Study the Emission Feature of Slow Protons Produced at Relativistic Energy

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The focus of this study is the emission feature's slow protons (black particle) produced from the interaction of ^{84}Kr with emulsion. We have investigated the multiplicity distribution's as a function of collision geometry. This study indicates a remarkable correlation between collision geometry with multiplicity distributions and the target fragmentation processes.

Introduction

The studies of nucleus-nucleus (A-A) and hadron-nucleus (h-A) collisions is extensively important parameter to reveals the physics of multiparticle production at relativistic energy [1,2]. One of the earlier detector technology using since the birth of experimental nuclear and astroparticle physics to study the reaction mechanism and the nature of heavy-ion interactivity process is NED [3,4]. The high resolution of the detector is one of the unique parameter which allow us to detect short-lived particles like charmed mesons, τ leptons etc. As per the PS model [1-3] is the basic concept to understand the N-N and h-N interaction. The overlapping part of the nuclei where two nuclei have collide with eachother is known as Participation Region (PR), while the remaining part of nuclei that do not participate in collision are known as Target Spectator (TS) and Projectile Spectator (PS) region respectively.

Experimental Details

In this observation, we employed NIKFI-BR2 nuclear emulsion plates (NEP), which have dimensions of 9.8 × 9.8 × 0.06 cm^3. They were exposed at GSI in Darmstadt, Germany. The NED is known to include a little amount of S and I along with a mixture of H, O, C, N, Ag, and Br [2-4]. Two widely used line and volume scanning techniques have been employed by us to detect the physics events from NED plates using the Olympus binocular transmitted light microscope BH-2 [1-4]. We have divided the occurrences into many classes, such as shower, black, and grey particles, based on their respective properties. Out of 700 occurrences, 550 were used in this study.

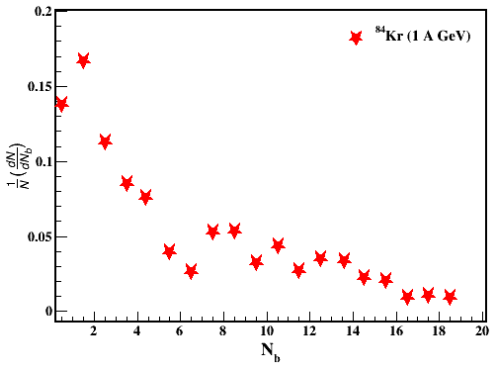

FIG. 1: Normalized multiplicity distributions of N_b in interaction of the projectile ^{84}Kr [5] with emulsion nuclei.

Result and Discussion

Figure 1 display the multiplicity distributions of N_b emerged in the interaction of ^{84}Kr [5] with emulsion. The Q (total charge) distribution of non-interacting projectile fragments produced in collision of ^{84}Kr [5] with CNO and AgBr-target of emulsion is shown in figure 2 and figure 3, respectively.

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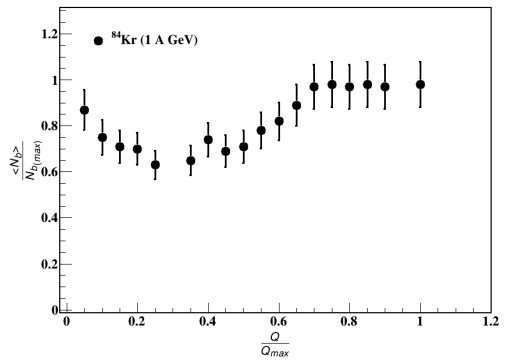

FIG. 2: Normalized distributions of N_b as a function of Q in the interactivity of ^{84}Kr [5] with CNO-target of emulsion.

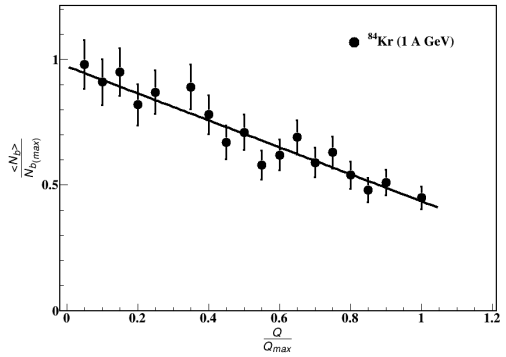

FIG. 3: Normalized distributions of N_b as a function of Q in the interactivity of ^{84}Kr [5] with AgBr-target of emulsion.

From figure 2 we observe that the normalized distributions of N_b is firstly decreases with the value of Q/Q_{max} 0 to 0.4 and after the values of Q/Q_{max} in between 0.4 to 0.7 the normalized distributions of N_b is increasing and after that from 0.7 to 1.0 it shows constant behaviour. And figure 3 shows that the normalized distributions of N_b is showing the decreasing nature as we move for Q/Q_{max} from 0 to 1.0. Which shows that the behaviour of black particles is totaly different from figure 2 which we observed with CNO-target events. This observation shows that the emission behaviour of black particles is strongly depends on the target's mass as well as collision centrality [5].

Conclusion

In this paper, we have studied the normalized multiplicity distribution of N_b and the Q of the projectile spectators are utilized as the experimental qualitative scale. We can see from figures 2 &,3, the emission probability of N_b particles is stongly dependent on the mass of target and as well as collision centrality [5]. Its happens because the black particles are generated for the cold part of TS region, due to less amount of incident kinetic energy transfer in this region as compare to other region.

Acknowledgments

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