Results are presented on baryon production in $\bar{\nu}n$ and $\bar{\nu}p$ collisions obtained within the framework of Monte Carlo quark-parton model. The inclusive distributions of protons and lambdas are compared with data. It is shown that the model which does not introduce diquarks can give satisfactory results on the distributions of baryons both in the target and fragmentation regions.

1. INTRODUCTION

It is well known that the process of generation of hadrons from a "parton state" appearing at intermediate stages of a collision is not calculable in QCD and some phenomenological models of hadron production must be used instead. The mechanism of hadronization is different in different models but there are some common features or even some common parameters which one can find in many models just because it is difficult to avoid their introduction. One of them is the ratio of $s\bar{s}$ to $u\bar{u}$ or to $d\bar{d}$ pairs created during the collision. This number controls the production of strange particles and it is believed that it has approximately the same value in all processes. Another universal but more model dependent parameter is the one which controls the production of final state baryons. For example in models of the Lund type it is the probability of producing $(qg)(q\bar{g})$ pair compared to $q\bar{q}$ production. The above consideration, namely the universality of strangeness and baryon production provides a motivation for investigating the production of baryons and especially of baryons with nonzero strangeness. Whatever the true theoretical description of multiparticle production will be in the future, this question should play an important role in it.

The present paper deals with the production of protons and of lambdas in antineutrino-nucleon scattering. There is one reason for choosing particularly $\bar{\nu}N$ process. Besides its simplicity from the quark-parton model (QPM) point of view there is the advantage of knowing the flavour of the fragmenting quark and of quarks remaining in the target region. In this paper we compare the hadron production in $\bar{\nu}p$ and $\bar{\nu}n$ collisions within the framework of Monte Carlo recombination model presented some time ago in [1]. In our preceding paper [2] we have applied the model to the $\bar{\nu}p$ collisions and calculated momentum distributions of final state mesons and baryons. The results on baryon production indicated that the parameter which controls the baryon production in the model should be lowered, i.e. the baryon production should be more suppressed. (The definition of the parameter is given below.) Results shown in this paper are calculated with the new lower value of the parameter.
The comparison of lambda production in $\bar{\nu}p$ and $\bar{\nu}n$ collisions is interesting also for the following reason: The quark remnant in nucleon after the ejection of one quark by $W$-boson is different in these two processes (see figs. 1 and 2). If the diquark remaining in the target region ($dd$ in $\bar{\nu}n$ and $ud$ in $\bar{\nu}p$ scattering) does not break up, then in the case of $\bar{\nu}n$ collision $\Lambda$ ($uds$) can be produced by sea quarks only. In this case the differences in $\Lambda$ distributions should show up in data.

The paper consists of three parts: In section 2 we briefly describe the model and its application to $\bar{\nu}N$ scattering, and in section 3 we discuss the results. The question is not posed whether there is a break up or non-break up of diquark but rather: can one do without diquarks?

![Fig. 1. The dominant mechanism of $\bar{\nu}p$ scattering according to the quark-parton model.](image1)

![Fig. 2. Analogical picture for $\bar{\nu}n$ scattering.](image2)

2. $\bar{\nu}N$ SCATTERING AND THE MODEL

The generally accepted picture of the process

$$\bar{\nu}N \rightarrow \mu^+ + X$$

within the QPM framework is the following: A $u$-quark of the incident nucleon absorbs the negative intermediate $W^-$ boson and becomes a forward going (i.e. in current direction) $d$-quark. The unaffected valence quarks travel backward (in the c.m. system of $W^-$ and $N$) and appear in the target region. The confining colour force field which is stretched between forward going quark and backward diquark leads to the production of $q\bar{q}$ pairs. Valence quarks and $q\bar{q}$ pairs recombine into the final state hadrons.

The model presented in [1] offers the following description of the above process: The system of $W^-$ and nucleon transforms after the interaction into the configuration consisting of three valence quarks, sea quarks and $q\bar{q}$ pairs originated from the colour field. The model works in the c.m. system of $W^-$ and $N$, i.e. the sum momenta of the quarks are zero. The distribution of all quarks and antiquarks in momentum (rapidity) space is given by the longitudinal phase space distribution. The distribution contains an additional Kuti-Weisskopf factor which describes the tendency of valence quarks to keep larger momentum fractions. With rapidities assigned to each quark