Arab Journal of Nuclear Science and Applications, 48(3), (86-94) 2015

A Systematic Study of Fast Target Protons Emitted in Relativistic Heavy Ion Collisions with AgBr Target Nuclei

S. Kamel[1*] and N. Rashed[2]

[1]*Physics Department, Faculty of Education, Ain Shams University, Cairo, Egypt.*
[2] *Physics Department, Faculty of Science, Fayoum University, Fayoum, Egypt.1*

Received: 1/6/2014 **Accepted: 15/10/2014**

ABSTRACT

In this work, the behavior and properties of medium energy protons with kinetic energy in the range 26–400 MeV is derived from measurements of the particle yields and spectra in the final state of relativistic heavy ion collisions (^{16}O–AgBr interactions at 60A and 200A GeV and ^{32}S–AgBr interactions at 3.7A and 200A GeV) and their interpretation in terms of the low order moments. The multiplicity distributions have fitted well with the Gaussian distribution function. The data also are compared with the predictions of the modified FRITIOF model showing that FRITIOF does not reproduce the trend and the magnitude of the data. The measurements of the ratio of variance to mean show that the production of target fragments at high energies cannot be considered a statistically independent process. However, the deviation of each multiplicity distribution from a Poisson is law gives an evidence for correlations. The KNO scaling behavior of two types of scaling (Koba–Nielsen–Olesen (KNO)-scaling and Hegyi scaling) functions in terms of the multiplicity distribution is investigated. A simplified universal function has been used in each scaling to display the experimental data.The examination of the relationship between the entropy, the average multiplicity, and the KNO function is performed. Entropy production and subsequent scaling in nucleus-nucleus collisions is carried out by analyzing the experimental data over a wide energy range (Dubna and SPS). It is interesting to point out that the data points corresponding to various energies overlap and fall on a single curve, indicating the presence of a kind of entropy scaling.

Key Words*: *Target fragmentations; nucleus–nucleus collisions; multiplicity moments; KNO-scaling; entropy scaling.

PACS Number(s): 25.75. −q, 25.75. Gz, 25.70. Mn, 25.70. Pq, 29.40. Rg