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Явление антиэкранирования в неупругой дифракции адронов на ядрах

Неупругая дифракция на ядрах рассмотрена в модели собственных состояний (МСС), которая правильно описывает пространственно-временную структуру взаимодействия. Показано, что МСС эквивалентна модели многократного рассеяния (ММР), в которой учетены все промежуточные состояния. В кварк-партонном варианте МСС найдено, что мнимая часть амплитуды неупругой дифракции отрицательна в отличие от упругой амплитуды. Это приводит к тому, что некоторые графики в ММР имеют аномальный знак - явление антиэкранирования. Данные о реакции $pd \to xd$ ясно подтверждают этот вывод. Пренебрежение антиэкранировочными поправками явилось причиной того, что сечения поглощения адронов дифракционно рожденных в ядре оказались сильно заниженными.

Работа выполнена в Лаборатории ядерных проблем ОИЯИ.

Препринт Объединенного института ядерных исследований. Дубна 1979

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Antishadowing Phenomenon in the Hadron Inelastic Diffraction on Nuclei

Inelastic diffraction scattering on nuclei is treated in the eigen-state method (ESM), correctly describing the space-time picture of the interaction. It is shown that ESM is equivalent to the multiple scattering model (MSM) which takes into account all possible intermediate states. In the quark-parton version of ESM we have found out that inelastic diffractive amplitude has the opposite sign to the elastic one. This leads to the abnormal sign of some terms in MSM - antishadowing phenomenon. The data on the $pd \to xd$ reaction clearly confirm this conclusion. The ignoring of the antishadowing corrections is a reason of the diminishing values of the absorbtion cross sections obtained for hadrons diffractivelly produced off nuclei.

The investigation has been performed at the Laboratory of Nuclear Problems, JINR;

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1. INTRODUCTION

The pattern of the inelastic diffraction as brought about by absorbtion has been firstly proposed by Feinberg and Pomeranchuk [1] and developed further by Good and Walker [2]. In the previous papers [3,4] we have applied these ideas, combined with the quark-parton model, to the elastic hadron-nucleus scattering. It has been found there that such eigen state method (ESM), which takes into account the Lorenz dilation of the hadronic fluctuation time, is equivalent to the multiple scattering model (MSM) which is seemed to be in contradiction with the space-time evolution of the interaction. The only condition of this equivalence is an inclusion of all possible intermediate states into the MSM graphs.

In section 2 of the present paper we generalize this result to the inelastic diffraction off nuclei. Using a simplified version of ESM we define in section 3 a sign of the imaginary part of the inelastic diffractive amplitude, and find out that it is negative, contrary to the elastic one. This result gives many consequences for MSM. For instance, in the diffractive production off the nucleus the MSM graphs which contain the even number of the inelastic vertices have abnormal, antishadowing sing relatively to the impulse term.

In section 4 this prediction is verified in the case of inelastic diffraction on a deuteron. Due to the antishadowing contribution the double scattering term in the amplitude should change the sign, when an effective mass of the produced particles is increased. This prediction is clearly confirmed by experimental data.

One of the main consequences of the antishadowing phenomenon is concerned with a problem of extracting the absorbtion cross section of produced hadronic system from the experimental data on the coherent particle production off nuclei. If in the theoretical calculations one neglects the graphs containing more than one diffractive vertex (as always has been done) one obtaines a diminished cross section value. During a long time this erroneus result has been treated as a physical phenomenon. This question is discussed in section 5.

Other consequences of the negative sign of the imaginary part of the inelastic diffraction amplitude are discussed in the Conclusion.

2. THE EIGEN-STATE METHOD AND THE MULTIPLE SCATTERING MODEL

We investigate here inelastic diffraction off nuclei in the framework of ESM developed earlier [3,4] for the elastic scattering.

Let $|k\rangle$ be a complete set of the interaction Hamiltonian eigen states (k = 0, 1, 2....is a number of state):

$$\hat{f}|k\rangle = f\,|k\rangle. \qquad (1)$$

Here $\hat{f}$ is the imaginary part of the scattering amplitude operator.

The physical states $|a\rangle$ form another complete set, which is connected with $|k\rangle$ by the unitary transformation

$$|a\rangle = \sum_k c_{ak}|k\rangle, \qquad (2)$$

$$\sum_k c^*_{ak} c_{k\beta} = \delta_{a\beta}, \qquad (3)$$

$$\sum_a c_{ka} c^*_{ai} = \delta_{ik}. \qquad (4)$$

Now one can write the inelastic diffraction amplitude [5]

$$f^{(1)}_{a\beta} = \langle\beta|\hat{f}|k\rangle = \sum_k c_{ak} c^*_{k\beta} f_k. \qquad (5)$$

If a target contains two scattering centers (deutron) the screening term has a form

$$f^{(2)}_{a\beta} = \sum_k c_{ak} c^*_{k\beta} f^2_k. \qquad (6)$$

We took here into account the Lorentz dilation of the fluctuation time, so the states $|k\rangle$ in sum (2) do not mix along with the interaction and each state $|k\rangle$ scatters independently [3,4].

In MSM one considers some intermediate physical states $|a\rangle, |\beta\rangle$ (the Glauber type correction) or $|\gamma\rangle \neq |a\rangle, |\beta\rangle$ (the inelastic type correction). This procedure seems to be in contradiction with the above space-time picture. Nevertheless, if one sums all the intermediate state contributions one obtains a correct result. Indeed, using (4)

$$\sum_\gamma f^{(1)}_{a\gamma} f^{(1)}_{a\beta} = \sum_\gamma \Big(\sum_k c_{ak} c^*_{k\gamma} f_k\Big)\Big(\sum_\ell c_{\gamma\ell} c^*_{\ell\beta} f_\ell\Big) = \sum_k c_{ak} c^*_{k\beta} f^2_k.$$

This result can be easily extended to any nucleus.

The equivalence of ESM and MSM shown above is a generalization of results obtained in /3,4/ for elastic scattering.

3. A SIGN OF THE INELASTIC DIFFRACTIVE AMPLITUDE

The positivity of the imaginary part of the elastic scattering amplitude (in the impact parameter representation) follows from the unitarity. Unfortunately, no such principle exists which could give a possibility to define the sing of the inelastic diffractive amplitude.

Here we try to determine its sign using a quark parton version of ESM /3,4/. It has been found /3,4/ that the main contribution to the inelastic diffraction amplitude arises from distinction between the active state scattering amplitudes $f_k (k \geq 1)$ and the passive one f_0. The dispersion of the amplitude f_k within the active component gives a small contribution to the diffraction /3,4/, and all these amplitudes for $k \geq 1$ can be taken equal to F. Then, the scattering matrix in the eigen state basis can be written in the following form:

$$\langle k | \hat{f} | i \rangle = F\delta_{ik} - (F - f_0)\delta_{i0}\delta_{k0} \,. \tag{7}$$

In the physical state basis

$$f_{\alpha\beta} = c_{\alpha i} f_{ik} c^*_{k\beta} = F\delta_{\alpha\beta} - (F - f_0) c_{\alpha 0} c^*_{0\beta} \,. \tag{8}$$

Thus, the elastic and inelastic diffraction amplitudes are equal to

$$f_{\alpha\alpha} = (1 - |c_{\alpha 0}|^2) F + |c_{\alpha 0}|^2 f_0 \tag{9}$$

$$f_{\alpha\beta} = - c_{\alpha 0} c^*_{0\beta} (F - f_0). \tag{10}$$

The passive state scattering amplitude $f_0 = 0$. So, the amplitude $f_{\alpha\alpha}$ in eq. (9) can be written as $f_{\alpha\alpha} = P_\alpha F$, where P_α-active state norm /3,4/.

In the quark-parton model /3,4/ the passive component coefficient for the state $|\alpha\rangle$ equals to $c_{\alpha 0} = (c_{q0})^{n_\alpha}$, where n_α is a number of quarks and antiquarks in the state $|\alpha\rangle$. The states $|\alpha\rangle$ and $|\beta\rangle$ differ by some number of quark-antiquark pairs. Thus, because the states $|q\rangle$ and $|\bar{q}\rangle$ have the opposite phases coefficients $c_{\alpha 0}$ and $c_{\beta 0}$ have the same ones, so the diffraction amplitude (10) has the negative sing.

To be convinced of this resúlt one must investigate some interference effects, where the sign of $f_{\alpha\beta}$ is clearly demonstrated.

4. THE ANTISHADOWING PHENOMENON

The negative sign of the inelastic diffractive amplitude leads to the abnormal sign of some inelastic multiple scattering terms in the hadron-nucleus diffractive amplitude. Let us consider in detail the inelastic diffractive scattering on a deuteron.

In MSM one can distribute $f_{\alpha\beta}$ into contributions shown schematically in Fig.1. According to above results the double diffractive term $f^{(2)}_{\alpha\gamma\beta}$, where $\gamma \neq \alpha, \beta$ has the same sign as the impulse term $f^{(1)}_{\alpha\beta}$. So this contribution has the antishadowing nature in contrast to the ordinary Glauber type corrections $f^{(2)}_{\alpha\alpha\beta}$ and $f^{(2)}_{\alpha\beta\beta}$. The sign of the whole double scattering term $f^{(2)}_{\alpha\beta} = f^{(2)}_{\alpha\alpha\beta} + f^{(2)}_{\alpha\beta\beta} + f^{(2)}_{\alpha\gamma\beta}$ depends on the relative values addends. Note that the longitudinal transfered momentum $q_\parallel \approx (m^2_\beta - m^2_\alpha)/2E$ is accepted by a deuteron only in one vertex $\alpha \to \beta$ in graphs Fig. 1b and 1c. Whereas in graph 1d the momentum $q_\parallel$ is divided between two vertices $\alpha \to \gamma$ and $\gamma \to \beta$. For this reason the deuteron form factor suppresses strongly the terms $f^{(2)}_{\alpha\alpha\beta}$ and $f^{(2)}_{\alpha\beta\beta}$, consequently, $f^{(2)}_{\alpha\gamma\beta}$ begins to dominate at large $q_\parallel$ value. Thus, we predict the change of the $f^{(2)}_{\alpha\beta}$ sign along with m^2_β increasing.

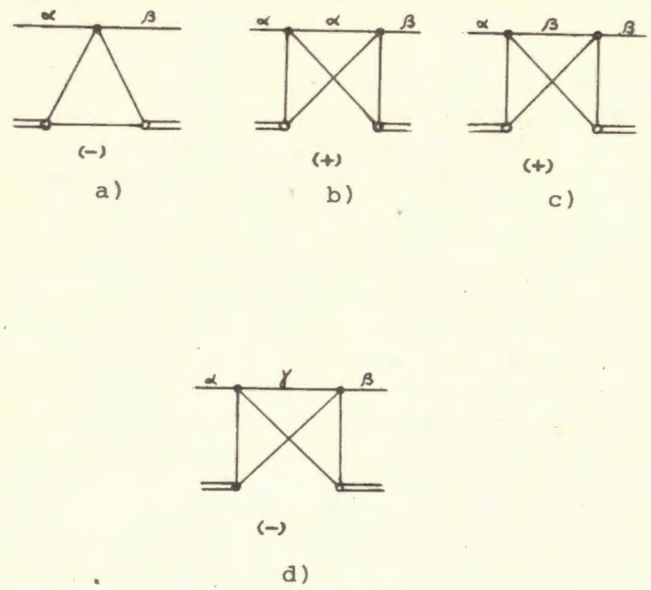

Fig.1. Feynman graphs, describing different contributions to the inelastic diffractive amplitude. The signs in the brackets correspond to the imaginary parts of this contributions

To check this prediction, consider the following combination of experimental data:

$$R(x, q^2) = 1 - \frac{d^2\sigma^{pd\to Xd}/dq^2dx}{4S^2(q^2/4)\, d^2\sigma^{pp\to pX}/dq^2dx} . \qquad (11)$$

Here – q^2 is the square of the 4-momentum transfered; $x \cong 1-M_x^2/s$ is the Feynman scaling variable; M_x is the effective mass of the state X; s is the c.m. total energy squared (in the reaction $pd\to Xd$ it corresponds to the nucleon-nucleon system); $S(q^2)$ is the deuteron form factor.

Expression (11) can be rewritten by using MSM amplitudes as follows:

$$R(x, q^2) = -2\frac{f^{(2)}_{\alpha\beta}}{f^{(1)}_{\alpha\beta}} - \left(\frac{f^{(2)}_{\alpha\beta}}{f^{(1)}_{\alpha\beta}}\right)^2 , \qquad (12a)$$

If, as was predicted above, $f^{(2)}_{\alpha\beta}(x, q^2)$ changes its sign with M_x^2 increasing, the function $R(x, q^2)$ must also change its sign.

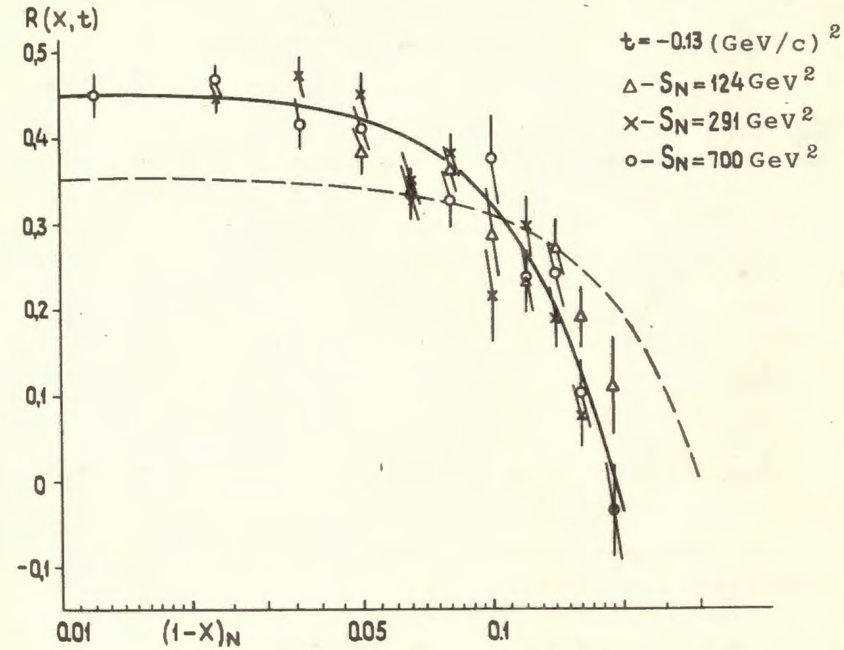

Fig.2. Function $R(x, q^2)$ calculated using (11), the data /6/ and results of fitting /7/. The dashed curve is the best description with the fixed value of $\kappa=1$ and one free parameter $\delta=2.34\pm0.14$. The solid curve is the best description of the data with two free parameters $\kappa=1.56\pm0.037$ and $\delta=4.46\pm0.12$.

The experimental data plotted in Fig.2 clearly confirm this prediction. The data on the reaction $pd \to dX$ have been taken from /7/. The cross section of the reaction $pp \to pX$ is calculated using the results of the triple-regge fit /8/ (the pion exchange contribution is excluded).

Let us estimate now the function $R(x, q^2)$ quantitatively. The total contribution of the graphs in Fig. 1b and 1c to the amplitude can be written as follows /9/:

$$f^{(2)}_{aa\beta} + f^{(2)}_{a\beta\beta} = -\frac{\delta}{8\pi^2}\int d^2k_\perp f^N_{a\beta}\left(\frac{1}{2}q_\perp + k_\perp, q_\parallel\right) \times f^N_{aa}\left(\frac{1}{2}q_\perp - k_\perp, 0\right) S\left(\frac{1}{4}q_\parallel^2 + k_\perp^2\right). \qquad (12)$$

Here $q_\perp$ and $q_\parallel$ are the transverse and longitudinal components of the q-momentum transfer, $\delta = 1 + \sigma^{\beta N}_{tot}/\sigma^{aN}_{tot}$. The functions f^N_{aa} and $f^N_{a\beta}$ are the elastic and inelastic diffractive amplitudes on a nucleon. We assume here that the amplitudes f^N_{aa} and $f^N_{\beta\beta}$ have the same q^2-slopes.

The $k_\perp$-dependence of $S(k_\perp^2)$ is so steep that other functions in integrand (12) can be evaluated at $k_\perp^2 = 0$.

$$f^{(2)}_{aa\beta} + f^{(2)}_{a\beta\beta} = -\frac{\delta}{8\pi^2} f^N_{a\beta}\left(\frac{1}{2}q_\perp, q_\parallel\right) f^N_{aa}\left(\frac{1}{2}q_\perp, 0\right)\int d^2k_\perp S\left(\frac{1}{4}q_\parallel^2 + k_\perp^2\right) \qquad (13)$$

One can estimate in the same manner the contribution of $f^{(2)}_{a\gamma\beta}$

$$f^{(2)}_{a\gamma\beta} = -\frac{1}{16\pi^3} f^N_{a\gamma}\left(\frac{1}{2}q_\perp, \frac{1}{2}q_\parallel\right) f^N_{\gamma\beta}\left(\frac{1}{2}q_\perp, \frac{1}{2}q_\parallel\right)\int d^2k_\perp dk_\parallel S(k_\perp^2 + k_\parallel^2). \qquad (14)$$

Now we can pass to the calculation of the ratio in expression (12). The impulse term is equal to

$$f^{(1)}_{a\beta} = 2 f^N_{a\beta}(q_\perp, q_\parallel) S\left(\frac{1}{4}q^2\right). \qquad (15)$$

One can write using eqs. (13) and (15) the following relation in a small M_x^2 region ($q^2 \to 0$):

$$\left.\frac{f^{(2)}_{aa\beta} + f^{(2)}_{a\beta\beta}}{f^{(1)}_{a\beta}}\right|_{q^2 \to 0} = -\delta r_{el}, \qquad (16)$$

where $r_{el} = |f^{(2)}_{aaa}/f^{(1)}_{aa}|$ is the relative value of the elastic Glauber correction in the total cross section.

The q^2-dependence of the amplitude $f^N_{aa}(q^2)$ is parametrized as followa:

$$f^N_{aa}(q^2) = f^N_{aa}(0) e^{-R_N^2 q^2}. \qquad (17)$$

Here $2R_N^2$ is a slope of the a-N elastic scattering differential cross section. Because in the reaction $pp \to pX$ the dissociation vertex contains no q^2-dependence, one obtains

$$f^N_{a\beta}(q) = f^N_{a\beta}(0) e^{-\frac{1}{2}R_N^2 q^2}. \qquad (18)$$

Such q^2-dependence is confirmed by analysing the experimental data /8/.

Now one can reconstruct the $q_\parallel$-dependence of ratio (16)

$$\frac{f^{(2)}_{aa\beta} + f^{(2)}_{a\beta\beta}}{f^{(1)}_{a\beta}} = -\delta r_{el} e^{\frac{1}{8}R_N^2(q^2 - q_\parallel^2)} F(q_\parallel^2), \qquad (19)$$

where

$$F(q_\parallel^2) = \frac{\int d^2k_\perp S\left(\frac{1}{4}q_\parallel^2 + k_\perp^2\right)}{\int d^2k_\perp S(k_\perp^2)}. \qquad (20)$$

It is worth while noting that the factor δ can depend on $q_\parallel$ logarithmically, because the number of produced particles grows with M_x^2. We neglect this weak dependence in comparision with the exponential one.

The calculation of the inelastic-type correction $f^{(2)}_{\alpha\gamma\beta}$ is the most difficult point. There is no information about the jet-into-jet diffractive amplitude $f^{N}_{\gamma\beta}$. Nevertheless, one can estimate the ratio $f^{(2)}_{\alpha\beta}/f^{(1)}_{\alpha\beta}$ at small values of the momentum transfer using the two component parton model developed in Section 3.

From relations (8) and (4) one obtains

$$f^{(2)}_{\alpha\gamma\beta}(b) = c_{\alpha 0} c^{*}_{0\beta}(F-f_0)^2(1-|c_{\alpha 0}|^2-|c_{\beta 0}|^2). \qquad (21)$$

Here the summation over $\gamma \neq \alpha, \beta$ is performed. The relation is written in the impact parameter b representation.

Using (21) and (8) we find*

$$\frac{f^{(2)}_{\alpha\beta}}{f^{(1)}_{\alpha\beta}}\Big|_{q^2\to 0} = \frac{\int d^2b\,(F^2-f_0^2)}{\int d^2b\,(F-f_0)}. \qquad (22)$$

Let us compare this ratio with the analogous relation in the elastic scattering, where after summation over the elastic and inelastic Glauber corrections one has

$$\frac{f^{(2)}_{\alpha\alpha}}{f^{(1)}_{\alpha\alpha}}\Big|_{q^2=0} = \frac{\int d^2b\,[F^2-|c_{\alpha 0}|^2(F^2-f_0^2)]}{\int d^2b\,[F-|c_{\alpha 0}|^2(F-f_0)]}. \qquad (23)$$

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* The integration in exprs. (22) and (23) is more complicated, bacause instead of $f^2_k(b)$ one must write $f_k(b-b_1)f_k(b-b_2)$ and integrate also over b_1 and b_2 nucleon positions with the deuteron density function. But this fact does not influence the final result and is omitted here for the sake of simplicity.

It is seen from (22)-(23) that if the passive amplitude $f_0=0$, then $\kappa=(f^{(2)}_{\alpha\beta}/f^{(1)}_{\alpha\beta})/(f^{(2)}_{\alpha\alpha}/f^{(1)}_{\alpha\alpha}) = 1$. The same conclusion has been obtained in ref./9/ by means of one component consideration. It is seen now that this result is valid only if $f_0=0$. Besides, after taking into account the small dispersion of the amplitudes f_k inside the active component, ratio (22) becomes larger than the elastic one. It is worth while noting also that the authors of ref./9/ have concluded from the equality $\kappa=1$ that the term $f_{\alpha\gamma\beta}$ has an abnormal sign. In ESM such conclusion is optional. As for the one component approximation, it must give no inelastic diffraction in the framework of ESM.

Thus, if one knows the value of κ, one can estimate the ratio $\lambda = f^{(2)}_{\alpha\gamma\beta}/f^{(1)}_{\alpha\beta}|_{q^2\to 0}\, r^{-1}_{e\ell}$ from the relation

$$\delta-\lambda = \frac{\kappa}{r_{e\ell}}\,\frac{f^{(2)}_{\alpha\alpha}}{f^{(1)}_{\alpha\alpha}}\Big|_{q^2=0}. \qquad (24)$$

The q^2 and $q^2_{\parallel}$-dependence of $f^{(2)}_{\alpha\gamma\beta}$ can be obtained from eqs. (14) and (18). We take into account only the exponential $q^2_{\parallel}$-dependence in the expression (14), neglecting the unknown power type $q_{\parallel}$-dependence.

After using eqs. (19) and (15), one has

$$\frac{f^{(2)}_{\alpha\beta}}{f^{(1)}_{\alpha\beta}}(q^2,x) = \frac{r_{e\ell}}{S(\frac{1}{4}q^2)}\,[\delta F(q^2_{\parallel})e^{\frac{1}{8}R^2_N(q^2-q^2_{\parallel})} - \lambda e^{\frac{1}{4}R^2_N q^2}]. \qquad (25)$$

All the parameters here are known except δ and κ, so after fixing $\kappa=1$ one can calculate the function $R(x,q^2)$ in (12) with only one free parameter. The results of the fitting are plotted in Fig. 2. We obtained $\delta = 2.34 \pm 0.14$. We used the following values of parameters: $r_{e\ell} = 0.045$; $\frac{r_{e\ell}(\delta-\lambda)}{\kappa} = 0.057$/10/, $R^2_N = 5\ (GeV/c)^{-2}$.

Form factor $S(q^2)$ is taken from [11]. The agreement with the experimental data is not bad in view of the performed approximations.

Because relation (24) obtained in the two-component approximation is rough, one can treat the parameter κ as a free one. It is clear that the value of parameter κ does not affect the position in x, where $R(x, q^2)$ changes its sign. After fitting both parameters one finds $\delta = 4.46 \pm 0.12$; $\kappa = 1.56 \pm 0.037$. The corresponding curve is also shown in Fig. 2.

Thus, the experimental data clearly confirm the antishadowing phenomenon in the inelastic diffraction*.

5. CAN THE ABSORPTION CROSS SECTION OF A SYSTEM DIFFRACTIVELY PRODUCED OFF A NUCLEUS BE DETERMINED?

One of the main results obtained in the decade investigation of inelastic diffraction off nuclei is the determination of the absorption cross section of an unstable hadronic system on a nucleon. The diffraction dissociation $a \to \beta$ on a nucleus is treated generally on a Glauber-like model, schematically shown in Fig. 3, where absorption of the incoming particle a and the produced state β us taken into account (without inelastic screening [13]). The β-N cross section can be thus determined. Most experiments have shown surprisingly small β-N cross sections [14].

The main correction to such calculation procedure arises from the process shown in Fig.3b. We insist in disregard of this correction diminishes significantly the output β-N cross

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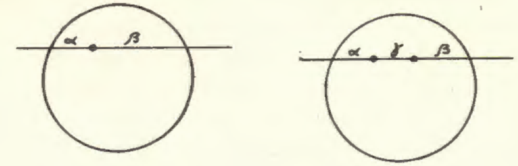
* The analysis of the experimental data [12] at ISR-energies has shown no definite conclusion because of the too large errors.



a) b)

Fig.3. Different contributions to inelastic diffractive amplitude on the heavy nucleus.

section. Crude estimations show that this effect is about 100%.

To be convinced of such large effect of antishadowing, let us examine the example of the deuteron considered above. The best agreement with the experimrntal data was achieved at $\delta = 4.46$, i.e., at $\sigma_{tot}^{\beta N} / \sigma_{tot}^{aN} = 3.46$. The value of the second parameter was found to be $\delta - \lambda = 2$. Thus, if somebody extracts $\sigma_{tot}^{\beta N}$, neglecting the term $f^{(2)}_{a\gamma\beta}$ $(\lambda \equiv 0)$, one will find $\delta = 2$, i.e., $\sigma_{tot}^{\beta N} / \sigma_{tot}^{aN} = 1$ (compared with [7]), the value is much smaller than the real one.

Thus, the analysis of diffraction production data without the antishadowing term gives absurd results. Miettinen and Pumplin in a recent paper [15] have come to the same conclusion. They used the parton model [5] similar to ours. They have found a source of errors in a wrong space-time description of the interaction in MSM. It was shown here that this is not a case, but the real reason of errors is the antishadowing effect.

Unfortunately, the calculation of the antishadowing corrections is impossible now, in a straightforward way at least. In the example of a deuteron the result for $\sigma_{tot}^{\beta N} / \sigma_{tot}^{aN} = 3.46$

is very crude because of many theoretical uncertainties in the calculations. Thus, a possibility of β-N cross section determination is questionable now. Nevertheless, some strange results obtained earlier can be understood at a qualitative level. For example, the strong dependence of effective cross section in the dissociation reaction $\pi \to 3\pi$ upon spin-parity of system [10] is probably a simple reflection of the dependence of antishadowing contribution upon a 3π-mass. This dependence can be strong due to the fact that the energies for which data are available are not high enough, so the nuclear form factor enhances the antishadowing contribution. For example, if somebody determines $(\sigma_{tot}^{\beta N})_{eff}$ from the diffractive dissociation on a deuteron, he finds that $(\sigma_{tot}^{\beta N})_{eff}$ strongly depends on β-mass in the region $1-x \approx 0.1-0.2$ in Fig. 1.

6. CONCLUSIONS

Let us summarize the main results of this study.

1. It is shown that ESM and MSM are the equivalent approaches, so MSM reflects correctly the space-time picture of diffraction.

2. In the two component approximation of the quark-parton version of the ESM it is found that the inelastic diffractive amplitude has a negative imaginary part in contrast to the elastic one.

3. For this reason some Feynman graphs in the diffractive dissociation on a nucleus have abnormal ("anti Glauber") signs.

4. It is shown also that experimental data [6] on the reaction $pd \to dX$ evidently confirm the antishadowing.

5. The procedure of determination of the diffractively produced system absorption cross section must take into account the antishadowing terms. In another way the resulting cross section is strongly diminished.

Moreover a few comments can be made.

a). All the high order inelastic corrections to the diffractive dissociation amplitude on a nucleus (after summation over the elastic rescatterings) have the same antishadowing sign as the second order one, which is shown in Fig. 3h).

b). The antishadowing influences not only diffractive dissociation. All the inelastic multiple scattering corrections to the elastic hadron-nucleus scattering amplitude have a negative sign.

c). Diffractive photoproduction of the vector mesons must be treated as the elastic scattering. Consequently, in the determination of the vector meson-nucleon cross section the disregard of inelastic corrections results in increasing of the cross section value. But the error here is not so large.

d). The absorbtion of particles produced in inclusive reactions on nuclei is calculated generally without inelastic corrections. This leads to a diminishing value of absorption cross section determined from this data. Such diminution partially imitates a passivity of produced particles.

e). The diffractive like structures (dips, breaks) in the dissociation differential cross section on nuclei should disappear, when the effective mass of the produced particles is increased. At the same time the differential cross section slope will decrease. This is a consequence of the fact that all the inelastic corrections to the elastic scattering amplitude have negative sign, but in the diffractive dissociation the signs of such contributions are positive (see the comments a and b).

f). If one parametrizes the A-dependence of the diffractive dissociation cross section on nuclei in the form A^{a} and determines the value of a inside different bins of M_x^2, one should find that a is increasing function of M_x^2.

We would like to acknowledge the usefull discussions of E.M.Levin and M.G.Ryskin.

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