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Searching for Ring-like and Jet-like substructure in 24Mg-Ag/Br interactions at 4.5 A GeV

Content :

We have investigated the azimuthal substructure of particles produced in 24Mg induced collisions with Ag/Br nuclei in an emulsion detector with energy 4.5 A GeV at JINR, Dubna within dense and dilute groups along the rapidity axis. In this investigation we have followed the method to search for ring-like and jet-like substructures and to determine parameters described by Adamovich et al [Adamovich et al., J. Phys. G19 (1993) 2035]. We have started it with a fixed number of shower track Nd. Each Nd tuple of particles are considered as a group along the η axis. This size of the group is given by, Δηd =|ηi-ηj|, where ηi and ηj are the first and last particle of the group. Rapidity density(ρc) is defined by, ρc=Nd/Δηd.To parameterize the azimuthal structure, two parameters S1 and S2 are introduced Both S1 and S2 are small (S1 →Ndln(Nd) and S2→1/Nd) for ring-like structures and are large (S1→∞ and S2→1)for jet-like structures. While S1 is sensitive to small gaps, S2 is sensitive only to large gaps. The normalized experimental S1, S2 , S1/ and S2/ distributions for different Nd,compared with the distributions calculated by the Monte-Carlo(MC)simulation are illustrated that the existence of the jet-like substructures in collisions results to lengthening of the right part of the S2 - distribution and to appearance of additional peaks there. The existence of the ring-like substructures results to deformations and/or to appearance of additional peaks at the left part of the S2 - distribution, where S2 < . One can see that our experimental distributions are shifted to the right, have a tail in the right part and are broader than the spectra calculated by the MC simulation. We have also plotted the vs Δη and vs Δη distribution for experimental as well as model based MC data. Here also the experimental data points have a strong tendency to be above the MC distribution. Once again presence of jet-like structure is established. We have plotted the probability distribution of the structure parameters (S1 and S2) from individual dense groups obtained from the different subgroups. In the right tails for dilute groups are clearly indicated that the certain ‘jettyness’ is present. However, there is no strong signal for ring-like structure. The jettyness observed in the data can essentially be attributed to electron-positron pair from γ conversion and to particle interference between identical particles(HBT). However, the parameter S2 is used in the investigation to

confirm some jet-structure for the dilute groups which can not be accounted for, not even with a stronger interference effect.

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