$ (solution I) or $X/Y = -0.34$ (solution II).

Knowing the constants X and Y, one can calculate the μ-meson energy spectrum for each