scheme, π^0 or ρ^0 mesons are emitted in the first case, and π_1 or π_2 mesons in the second case.

Obviously, this situation is entirely similar to that arising for neutral K mesons.[8]

In conclusion the author expresses his deep gratitude to V. V. Chavchanidze for his guidance.

Note added in proof (June 15, 1958): If we take, for example, $m_{\pi^+} \sim (\pi^+)^* Q\pi^+$, where Q is some "mass" operator, one can roughly estimate the mass of ρ^0 as ~ 139 Mev, using formulas (1) to (3). Hence, the investigation of π^0 production processes appears to be the most convenient way to discover the ρ^0 meson (cf. Fliagin, Dzhelepov, Kiselev, and Oganesian, Preprint R-188 Joint Inst. for Nucl. Prob.).

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SIMPLE MAGNETOACOUSTIC WAVES

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In ordinary hydrodynamics, it is shown[1] that points of high density in a simple wave move more rapidly than points with low density, if the inequality

$$\left(\frac{\partial^2}{\partial p^2}\frac{1}{\rho}\right) > 0 \tag{1}$$

is satisfied.

In magnetic hydrodynamics, three types of simple waves are present:[2] fast and slow magnetoacoustic, and Alfven (magnetohydrodynamic) waves. The latter wave type is characterized by a constant density and constant velocity. As regards the first two types of waves, it can be shown that points of high density in them are displaced with higher velocity if condition (1) is satisfied.

It follows from this, in particular, that self-similar waves are always waves of discontinuity. The dependence of the phase velocity on the density leads, just as in ordinary hydrodynamics, to the result that in regions of compression the liquid continues to be compressed as long as a shock wave is not formed.

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IMPOSSIBILITY OF RAREFACTION SHOCK WAVES IN MAGNETOHYDRODYNAMICS

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As is known,[1] according to Zemplen's theorem in hydrodynamics, rarefaction shock waves are impossible if

$$\left(\frac{\partial^2}{\partial p^2}\frac{1}{\rho}\right)_s > 0 \tag{1}$$

Landau and Lifshitz[2] have shown that in magnetohydrodynamic low-amplitude shock waves are compression waves if conditions (1) are satisfied.

Hoffmann and Teller[3] have shown that in an ideal gas the compressed shock wave is thermodynamically unstable if the magnetic field is parallel to the plane of explosion. They left open the problem of thermodynamic instability of rarefaction shock waves.

It turns out, however, that Zemplen's theorem is correct also in magnetohydrodynamics for an arbitrary explosion intensity and for an arbitrary magnetic-field direction, provided condition (1) is augmented by the condition

$$(\partial p / \partial T)_\rho > 0. \qquad (2)$$

The increase in shock-wave pressure leads to an increase in density.

To explain how the tangential magnetic field $H_\perp$ changes upon passage of a shock wave, it is enough to use the formula

$$H_\perp = H_{0\perp}\rho (v_{0x}^2 - V_{0x}^2) / (\rho_0 v_{0x}^2 - \rho V_{0x}^2), \qquad (3)$$

which follows from the conditions on the surface of the explosion (the subscript 0 refers to the region ahead of the shock wave, and V_x is the normal projection of the Alfven velocity). Small magnetic fields $[H_x^2 < 2\pi v_{0x}^2(\rho_0/\rho)(\rho + \rho_0)]$ become reinforced by passage of a shock wave, while large magnetic fields $[H_x^2 > 2\pi v_{0x}^2(\rho_0/\rho)(\rho + \rho_0)]$ are attenuated. This indicates that shock waves play a certain equalizing role.

The reinforcement of weak magnetic field by passage of shock waves was noted by Helfer.[4] In his opinion this is one of the mechanisms of formation of strong interstellar magnetic fields.

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ON THE PROBLEM OF TWO-NUCLEON INTERACTION IN THE TAMM-DANCOFF METHOD

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In the field theory of nucleon interactions, the effective potential is usually calculated with the help of the so-called "adiabatic" approximation (i.e., neglecting the motion of the nucleons during the meson exchange).[1-8] Here the potential obtained in the adiabatic approximation is attractive already in the second order term in the coupling constant (g^2), and contains a singularity of type r^{-3}. In higher approximations with respect to the coupling constant, the singularity of the potential increases.

In the investigation of a system of two nucleons with the help of such mesonic potentials one usually introduces into the theory a second arbitrary constant,[6,7] the cut-off constant for the interaction r_c. This is a great deficiency of the theory. However, the author has shown[9] that this arbitrariness of the theory can be excluded in the non-adiabatic treatment of the nucleons, and that a theory can be constructed with a single arbitrary constant, the coupling constant. In the paper[9] it was shown that the Tamm-Dancoff method[1-2] for the two-nucleon system may be applied in its two-meson approximation only. It appeared that the terms of order g^4 in the nucleon interaction are significant only in the nonrelativistic energy region of the interacting particles, while the interaction in the relativistic energy region is completely determined by the terms of order g^2. This result permits one to replace the exact equations for the state amplitude of the two-nucleon system by approximate equations in which the terms of order g^4 are treated only adiabatically (with $p, p' \leq P < M$), while the terms of order g^2 are treated exactly. This greatly simplifies the solution of the equations.

Recently these equations were integrated numerically on the "Strela" electronic computer of the U.S.S.R. Academy of Sciences. For the state $^3S_1 + {}^3D_1$ of the two-nucleon system, we found the lowest eigenvalue of the coupling constant for which the system is in the bound state with binding energy $\mathscr{E} = 2.227$ Mev. The scattering problem was solved for the $^1S_0$ state with a given value for g^2.