Measurement of D^0-hadron azimuthal correlations in p-Pb collisions at $\sqrt{s_{\rm NN}} = 5.02$ TeV with ALICE

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INTRODUCTION

The main objective of ALICE experiment [1] at the LHC is the study of the Quark Gluon Plasma (QGP), a state of matter in which quarks and gluons are not confined into hadrons, that is expected to be formed in high energy collisions of heavy nuclei.
Due to their large mass, heavy quarks are predominantly produced in the initial phase of the collision. They experience the full evolution of the QGP medium and interact with its constituents. In this way, they lose energy via both collisional and radiative processes, as supported by several experimental observations, among which the measurement of a suppression of D meson production for $p_T > 4$ GeV/c in central Pb-Pb collisions. **Azimuthal correlations** between particles from heavy-flavour quarks and hadrons are sensitive to the path length dependence of heavy-quark energy loss and can help to understand how heavy quark jets get modified in the medium. With this goal, we report on the status of the analysis of D^0-hadron azimuthal correlations in p-Pb collisions at $\sqrt{s_{\rm NN}} = 5.02$ TeV which, beside providing the necessary reference for studies in Pb-Pb collisions, can be sensitive to initial state, cold nuclear matter effects, absent in pp collisions.

EXPERIMENTAL SETUP

The main detectors exploited in this analysis are the Inner Tracking System (ITS), the Time Projection Chamber (TPC) and the Time Of Flight (TOF) detector. The ITS and the TPC allow for track reconstruction in the pseudorapidity range $|\eta| < 0.9$. The measurements of the specific energy loss dE/dx in the TPC and of the time of flight in the TOF are used for particle identification, in particular for separating pions and kaons up to 1.5 GeV/c.

ANALYSIS STRATEGY

The analysis steps are:

1. **D^0 meson signal extraction:** D^0 meson candidates are identified via the reconstruction of $D^0 \rightarrow K^-\pi^+$ decays (branching ratio = 3.88 ± 0.05 %) via an invariant mass analysis of displaced secondary vertices. The signal selection strategy, which exploits the relatively large D^0 life time, $c\tau \approx 123$ μm, is the same as described in [2].

2. **Azimuthal correlations:** each selected D^0 with $2 \leq p_T \leq 16$ GeV/c is correlated with charged particles with $|\eta| < 0.8$ in specified transverse momentum ranges, $p_T^{assoc} > 0.3, 0.5, 1, 2$ GeV/c.

3. **Background subtraction and corrections:** the contribution of the background under the D^0 peak is subtracted using the the azimuthal correlation distribution obtained in the side-bands of the D^0 invariant mass peak. Each correlation pair is weighted by the inverse of the product of the reconstruction efficiencies of the trigger and associated particle. Effects related to the limited detector acceptance and spatial inhomogeneities are corrected for by dividing the obtained $(\Delta\phi, \Delta\eta)$ correlations by

those obtained by pairing a D^0 candidate from a given event with tracks from other events (event mixing), normalized to $(\Delta\phi,\, \Delta\eta) = (0,\, 0)$.

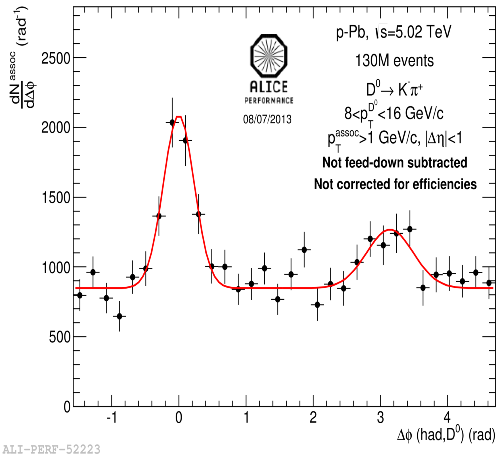

FIG. 1: Correlation between D^0 mesons with $8 < p_T < 16$ GeV/c and charged hadrons with $p_T^{assoc} > 1$ GeV/c.

PRELIMINARY RESULTS

About 130 million minimum bias events from p-Pb collisions at $\sqrt{s_{\rm NN}} = 5.02$ TeV are used for the analysis. Figure 1 shows the background subtracted azimuthal correlation distribution for D^0 with $8 < p_T < 16$ GeV/c and $p_T^{assoc} > 1$ GeV/c. Near side ($\Delta\phi \sim 0$) and away side ($\Delta\phi \sim \pi$) peaks are clearly visible.

CONCLUSIONS

We studied the azimuthal correlations between D^0 mesons in the range $2 < p_T < 16$ GeV/c and hadrons with $p_T^{assoc} > 0.3, 0.5, 1, 2$ GeV/c. The study of the properties of the correlation peaks observed is ongoing.

References

[1] K. Aamodt et al., ALICE Collaboration, JINST3 S08002 (2008).
[2] B. Abelev et al., ALICE Collaboration, JHEP 1201 128 (2012).