Multiplicity dependence of azimuthal correlations of D mesons with charged particles in p-Pb collisions with ALICE

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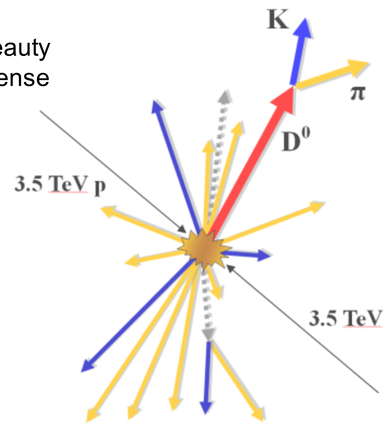
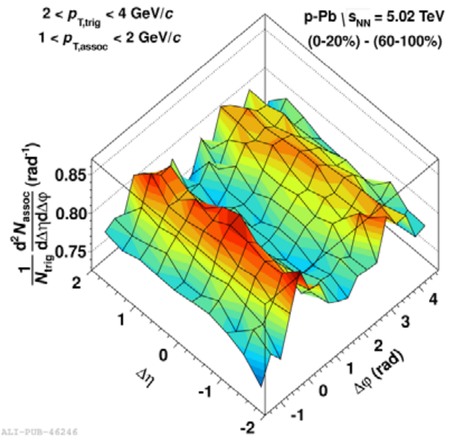
Physics Motivations

Angular correlations between heavy-flavour particles and charged hadrons can give us access to the charm and beauty production and fragmentation mechanisms and provide further insight on the heavy-quarks interaction with the hot and dense QCD medium created in heavy-ion collisions (Quark-Gluon Plasma).

p-Pb:
- Assess cold nuclear matter effects (e.g. shadowing, parton energy loss and color-glass condensate).
- Investigate on the presence of a double ridge (i.e. long-range ridge-like structures in near- and away-side regions) as observed in h-h correlations [1-3].

p-Pb *vs* centrality:
- Investigate possible modifications of the correlation pattern as a function of centrality that could point toward a different fragmentation and hadronization of charm in different collision centralities;
- Extract possible D-meson v_2 by subtracting low-multiplicity from high-multiplicity events.





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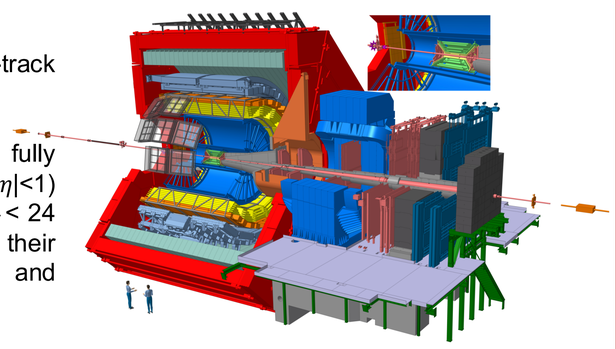
Analysis procedure

Analysis strategy

- Analysis performed for p-Pb collisions at $\sqrt{s_{NN}}$ = 5.02 TeV in three ZNA[1] classes: **0-20%, 20-60%, 60-100%** [5].
- D-meson and associated charged-track selection:
  - D mesons (trigger particles) fully reconstructed in the central barrel ($|\eta|<1$) from their hadronic decays [4] in $3 < p_T < 24$ GeV/c and selected exploiting their displaced decay vertex topology and Particle IDentification (PID).
  - Associated tracks reconstructed in the central barrel and selected via quality cuts.



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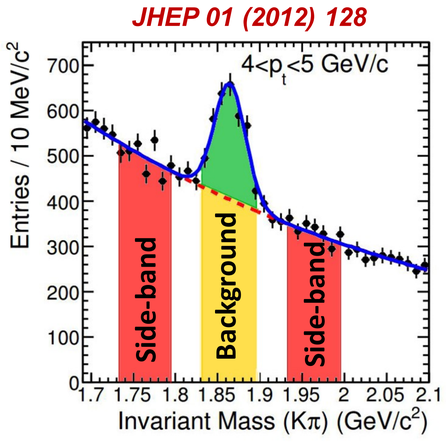
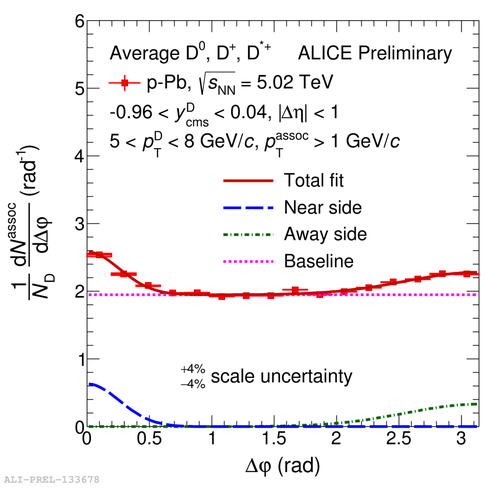


- Evaluation of ($\Delta\varphi$,$\Delta\eta$) correlations of D candidates in invariant mass peak region with selected associated tracks.
- Removal of correlations from **background** D-meson candidates via **side-band** subtraction.
- Event-mixing correction in order to correct for spatial inhomogeneities and limited acceptance.
- Further corrections for:
  - D-meson and associated-track reconstruction efficiency.
  - D mesons produced via B-meson decays → subtracted exploiting templates of angular correlation distribution of B→D mesons.
  - secondary-track contamination → purity factor evaluated via Monte Carlo simulations.
- Projection along $\Delta\varphi$ axis (to reduce statistical fluctuations).
- Weighted average of D^0, D^+, D^{*+} correlation distributions.
- Fit to fully-corrected azimuthal correlation distributions:
  - two Gaussians describing near- and away-side peaks and a constant term for the baseline.
- Extraction of physical observables: near- and away-side peak yields and widths, baseline height.

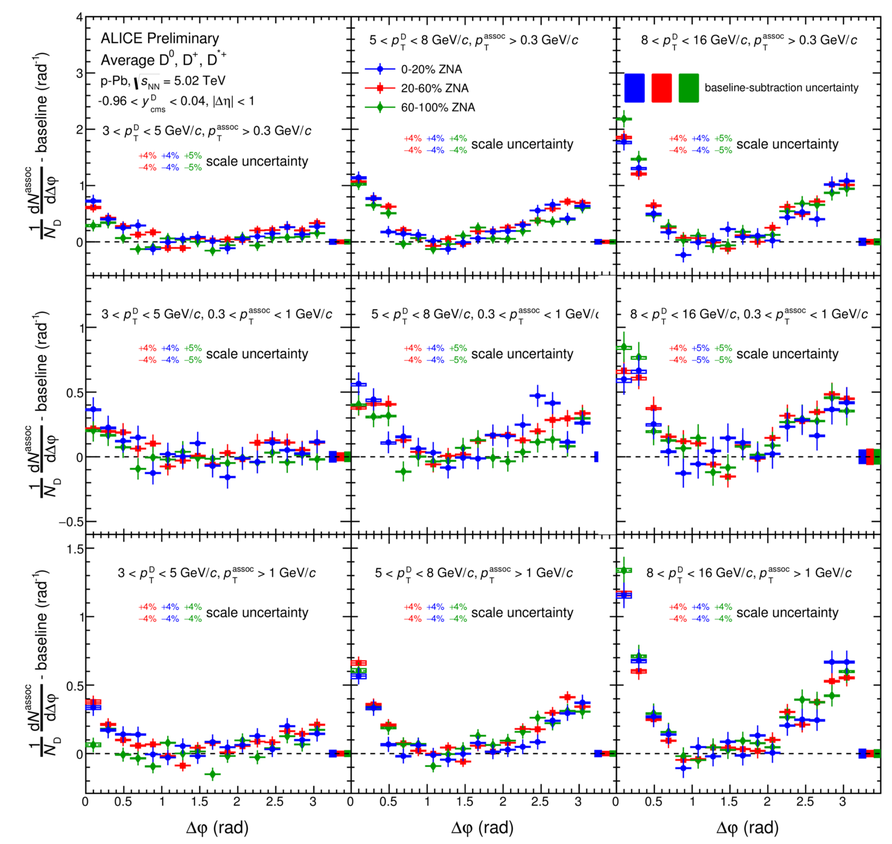


[1] Method that estimates the centrality via the two sets of neutron calorimeters of the Zero-Degree Calorimeters (ZDC) placed on the A side of the ALICE detector.

Results

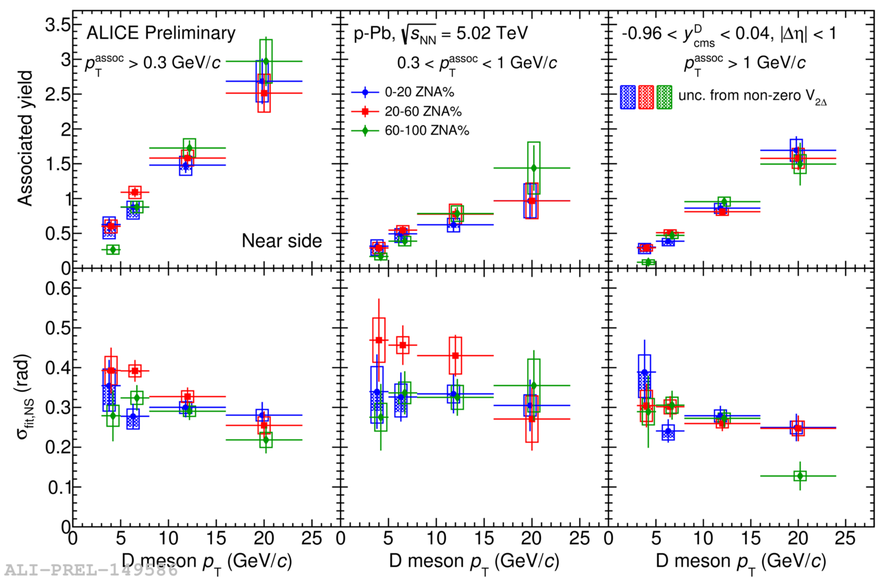
Comparison of $\Delta\varphi$ correlation distributions in p-Pb collisions among the three centrality classes

- Compatibility within uncertainties for the azimuthal correlation distributions in the three centrality classes, for all the kinematic ranges.
- From these results, no evident effect induced by possible centrality dependence of the charm fragmentation.



Comparison of near-side fit observable in p-Pb collisions among the three centrality classes

- Consistent p_T evolution of the correlation peaks within total uncertainties.
- No clear modification of the near-side peak properties as a function of the centrality:
  - same increasing trend with p_T(D) due to larger charm quark energy.
  - similar increase of the peak collimation going to high p_T(D).
- Overall compatibility with the results obtained in the centrality-integrated analysis in p-Pb collisions at $\sqrt{s_{NN}}$ = 5.02 TeV performed either with Run1 [6] and Run2 samples.



References: **[1]** ALICE Collaboration, Long-range angular correlations of π, K and p in p-Pb collisions at $\sqrt{s_{NN}}$ = 5.02 TeV, **Phys. Lett. B 726 (2013) 164-177**
[2] CMS collaboration, Observation of long-range, near-side angular correlations in proton-proton collisions at the LHC, **JHEP 1009 (2010) 091**
[3] ALICE collaboration, Forward-central two-particle correlations in p-Pb collisions at $\sqrt{s_{NN}}$=5.02 TeV, **Phys. Lett. B 753 (2016) 126-139**
[4] Particle Data Group, **Chin. Phys. C40 no.10 (2016)**
[5] ALICE Collaboration, Centrality dependence of particle production in p-Pb collisions at $\sqrt{s_{NN}}$ = 5.02 TeV, **Phys. Rev. C 91 (2015) 064905**
[6] ALICE Collaboration, Measurement of azimuthal correlations of D mesons with charged particles in pp collisions at √s=7 TeV and p-Pb collisions at $\sqrt{s_{NN}}$ = 5.02 TeV, **Eur. Phys. J. C (2017) 77:245**