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Simple Regge pole model for the reaction $\pi^- p \rightarrow \eta' n$

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Abstract. The most recently measured differential cross-section data for $\pi^- p \rightarrow \eta' n$ has been fitted by using a simple Regge pole model with phenomenological residue functions. It has also been observed that this inelastic process has the scaling property.

Keywords. Regge pole model; residue functions; scaling property.

Recently, Apel *et al* (1979) have measured differential cross-sections for the reaction $\pi^- p \rightarrow \eta'$ (958) n at momenta of 15, 20, 25, 30 and 40 GeV/c. This reaction has already been investigated at momenta up to 50 GeV/c by Harvey *et al* (1971), Apel *et al* (1972, 1973) and Bolotov *et al* (1974 a), but at a statistical level of only 50 decays of $\eta' \rightarrow 2\gamma$. In the experiment of Apel *et al* (1979), a total of 6000 decays were recorded. This made it possible to widen the range of the determination of differential cross-sections to $-t \approx 1{\cdot}8$ (GeV/c)^2 and also to study the region of small momentum transfers, where, in contradiction with the data of Edwards *et al* (1976) a marked drop in the cross-section is seen for $t \rightarrow 0$. In order to improve the statistics, the data at momenta of 20, 25 and 30 GeV/c were combined by Apel *et al* (1979), including a weighting for the relative differential cross sections $d\sigma/dt$. The results for the differential cross-sections thus obtained are shown in figure 1. The sharp drop in the differential cross-section near $t=0$ points to the dominating contribution of the spin flip amplitude to the process. In this paper we will confine ourselves to the results of Apel *et al* (1979) and fit them by using a simple Regge pole model.

The main characteristics of the high energy angular distribution for this reaction are:

(i) The differential cross-section data show a turnover near $t=0$.

(ii) The differential cross-section decreases with an increase in energy.

(iii) For $0{\cdot}2 \lesssim -t < 0{\cdot}8$ (GeV/c)^2, the $d\sigma/dt$ decreases exponentially with a slope of about 10 (GeV/c)^2.

(iv) The $d\sigma/dt$ shows a change of slope near $-t = 0{\cdot}8$ (GeV/c)^2. For $-t \gtrsim 0{\cdot}8$ (GeV/c)^2 the errors are so large that $d\sigma/dt$ may be considered as falling or rising slowly.