

DISTRIBUTION OF MULTIPLICITIES IN PROTON-NUCLEUS
INTERACTIONS AT 67, 200, 300 and 400 GeV

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One of experimentally established facts is the existence of KNO scaling in multiparticle production (1). This means that the distribution function is of the following form

$$P_n = \frac{1}{\langle n \rangle} \psi \left(\frac{n}{\langle n \rangle} \right)$$

where $\langle n \rangle$ is the average multiplicity and $Z = \frac{n}{\langle n \rangle}$ is the so called KNO variable.

The distribution of multiplicities can be analysed according to a statistical model proposed by Bogatskaya et al (2), (3) as:

$$P_n = K \cdot BE_0 \cdot \exp(-BE_0 n) [1 - \exp(-BE_0 n)]^{k-1},$$

where the constant E_0 has a meaning corresponding to that of energy the parameter $B \sim \frac{1}{T}$ corresponds to the inverse temperature and K is a positive whole number corresponding to the number of available energy states of nucleons in the model

The average multiplicity from the above relation $\langle n \rangle = \sum_{n=0}^{\infty} n P_n$ is in

agreement with the KNO scaling and the scaling function has the form:

$$\langle n \rangle P_n = \psi \left(\frac{n}{\langle n \rangle} \right) = \psi(Z) = K \psi \exp(-Z\psi) [1 - \exp(-Z\psi)]^{k-1}$$

where $\psi = \sum_{j=1}^k \frac{1}{j}$.

In this work experimental data from proton-nucleus interactions at 67, 200, 300 and 400 GeV (Lab) were analysed according to the mentioned method. Experimental data were obtained from nuclear emulsion collaborations ref. (4), and (5). The best fits through experimental points were obtained at the value $K=3$ and the dependence of the parameter BE on energy is tabulated. These data are shown also in the figure where the energy dependence is evident.

