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BINARY DIFFRACTIVE REACTIONS IN QCD BORN APPROXIMATION

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It is well known that the additive quark model (AQM) meets some difficulties in explaining the large observed values of the hadronic diffraction cross sections [1,2]. Recently the authors of ref. [2] have obtained correct magnitude for cross section of the whole pion diffraction at zero angle, using another approach, called QCD Born approximation. The analysis of two-body diffractive reactions within this approach is quite a complicated problem. It may be solved only with some simplified assumptions. Supposing that the quark wave functions of hadrons are harmonic oscillator ones, we have derived the following expressions for amplitudes of the simplest diffractive reactions

$$NN \to NN, \tag{1}$$

$$NN \to NN^*(1470), \tag{2}$$

$$NN \to NN^*_{1/2}(1690) \tag{3}$$

(here $N^*_{1/2}(1690)$ denotes the one-half-helicity state of $N^*(1690)$):

$$f_1(q) = \frac{i\sigma_{NN}^{tot}}{8\pi \ln 2} \int_0^\infty \frac{dx}{x^2} \{\exp[-\frac{aq^2}{4}(\frac{1}{x}+\frac{1}{3})] \times$$

$$\times [\theta(x-1)\ln(x^2-1) - \theta(1-x)\ln(1-x^2) -$$

$$-2\theta(x-2)\ln(x-1)]\},$$

$$\sqrt{12} f_2(q) = \sqrt{40} f_3(q) = \frac{d}{da}(af_1),$$

$$a = \langle r^2 \rangle_N .$$

From the above one can easily obtain simple relations between cross sections at zero angle and slope parameters of reactions under consideration $B_2 = B_3 = 2B_1$

$$\frac{d\sigma_1}{dt}(0) = 12\frac{d\sigma_2}{dt}(0) = 40\frac{d\sigma_3}{dt}(0).$$

The available experimental data [3] are in agreement with these predictions within 20% accuracy.

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