Erratic Fluctuations of Nuclear Fragments in the Collisions of ²⁸Si-Emulsion Nuclei at BNL Energies

M. Ayaz Ahmad¹, Hashim Rasool², Shafiq Ahmad² and Jamal Hamza Madani¹

¹Physics Department, College of Science, University of Tabuk, P.O. Box 741, Tabuk-71491, Saudi Arabia (K.S.A.)
²Physics Department, Aligarh Muslim University, Aligarh 202002, India. mayaz.alig@gmail.com

Abstract

An analysis has been made to study the chaotic behavior in the nuclear fragmentation process of ²⁸Si–Emusion collisions at 14.5 A GeV by using new parameters such as erraticity spectrum and the entropy index, μ_q . The present study provides some evidences of the erratic behavior of the target fragments i.e. suggesting chaotic target fragmentation and also spells out for the chaos in the relativistic and ultra relativistic heavy-ion collisions. Finally, it is also observed that the target fragmentation process becomes less chaotic with the raise of average multiplicities in the multiparticle production of the final states.

PACS: PACS 25.75.Gz, 29.40.Rg, 25.75.Ag

Keywords: Particle correlations and fluctuations, Nuclear emulsions and Global features in relativistic heavy ion collisions.

1. Introduction

The possibility of observing a new state of quark matter has developed a lot of interest in the study of relativistic nucleus-nucleus collisions. The recent lattice QCD calculations predict a phase transitions of nuclear matter of confined hadrons into a quark-gluon plasma (QGP) at a sufficiently high temperature (200-220 MeV), high energy density of the order of 3 GeV/fm³ and/or high baryon density (> 0.5/fm³). It is widely believed that the strong interacting matter in these violent collisions undergoes a transition, temporarily, to deconfined quark-gluon plasma (QGP). Initially, there was a strong speculation that the origin of intermittent type of non-statistical fluctuation