Azimuthal distributions of jets with respect to high-p_T neutral pion triggers in pp collisions at $\sqrt{s}$ = 7 TeV and PbPb collisions at $\sqrt{s_{NN}}$ = 2.76 TeV from ALICE

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Jet measurements play a critical role in probing the hot and high energy density matter created in heavy ion collisions. Energy loss of patrons can be studied by measuring changes in the jet structure during jet suppression.

In general, the energy loss of recoil jets and leading jets depends on the path length in the medium. For example, jet pairs with a large energy asymmetry in the final states can be from the surface of the medium. While leading jets escape the medium from the surface, recoil jets traverse in the medium with loss to its energy. We can use this surface bias to obtain deeper insight into the properties of the medium. 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 leading hadrons, we can perform a more comprehensive and direct study of jet interactions with the medium.[1)]

In this paper, we report the jet azimuthal distribution with neutral pion trigger in pp collisions at $\sqrt{s}$ = 7 TeV and PbPb collisions at $\sqrt{s_{NN}}$ = 2.76 TeV from LHC-ALICE. The ALICE detector was built to exploit the unique physics potential of nucleus-nucleus interactions at the LHC.[2)] This analysis used the central tracking devices, ITS and TPC, for charged particle track measurements, and the electromagnetic calorimeter EMCal for π^0 measurements.

This analysis used the shower shape and cluster splitting method[3)] to identify high p_T π^0. Using this method, high p_T π^0 around 40 GeV/c can be identified with a signal-to-noise ratio of 90 %.

Jets are reconstructed with the anti-k_T jet algorithm of the FastJet[4)] package combining charged tracks measured in the central tracking devices and a cone size parameter of $R = 0.4$. The contribution of underlying events is subtracted from the reconstructed jets using the average background momentum method.

Figure.1 and 2 show the azimuthal correlation between trigger π^0 and jet in pp and PbPb collisions, respectively, with three different trigger π^0 regions and two different associated jet p_T thresholds. Two clear jet peaks are observed, indicating that high p_T production is corelated with jet production. Both near and away-side widths decrease with increasing p_T of the trigger π^0. The decrease is stronger for the away-side correlation width. As the next step, we plan to study the path length dependence by selecting different trigger $\pi^0 p_T$ in the ratio of the per-trigger yield (I_{AA}).

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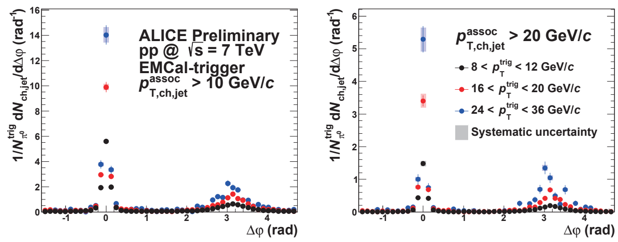

Fig. 1. π^0-jet azimuthal correlations in pp collisions at $\sqrt{s}$ = 7 TeV normalized by number of trigger π^0 for trigger π^0 regions $8 < p_T^{trig} < 12$ GeV/c, $16 < p_T^{trig} < 20$ GeV/c, $24 < p_T^{trig} < 36$ GeV/c, and associated jet thresholds $p_T^{asso} > 10, 20$ GeV/c

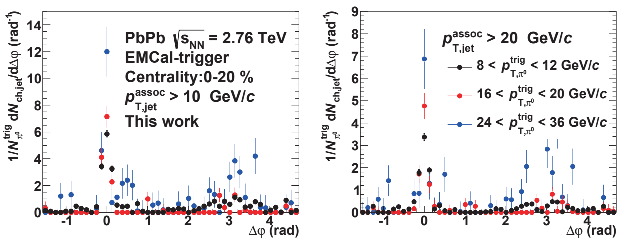

Fig. 2. π^0-jet azimuthal correlations in PbPb collsions at $\sqrt{s_{NN}}$ = 2.76 TeV normalized by number of trigger π^0. Trigger $\pi^0 p_T$ regions and associated jet p_T thresholds are same as Fig.1.

References

1) ALICE collaboration, An Addendum to the EMCal Technical Design Report (DCAL), CERN-LHCC-2010-011
2) ALICE collaboration, Performance of the ALICE Experiment at the CERN LHC, arXiv:1402.4476v2
3) ALICE collaboration, X. ZHU, Analysis of the π^0-Charged Hadron Correlations Using ALICE EMCAL, https://indico.cern.ch/event/181055/session/37/contribution/451
4) M. Cacciari, G. P. Salam, G. Soyez et al.: CERN-PH-TH/2011-297