article become understandable. The presence of a dip [1, 8] in ρ^{ω}_{00} for the reactions $\pi^+p \to \omega\Delta^{++}$ and $\pi^+n \to \omega p$ at $|t| \simeq 0.25$ is due to the fact that the influence of the ρ^0-ω mixing becomes stronger in the region of small $|t| \lesssim 0.2$, and is an indirect confirmation of the described picture. It would be of interest to measure $\rho^{\omega}_{00}(d\sigma/dt)^{\omega}$ and ρ^{ω}_{00} in the reactions $\pi^-N \to \omega(N,\Delta)$ at $|t| \lesssim 0.3$, since their predicted values are smaller by a factor 2 - 3 than in $\pi^+N \to \omega(N,\Delta)$. It must be noted that in spite of the strong difference in $\rho^{\omega}_{00}(d\sigma/dt)^{\omega}$, the expected difference in $(d\sigma/dt)^{\omega}$ is larger by not more than 20%. At the present time there are no data on ρ^{ω}_{00} and $\rho^{\omega}_{00}(d\sigma/dt)^{\omega}$ for $\pi^-N \to \omega(N,\Delta)$. Their study, together with experiments on the ρ^0-ω interference in the two-pion mass spectrum, would make it possible to establish the value of ϕ_{ε}, since all the results are connected with the closeness of ϕ_{ε} to $\pi/2$. The figure illustrates the described situation for the reactions $\pi^+n \to \omega p$ and $\pi^-p \to \omega n$ within the framework of the Regge-pole model with cuts at 4.19 GeV. The comparison for $\pi^+n \to \omega p$ with experiment is made in [8]. The ρ and B Regge poles and the ρP cut were taken for f_{ω}, and the π Regge pole from [12] was taken for f_{ρ}, with $|\varepsilon| = 0.06$ and $\phi_{\varepsilon} = \pi/2$. It should be noted that even at $|\varepsilon| = 0.03$ all the results remain in force, although the influence of the ρ^0-ω mixing, naturally, decreases. A detailed analysis of ρ^{ω}_{ij} for $\pi N \to \omega N$ and $\pi N \to \omega\Delta$ with allowance for ρ^0-ω mixing will be reported separately.

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ESTIMATE OF ΛN INTERACTION IN THE p STATE

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At the present time, the experimental data on Λp scattering and on the binding energies of hypernuclei are such that the information extracted from them is in the way of estimates. This applies specially to the question of the strength of the ΛN interaction in the p state. All that can be regarded as established is the fact that if the ΛN potentials are chosen in accord with the Λp scattering, then they must overestimate the experimental values of the Λ-particle detachment energies, B_{Λ}, in the hypernuclei of the p shell and in nuclear matter [1, 2]. The situation is not remedied by additional fitting of the potential to B_{Λ} of the hypernuclei H^3_{Λ} and He^4_{Λ}. The potentials chosen in this manner overestimate B_{Λ} even for He^5_{Λ}, the heaviest hypernucleus of the s shell [3] (the so-called He^5_Λ problem). This is most likely connected with the inappropriate fitting procedure, which gives preference to crude data on Λp scattering, although B_Λ of hypernuclei has been measured much more accurately, especially B_Λ (He^5_Λ). It is possible to avoid the overestimate of the theoretical values of B_Λ in the hypernuclei of the p shell in various manners, particularly by assuming that the ΛN interaction in the relative p state differs in strength from the interaction in the s state - the most preferable assumption, since in this case the number of introduced new interaction parameters is minimal. According to Herndon and Tang [3], for best description of elastic Λp scattering it is necessary that the ΛN interaction in the p state (V_1, $\ell = 1$) amount to approximately 0.3 - 0.7 of the interaction strength in the s state (V_0). According to Brink and Grypeos [4], if we calculate B under the assumption that $V_1 = V_1$ and $V_1 = 0$, then all the experimental points lie between these two limiting cases. However, by calculating the hypernucleus of the p shell by the Hartree-Fock method, Ho and Volkov reached the conclusion that even at $V_1 = 0$ the detachment energies of the Λ particles remain overestimated [5]. However, the ΛN potentials of Ho and Volkov give a much larger value for B_Λ (He^5_Λ) (6.9 MeV according to our calculations), and consequently their results should be revised. It is therefore of interest to estimate once more the ΛN interaction in the p state.

The known hypernuclei of the p shell are not suitable for the estimate, since there are no reliable data whatever on the spin-orbit and tensor ΛN forces. The most suitable hypernucleus, O^{17}_Λ, has unfortunately not yet been identified. Nevertheless, by interpolating between the known points, it is possible to obtain $B_\Lambda(O^{17}_\Lambda) = (15 \pm 1)$ MeV with an accuracy perfectly adequate for our analysis. To calculate the binding energy of O^{17}_Λ, we use the main approximation of the method of K harmonics. All the needed formulas can be found in [6, 7]. To this end, it is necessary to solve an equation of the type of the Schrodinger radial equation

$$\left[\frac{d^2}{d\rho^2} - \frac{\ell(\ell+1)}{\rho^2} - W(\rho) - \kappa^2\right] f(\rho) = 0,$$

where $W(\rho)$ is the effective interaction between the particles and $\ell = 34.5$ in this case. When the Majorana forces are taken into account the ΛN potential takes the form

$$V_{\Lambda N} = V_0 \frac{1 + P_x}{2} + V_1 \frac{1 - P_x}{2} .$$

Here $V_0 = (V_s + 3V_t)/4$, where V_s and V_t are the singlet and triplet ΛN potentials). We also write V_1 in the form $V_1 = kV_0$. If we then choose the NN and ΛN potential in the form of a sum of Gaussian potentials with parameters describing well He^4, O^{16}, He^4_Λ, and He^5_Λ [8], then the final result reduces to the following: For all the sets of the ΛN potentials, $B_\Lambda(O^{17}_\Lambda) \simeq 15.5$ holds at values of k from -0.30 to -0.45. Otherwise it is necessary that the ΛN interaction in the p state be entirely repulsive, but its strength should be one-third or one-half that of the interaction in the s state.

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VERIFICATION OF VECTOR DOMINANCE

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When the consequences of the vector-dominance hypothesis are compared with experiment, the question arises of the choice of the coordinate system [1, 2], since the vector meson, unlike the photon, has not only transverse polarization components, but also longitudinal polarization. In addition, there is the question of the validity of the assumption that the hadron amplitudes are independent of the mass of the vector particle. We consider below reactions of the type $0 + 0 \to 0 + 1$, in which, at a constant internal parity ($I_i = I_f$, I_i, and I_f are the internal parities of the initial and final states) the vector particle has only transverse polarization [3 - 5], regardless of the mass value, and in this sense is "photonlike." In reactions of this type it is possible to formulate the consequences of the vector dominance in explicitly covariant fashion, as well as to attempt to resolve the question of whether the hadron amplitude depends on the square of the vector-particle mass or not. The simplest example is afforded by the reactions caused by the isovector photon and the related reactions with $\rho^\pm$ mesons [6]:

$$\gamma + He \to He + \pi^0, \quad \pi^\pm + He \to \rho^\pm + He, \quad e + He \to e + He + \pi^0.$$

The easiest way to verify the transversality of the polarization of the nonzero-mass vector particle taking part in the reaction $0 + 0 \rightleftarrows 0 + 1$ is with the aid of the selection rule [7]

$$I_i(-1)^{S_i} = I_f(-1)^{S_f},$$

where S_i and S_f are the summary spin projections of the initial and final particles on the normal to the reaction plane. If $I_i = I_f$, $S_i = 0$, and $S_f = s_v$, then the produced vector meson has a spin projection $s_v = 0$, and consequently its vector polarization is directed normal to the reaction plane. Thus, the vector particle is produced in a pure spin state, and its normal density matrix is defined uniquely and does not depend on the dynamics of the collision.

In accordance with the vector-dominance hypothesis, the matrix element of the isovector part of the electromagnetic current j_μ^3 is connected with the matrix element of the current j_μ^ρ responsible for the emission of the neutral ρ meson by the relation

$$(\pi He|j_\mu^3|He) = \frac{e m_\rho^2}{f_\rho}\frac{1}{k^2 + m_\rho^2}(\pi He|j_\mu^\rho|He), \qquad (1)$$