LETTERS TO THE EDITOR

CAN THE POMERON BE PRODUCED?

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Referring to the topological expansion for strong interactions, we consider as a mechanism for multiproduction the emission of central clusters identified with hadronic states lying on the pomeron trajectory.

Our purpose is to put together some popular ideas regarding the phenomenology of multiparticle production, e.g. cluster production, with the recent developments in the theory of strong interactions, e.g. the topological expansion [1] for the amplitudes. We will be led to identify some kind of clusters with hadronic states lying on the pomeron trajectory.

These considerations are hypothetical in nature and perhaps foreshadowed in some recent papers, however we think it is worth to state them explicitly.

The cluster production seems to be a general feature of the multiproduction phenomena at ISR and NAL energies [2]. Let us begin with the properties of clusters as shown by the experiments. First we have to make a distinction between "leading" and "central" clusters. The former are essentially excited states of the incoming particles, whose decay products lie at the ends of the rapidity axis (fragmentation region). The latter are responsible for the production of secondaries in the central region.

The picture emerging from experimental data and from the standard assumptions of models [3], is that central clusters are mainly neutral, decaying almost isotropically and emitted in an uncorrelated way. There is evidence for the emission of central clusters whose size is significantly larger than the multiplicities of the familiar low-mass resonances [4].

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The above properties of central clusters are compatible with those of hypothetical "particles" lying on the pomeron trajectory.

In the framework of the topological expansion for strong interactions (TESI) one can conceive the pomeron decay as a mechanism for the production of secondaries in the central region.

The TESI provides a unitary point of view for looking at the multiproduction phenomena [5]. For N-particle production in hadron-hadron collisions, one obtains, depending on the topology, diagrams of "multiperipheral type" (Fig. 1) or describing the diffraction (Fig. 2), where the cylinder represents a bare pomeron.[1] The topological classification for the multiproduction diagrams is exhausted by the class shown in Fig.3 , that we will call "multiple diffraction" diagrams, and that describe the emission of secondaries in the central region as coming from pomeron decay. The contribution from such diagrams to multiproduction amplitudes cannot be excluded "a priori".

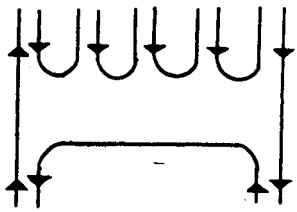

Fig. 1

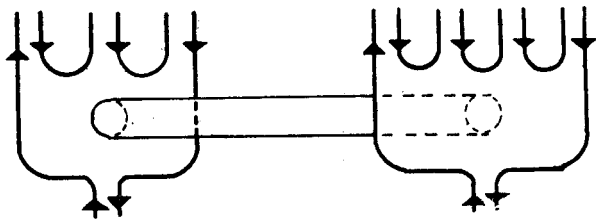

Fig. 2

If TESI is viewed as $1/N$ expansion of dual theories or of field theories, one can show that the triple-pomeron vertex is of order $1/N$ [5], and therefore strong enough to provide such a production mechanism.

On the other hand, according to $1/N$ expansions the amplitudes with a small number of triple-pomeron vertices dominate. This supports the production at high energy of few and massive central clusters [6].

In conclusion, we are led to consider, as a possible mechanism for multiproduction, the emission in the central region of clusters essentially different from the familiar reso-

[1] In the figures, the simplest diagram for each kind is shown. Any other diagram is obtained inserting holes and handles.

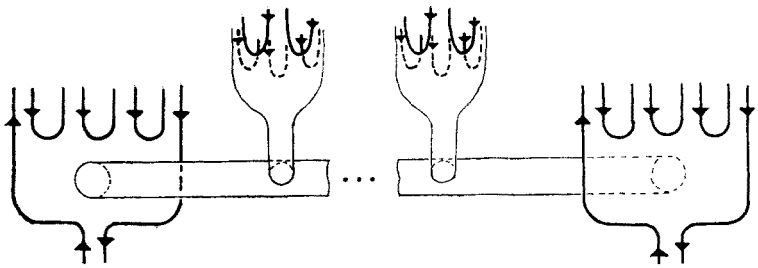

Fig. 3

nances. In particular, their assignation to the pomeron trajectory gives for such clusters, besides the neutrality, a strong deviation from the ordinary spin-mass relation.

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