order as $W_2(\rho)$ and must already compete with the sum $W_0(\rho) + W_1(\rho)$. Therefore the formation of resonances in this region is even less probable.

A similar situation holds for nuclei with $A > 40$.

Thus, in the model with exchange Δ-N interaction, the attraction between the Δ isobar and the nucleus is not sufficient for the formation of the bound state, and therefore the existence of resonances in the system (ΔAN) with $A > 4$ is not highly probable.

To obtain this result we used the approximation $K = K_{min}$ of the K-harmonics method, which is a poor approximation because Δ and N are not identical for the system in question. However, the obtained limitation of the growth of the interaction between the Δ isobar and the nucleus has a general character which does not depend on the employed approximation. It is the consequence of the presence in the Δ-N potential of the operator of permutation of the spatial coordinates of the isobar and the nucleon, just as a saturation of the nuclear forces is a consequence of the fact that the nucleon-nucleon Majorana potential contains the operator of permutation of the spatial coordinates of the nucleons.

If multibaryon resonances are ever observed, this will mean that there exists between the isobar and the nucleon an interaction that does not reduce to either the exchange or to induced interaction.

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POSSIBILITY OF OBSERVING QUASINUCLEAR MESON RESONANCES IN COLLIDING e^+e^- BEAMS

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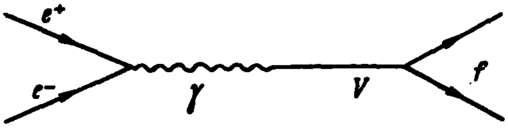
In recent papers [1 - 3] there was proposed a mechanism for the formation of quasinuclear meson resonances, which were regarded as nonrelativistic bound states in the $N\bar{N}$ system. Among these there are four mesons with photon quantum numbers ($J^{PC} = 1$). Two of these mesons corresponding to the $^{33}S_1$(1727) and $^{33}d_1$(1855) states of the $N\bar{N}$ system with respective widths 94 and 117 MeV have an isospin I = 1 and positive G parity, while the other two mesons have negative G parity, I = 0, and correspond to the $^{13}S_1$(1414) and $^{13}d_1$(1382) states of the $N\bar{N}$ system with widths 63 and 71 MeV. From the quasinuclear nature of the considered meson resonances it follows, in particular, that a correspondence should occur between the partial widths of the decays of the resonances and the cross sections for the annihilation in the same states where, as is well known



[4, 5], multiple production predominates. It is of interest to consider the mechanism for the production of the indicated quasinuclear meson resonances in colliding e^+e^- beams, where there are indications [6, 7] of a multiple character of the production of particles in the energy region of interest to us.

In the single-photon approximation, the cross section for the resonant production, corresponding to the diagram of the figure, is given in the resonance region by the formula

$$\sigma(e^+e^- \to V \to f) = \frac{12\pi}{m_V^2} \frac{\Gamma(V \to e^+e^-)\Gamma(V \to f)}{\Gamma_V^2}, \tag{1}$$

where Γ_V, $\Gamma(V \to e^+e^-)$, and $\Gamma(V \to f)$ are respectively the total and partial widths of the resonance in question, and m_V is its mass.

As shown in [1 - 3], the total and partial widths can be calculated with the aid of the following formula:

$$\Gamma = (v\sigma_{N\bar{N}})\overline{|\psi(0)|^2}, \tag{2}$$

where $\sigma_{N\bar{N}}$ is the cross section for the annihilation of $N\bar{N}$ and corresponding states at $v \to 0$, v is the relative velocity $N - \bar{N}$ and $\overline{|\psi(0)|^2}$ is the average density of the particles in the annihilation region.

With the aid of (2) we obtain

$$\sigma(e^+e^- \to V \to f) = \frac{12\pi}{m_V^2} \frac{v\sigma(N\bar{N} \leftarrow e^+e^-)}{v\sigma(N\bar{N} \to f)} a_f , \tag{3}$$

where

$$a_f = \frac{\Gamma(V \to f)}{\Gamma_V} = \frac{\sigma(N\bar{N} \to f)}{\sigma_{N\bar{N}}} -$$

is a quantity known from the experimental data on the $N\bar{N}$ annihilation.

In the single-photon approximation, the quantity $v\sigma(e^+e^- \to N\bar{N})$, as is well known, is given by the formula

$$v\sigma(e^+e^- \to N\bar{N}) = \frac{\pi\alpha^2}{M^2}|G|^2, \tag{4}$$

where M is the nucleon mass; $G = G_E(4M^2) = G_M(4M^2)$ is the electromagnetic isoscalar or isovector form factor of the nucleon, depending on the isotopic spin of the meson in question.

The quantity G can be obtained in principle from experiments on $p\bar{p} \to e^+e^-$ and $e^+e^- \to n\bar{n}$, but the presently available experimental data [8, 9] do not make it possible to make definite statements concerning the value of $G(4M^2)$. According to most presently available theoretical models [10 - 12], $G(t)$ increases with decreasing t and amounts to $\sim 0.1 - 0.5$ in the region of t of interest to us ($t \sim 4M^2$). We finally obtain

$$\sigma(e^+e^- \to V \to f) = 1.6 \cdot 10^{-32} a_f (M/m_V)^2 |G|^2. \tag{5}$$

Since at present there are experimental data only for the $N\bar{N}$ annihilation at rest, the values of a_f are known only for the S states [4, 5]. Namely, for the $^{33}S_1(1727)$ state the values of a_f are equal to $(3.2 \pm 0.3) \times 10^{-3}$, $(5.4 \pm 0.6) \times 10^{-2}$, $(3.2 \pm 0.6) \times 10^{-2}$, $(1.9 \pm 0.6) \times 10^{-2}$, and $(2.2 \pm 1.7) \times 10^{-3}$ for the channels $\pi^+\pi^-$, $2\pi^+2\pi^-$, $\rho^0\pi^+\pi^-$, $\rho^0 f^0$, and $\rho^0\eta^0$, respectively. In the case of the $^{13}S_1(1414)$ state the quantities a_f for the channels $\pi^\pm\rho$ and $\pi^0\rho^0$ are respectively equal to $(2.9 \pm 0.4) \times 10^{-2}$ and $(1.4 \pm 0.2) \times 10^{-2}$. As to the mesons $^{33}d_1(1855)$ and $^{13}d_1(1382)$, one can conclude from the available data on $N\bar{N}$ annihilation in flight that the qualitative character of the distribution with respect to the number of pions remains unchanged.

As shown in [3], meson pairs with identical quantum numbers become intermixed, and therefore we should expect a resonance curve different from the Breit-Wigner one.

Besides the mesons under consideration, which correspond to bound states of the $N\bar{N}$ system, the quasinuclear model predicts also the existence of resonances in the $N\bar{N}$ system with masses larger than 2M, among which there may be included resonances with the quantum numbers of the photon.

Thus, the experiment proposed for colliding e^+e^- beams makes it possible to observe quasinuclear meson resonances, and also to obtain considerable information on the behavior of the electromagnetic form factors of the nucleon in the time-like region and concerning the mechanism of multiparticle production of pions in the energy region under consideration.

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