Pathlength dependence of particle-yield modification on the near-side with ALICE at the LHC

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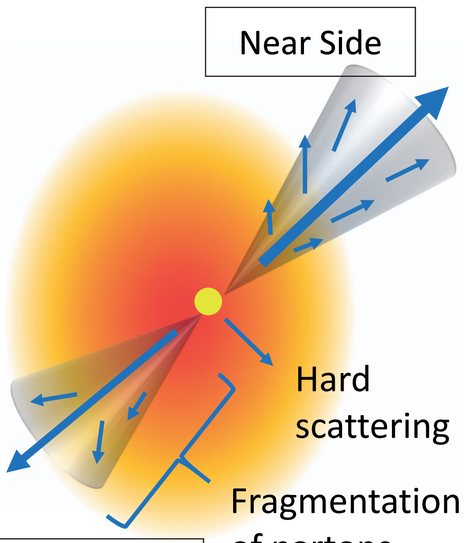
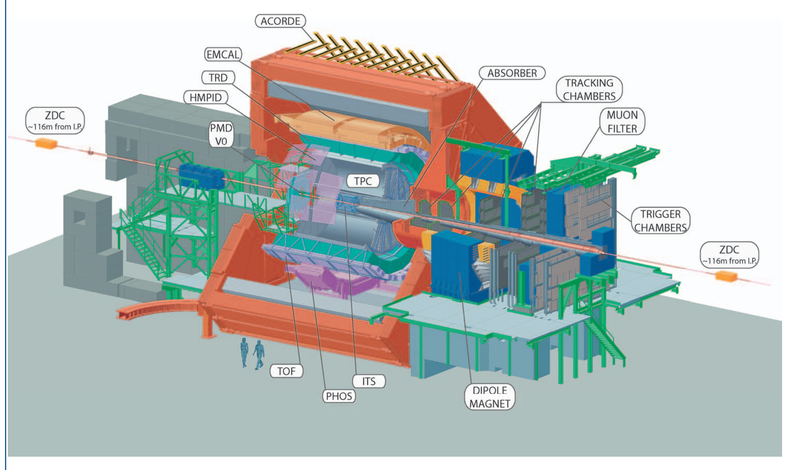
Motivation



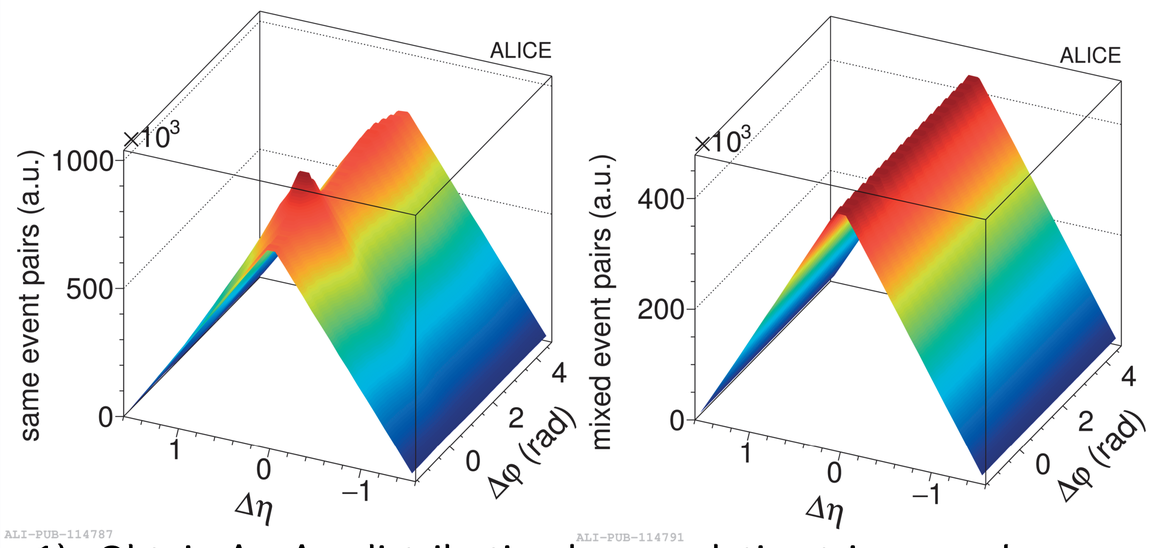
- Energy loss of hard-scattered partons in the hot and dense medium is called jet quenching.
- In the low p_{T} region where soft production and bulk effects such as flow dominate, di-hadron correlations are a convenient method to measure jet-like particle properties.
- Effects of jet quenching can be quantified by using I_{AA}, which is the ratio of the jet yield in Pb-Pb collisions to the jet yield in pp collisions.

A Large Ion Collider Experiment[1]



- ALICE detector central barrel
  - $|\eta| < 0.9$
  - 2π coverage of φ
  - $p_{\mathrm{T}} \geq 0.15$ (GeV/c)
- ITS : Inner Tracking System
  - Multi-layered silicon detector
  - Tracking & Vertex determination
- TPC : Time Projection Chamber
  - Gas Detector to determine track's momentum ($0.15 \leq p_{\mathrm{T}} < 100$ GeV/c)
- V0
  - Scintillators at forward rapidity - Triggering / Centrality & Ψ_{RP} determination

Analysis Procedure [2]

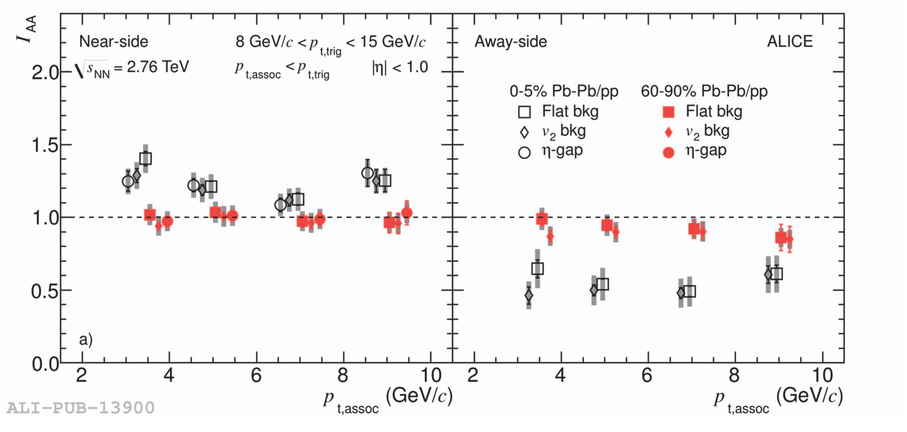


1) Obtain $\Delta\eta$-$\Delta\varphi$ distribution by correlating trigger and associated particles for the same and mixed events. Project per-trigger yield correlation function to the $\Delta\eta$ axis.
2) Perform fitting using the generalized gaussian function, and extract the constant parameter for background estimation.

$$f(\Delta\eta) = \frac{\beta}{2\alpha\Gamma(1/\beta)}\exp(-|\Delta\eta|/\alpha)^{\beta} + const$$

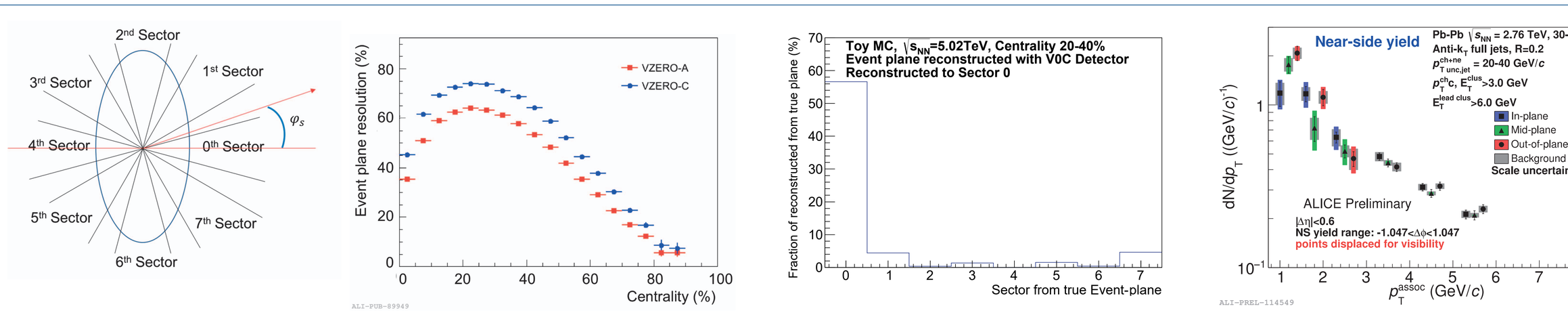
3) Obtain the yield after the background subtraction to calculate I_{AA} & I_{CP}.

Jet-like Particle Yield Modification [3]



- Jet-like particle yield modification can be quantified with I_{AA} and I_{CP}. $I_{\mathrm{AA}} = \frac{Y_{\mathrm{PbPb}}}{Y_{pp}}$ where Y_{PbPb} (Y_{pp}) is the yield in Pb-Pb(*pp*) collisions.
- Near-side is enhanced: Near-side partons are also affected by the medium.
  - Fragmentation function softening
  - The difference of parton distributions in Pb-Pb to *pp*
- Away-side is suppressed: Significant in-medium energy loss is observed.

φ_s Dependence of Jet-like Particle Yield Modification



1) The event plane dependence of the jet-like yield can be obtained by measuring correlations as a function of φ_s ($\varphi_s = \varphi_{trigger} - \Psi_{EP}$)
2) Toy MC model to estimate the effect of event plane resolution on the trigger particle classification and jet-like yields has been investigated. Smearing is defined as a fraction of # of tracks from true / Total # of tracks from reconstruction. The finite resolution affects the number of trigger particles by 40%.
3) Jet-hadron correlation results show no dependence on the event plane within uncertainty.[4] Analysis of the jet-like yield modification as a function of the azimuthal angle with respect to the event plane using di-hadron correlations is currently on-going.

[1] : ALICE Collaboration, B. Abelev *et al*, Performance of the ALICE Experiment at the CERN LHC, Int. J. Mod. Phys. A 29 (2014) 1430044
[2] : ALICE Collaboration, J. Adam *et al*, Evolution of the longitudinal and azimuthal structure of the near-side jet peak in Pb-Pb collisions at sNN=2.76TeV, arXiv:1609.06667 [nucl-ex]
[3] : ALICE Collaboration, K. Aamodt *et al*, Particle-Yield Modification in Jetlike Azimuthal Dihadron Correlations in Pb-Pb Collisions at sNN=2.76 TeV, Phys. Rev. Lett. 108, 092301 (2012)
[4] : Joel Mazer, ALICE Collaboration, Jet-hadron correlations relative to the event plane at the LHC with ALICE, Nuclear Physics A, Vol. 976, 500-503