

Recombination model for hadron production

PARTHAJYOTI DATTA and D BONDYOPADHYAY

Department of Physics and Astrophysics, University of Delhi, Delhi 110 007, India

MS received 23 June 1980

Abstract. We calculate baryon distributions in the fragmentation region of pp collision using Das and Hwa picture of quark recombination. A new estimation of the sea quark distributions in proton is obtained by fitting the pseudoscalar meson data at fixed P_T taking account of parton transverse momenta.

Keywords. Recombination; fragmentation; scaling; structure function; hadron production; baryon distribution.

1. Introduction

Sometime ago Das and Hwa (DH) (1977) had shown that in the quark parton picture, the production of pseudoscalar mesons such as π^\pm and K^\pm in the fragmentation region of pp collision proceeds *via* quark recombination. The evidence for the recombination mechanism comes from the observation that the x -distribution of the pions in the fragmentation region of an incident proton is very similar to the distribution of valence quarks that they share with the proton, as is revealed in deep inelastic ep scattering experiments. The close similarity with π -meson distribution has been shown strikingly in a series of experiments (Ochs 1977; Singh *et al* 1978), the agreement being particularly good for π^+ . Also it was shown by DH that the mechanism of quark scattering and fragmentation can account for only about 1% of total meson production and hence cannot be responsible for the bulk of the production at low P_T . In view of the success of the recombination model for mesons it is natural to think that it may be applicable in the case of baryons also. First indication that such a mechanism might be active in the production of protons came from the observation (Van Hove and Pokorski 1975) that the same average value 0.5 is found experimentally for $\langle x_p \rangle$ and $\langle x_q + x_{q'} + x_{q''} \rangle$, the former from the leading particle measurements in pp collisions and the latter from deep inelastic lepton nucleon scattering. Recently, Van Hove (1979) has given a combined picture of meson and baryon production in the fragmentation region using recombination as the mechanism. In this work the probability for all three valence quarks of the proton to recombine to form a proton as well as the probability for a single or two valence quarks to recombine with two or a single sea quark has been estimated. These are baryon formation probabilities designated by p_3 , p'_1 and p_2 and from their knowledge different baryon cross-sections in the fragmentation region of pp collision can be calculated. However, Van Hove's method is capable of predicting only certain overall production probabilities, no procedure is suggested