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The elastic $\pi^+ P$ and $\pi^- P$ scattering at high energies has a peak near 180^o [1-3].

It has been pointed out by Fujimoto, Machida and Namiki [4], that from the point of view of the quark model the peak in elastic meson-baryon backward scattering (as well as in some inelastic meson-baryon interactions) can be qualitatively explained as a result of quark exchange between the colliding particles[x].

In this note some consequences of the quark exchange model for backward scattering are drawn and compared with the existing experimental data. An extension of the model is also proposed to get quantitative relations between cross sections of some processes.

1) If the peak in backward scattering is due to the exchange of single quarks, then the shape of the peak must depend on the own momenta of quarks inside the potential well of the meson and baryon. In this case it is naturally to expect, that the shape of the backward scattering peak as a function of transverse momenta $P_\perp$ must have a weak dependence (or be independent) upon the primary momentum.

This is really observed for the narrow peak of NP-charge exchange [5] (the NP-charge exchange process can be considered, in some sense, as NP-backward scattering).

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[x] The peaks in meson-baryon backward scattering were also threated in [4] as Sakaton-exchange phenomena. But according to this model there must be no peak in the elastic $\pi^- P$ backward scattering, so this model is in contradiction with the experiment.

The existing experimental data on the shape of the peak in elastic $\pi^{\pm} P$ backward scattering are not in contradiction with the constancy of the slope of the peak by changing the energy. According to [6], if the slope of the peak is expressed by $\frac{d\sigma}{dt} \sim \exp Bu$, then for 4 GeV/c $12 < B < 20$ $(\mathrm{GeV/c})^{-2}$ and for 8 GeV/c $13 < B < 27$ $(\mathrm{GeV/c})^{-2}$ [x].

It must be stressed, that the momenta, corresponding to the width of the peak in $\pi^{\pm} P$ backward scattering and NP-charge exchange, are small (~ 0.1 GeV/c).

2) So far as baryons have to be built of quarks, and antibaryons - of antiquarks, there cannot be any quark exchange between baryons and antibaryons and, therefore, in baryon-antibaryon interactions must be no peaks, resulting from such exchange.

In the experimental data on elastic $\bar{P}P$ scattering at 3 GeV/c [7] and 4 GeV/c [8] no peaks near 180° are seen.

There is no narrow peak in the $\bar{P}P \to \bar{N}N$ charge exchange, in contrast to NP-charge exchange [9].

3) The quark composition of the π^+, π^- and a proton must be $(p\bar{n})$, $(n\bar{p})$, (ppn), respectively. Therefore in $\pi^+ P$ - backward scattering p-quarks have to be exchanged, while in $\pi^- P$ - backward scattering n-quarks, the isotopic partners of the p-quarks.

But in the p-quark exchange with the π^+-meson each of two p-quarks of the proton can take part, while in the n-quark exchange with the π^--meson - the only n-quark of the proton.

The ratio of the cross sections of elastic $\pi^+ P$ and $\pi^- P$-scattering at 180° at 8 GeV/c is about 4 [6/xx]. According to the quark exchange model such a value of the ratio $R(\pi^+/\pi^-)_{180^\circ} = \frac{(d\sigma/d\Omega)(\pi^+ P)_{180^\circ}}{(d\sigma/d\Omega)(\pi^- P)_{180^\circ}}$ can be explained under the assumption, that the amplitude of backward elastic scattering is proportional to the number of possible channels of two-body quark exchange, or more generally, to the sum of the amplitudes of quark exchange between pairs of quarks, and there is no interference between these amplitudes.

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x/ The distribution of cross sections as a function of $P_\perp$ is different from the u (or t) dependence. But near 180°, where $|\sin\theta| \approx |\mathrm{tg}\,\theta|$, equal slopes in the u (or t) dependence of the cross sections correspond to equal slopes in the $P_\perp$-dependence.

xx/ This ratio has been also measured at 4 GeV/c, but at this energy the formation of isobars has a strong influence on backward scattering cross sections [10,11];

This assumption is in accordance with the hypothesis of additivity of two-body quark scattering amplitudes at small momentum transfers [12-15], which is in good agreement with experimental data.

The assumption of additivity of quark exchange amplitudes in the scattering at 180° gives, for example, the following ratio of cross sections of K-meson elastic backward scattering:

$$\frac{d\sigma}{d\Omega}(K^+P)_{180^\circ} : \frac{d\sigma}{d\Omega}(K^\circ P)_{180^\circ} : \frac{d\sigma}{d\Omega}(K^- P)_{180^\circ} : \frac{d\sigma}{d\Omega}(\bar{K}^\circ P)_{180^\circ} = 4:1:0:0 .$$

The relations between backward scattering cross sections, following from the additivity of quark exchange amplitudes, do not coincide with Regge pole theory predictions. Therefore, a measurement of this relations (in the first place of $R(\pi^+/\pi^-)_{180^\circ}$) at higher energies would be essential.

4) The above mentioned qualitative and quantitative considerations may be, probably, also applied to two-body inelastic processes, in which different quarks are exchanged.

In this case at high enough energies such a relation, for example, may be held,

$$\frac{d\sigma}{d\Omega}(K^- P \to \Sigma^\circ \pi^\circ) : \frac{d\sigma}{d\Omega}(K^- P \to \Sigma^+ \pi^-) : \frac{d\sigma}{d\Omega}(K^- P \to \Sigma^- \pi^+) = 4:1:0$$

if the angle between K^- and π-mesons is 180°.

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