Contribution ID: **712** Type: **Poster**

Two-particle correlation via Bremsstrahlung

Friday 6 July 2018 20:15 (15 minutes)

An angular correlation between trigger-jet and high-transverse momentum particles observed in AA collisions at the RHIC is well known for ridge structure. This phenomenon is well explained from the hydrodynamical model and it has been a strong evidence of the QGP generation. However, recently the ridge structure has also been reported in high multiplicity pp collisions at LHC. In pp collisions, a sufficiently high-density medium such as QGP is not expected to be produced and therefore, we tried to understand this phenomena through kinematic model between jet particles and partons.

Kinematically, jet particles interact with partons through collisions and lose their energy mostly by emitting gluons and photons. However, unlike photons, gluons carry color charge by themselves and therefore, they interact with other gluons.

In this study, we tried to understand the ridge structure of the correlation between jet particles and partons through only photon Bremsstrahlung process because the gluon radiations are very complicated due to its color degree of freedom. We calculated the scattering cross section between jet particles and medium partons, which leads to two-particle correlation.

During collisions, initial jet particles and partons exchange momenta and the initial distribution of medium partons momentum affect the scattering cross section. In high energy collisions, beams are colliding almost at the speed of light and so the space is contracted in a beam direction. Therefore it is more plausible to use a relativistic statistical distribution for the initial medium parton momentum. However, in the case of non-central collision there is spatial anisotropy which leads to the asymmetry in momentum distribution and therefore, we introduced anisotropic elliptic flows about the azimuthal angle.

We studied the behavior of the correlation depending on the energy losses of initial jets and on the angles between initial and final jets. Collective peak of medium partons moves away from the trigger jet as the energy loss increases or as the angles between initial and final jet decreases.

This study mainly based on the simple calculation such as no color degree of freedom and single photon emission. Also final jets are assumed to be on the perpendicular plane to the beam direction. More solid conclusion should be hold until future studies for realistic situations.

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Session Classification: POSTER

Track Classification: Heavy Ions