Inclusive Experiments and Triple-Pomeron Vertex.

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Recently, the dimensionless parameter $\eta_P$ associated with the triple-pomeron vertex and the formula for $\eta_P$ based on a multiperipheral model have been given by ABARBANEL, CHEW, GOLDBERGER and SAUNDERS (1). If $\eta_P$ is zero, it has been predicted that the diffractive-dissociation cross-section is vanishing (2). However, the experimental magnitude of the diffractive-dissociation cross-section seems to be nonvanishing. The correlation of $\eta_P$ to the small displacement of the Pomeron intercept $x_p(0)$ below 1 has been discussed by CHEW and FRAZER (3) and in ref. (1).

The qualitative estimation of $\eta_P$ has been given by WANG and WANG (4) and by TING and YESIJN (5) on the basis of the Harari-Freund ansatz (e) for the pomeron-proton scattering, and extremely small value of $\eta_P$, consistent with zero, has been predicted. In this paper, assuming the finite-energy sum rule (FESR) for the pomeron-proton scattering, we estimate the value of $\eta_P$.

We consider the proton-proton collision process $p+p \rightarrow p+X$, where $X$ represents a sum of produced particles which go unobserved. We assign the momenta $p_a$, $p_b$ and $p'_f$ for the incident, target and final-observed proton, respectively, and define the invariants as

\[ s = (p_a + p_b)^2, \quad t = (p_a - p'_f)^2, \quad s' = (p_a + p_b - p'_f)^2. \]

In the region where $s$ is large and $s/s'$ is large, it is considered that the process $p+p \rightarrow p+X$ is described by the diagram as is shown in Fig. 1. In this energy region the experimental results in the process $p+p \rightarrow p+X$ have been given by ANDERSON et al. (7). In the low-$s'$ regions, the $N^*$ resonances are produced diffractively, while the background cross-sections decrease with increasing incident momentum $p_L$ like $p_L^{-n}$.

\[ (1) \]


where \( n = 1.01 \pm 0.2 \) at \( (s')^1 = 1.4 \text{GeV} \) and \( n = 1.13 \pm 0.1 \) at \( (s')^8 = 1.69 \text{GeV} \). This fact means that the background may be produced by the ordinary reggeon exchange only \((4, 5)\).

On the other hand, the multiperipheral model leads us to the following conjectures for the diffractive dissociation process \( (\alpha_c = \alpha_p \text{ in Fig. 1}) \). Following to the Chew-Pignotti model \((1)\), we introduce the two coupling parameters \( \bar{\gamma}_M \) and \( \bar{\gamma}_P \) as in Fig. 2. In Fig. 2

M, P and \( \mu \) represent the ordinary reggeon, pomeron and particle, respectively. Chew and Pignotti have derived the smallness of \( \bar{\gamma}_P \) using the total cross-section consistency requirement: \( \bar{\gamma}_M^2 \sim 2(1 - \alpha_M) \) and \( \bar{\gamma}_P^2 < 2(1 - \alpha_P) \). Thus it may be conjectured that the diffractive dissociation processes are dominated by the following lowest-order diagram in \( \bar{\gamma}_P \) as is shown in Fig. 3. Therefore the pomeron-proton collision processes will be given by the repeated M-exchange terms. According to the argument of Chew and

Frazer \((2)\), at high-energy regions, the absorptive part of the scattering amplitude given by the repeated M exchange should be singular at \( J \approx 1 \) in the J-plane \((*)\). The singularity is a pole, and the position of the pole does not depend on the external particles. Furthermore, the pole contribution has been identified with the inelastic part

\((*)\) Silverman, Ting and Yesian \((*)\) have assumed that the repeated ordinary-reggeon exchange produces ordinary reggeon.