Azimuthal distributions of jets with respect to high-p_T neutral pion triggers in pp collisions from ALICE

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Jet measurements play a critical role in probing the hot and dense QCD medium created in heavy-ion collisions. Detailed transport properties of the medium can be extracted through measurements of parton energy loss and medium response with respect to the lost energy.

In general, the energy loss of recoil jets and leading jets depends on the path length in the medium (i.e, creation point and moving direction in the medium). For example, jet pairs with a large energy asymmetry in the final states can be from the surface of the medium,as shown in Fig.1. While leading jets escape the medium from the surface recoil jets traverse in the medium with loss to its energy. We use this surface bias to acquire deeper insight into the medium properties: The stronger the surface bias, the greater is the path length in the dense medium of the recoiling jet at the opposite azimuth. By measuring the full jets in the recoil side rather than measuring high-p_T hadrons, we can perform a more comprehensive and direct study of jet interactions in medium.[1)]

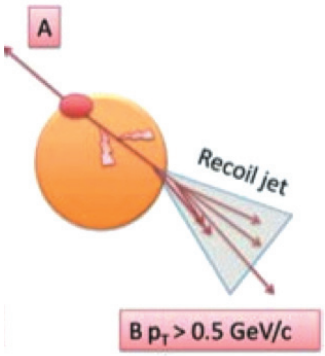

Fig. 1. Simple geometry of hadron-jet correlation with the leading particle in a recoil jet momentum threshold $p_T > 0.5$ (GeV/c)[2)]

In this paper, we report the jet azimuthal distribution with neutral pion triggers in pp collisions at $\sqrt{s}$ = 7 TeV from LHC-ALICE, which is very important as a baseline study for heavy-ion collisions. The ALICE detector was built as a general-purpose detector for measurements of ultra relativistic heavy ion collision at the LHC.[3)] For neutral pion identification, an electromagnetic calorimeter (EMCAL) is used. Jets are measured by a Time-Projection Chamber (TPC) and Inner-Tracking System (ITS).

This analysis used the shower shape and cluster splitting method[4)] to identify high p_T π^0. With this method, high p_T π^0 around 40 GeV/c can be identified with the signal-to-noise ratio of 90%.

Fig.2 shows the azimuthal angular correlation between π^0 and jet in pp collisions, where π^0 p_T is from 8 to 12 GeV/c and the associated jet p_T is higher than 10 GeV/c. From this distribution, two main observables will be discussed as the functions of trigger and associated p_T. One is the away-side yield per trigger yield, and the other is the width of the near-side and away-side correlation. These quantities will be discussed in the future, and similar analysis will be done for p-Pb and Pb-Pb collisions in order to understand the ordinal nuclear matter effects and the properties of the hot and dense medium.

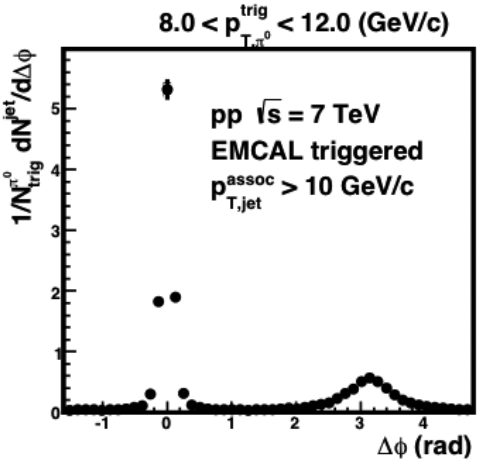

Fig. 2. π^0-jet azimuthal correlation with trigger p_T region of 8-12 GeV/c and associated jet threshold $p_{T,jet} > 10$ GeV/c

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References
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3) ALICE collaboration, Performance of the ALICE Experiment at the CERN LHC, arXiv:1402.4476v2
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