Study of charm in jet using $D^*$ mesons in pp collisions at the LHC with ALICE

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Motivation for charm jet studies

- Fragmentation function: distribution of the original parton momentum fraction carried by the hadron
- Charm quark fragmentation into hadrons is known from $e^+e^-$ experiments and peaked at large momentum fraction $z$
- Measure charm fragmentation in pp to study
- Production mechanisms
- Fragmentation into hadrons
- Measurement in Pb-Pb collisions to address in-medium modifications
- Jet momentum used as a proxy for the quark/gluon initial momentum

$$z = \frac{p_{D_{ch},part}}{p_{jet}}$$

with $p_{D_{ch},part} = \frac{p_{D} \cdot D_{ch}}{|p_{jet}|}$

Pythia Perugia2011 simulation

Plateau in the charged jet yield to min. bias at around 25 GeV/c for L0 and 40 GeV/c for L1-Jet triggers

$\text{D}^*_{ch}$ in jet $\equiv R(D^*,\text{jet}) < 0.4$

A $D$ meson within the jet can have its decay products (daughters) falling outside the jet cone, due to kinematics

EMCal cell size ($\eta \times \phi$): 0.014 rad

Data sample: pp at $\sqrt{s} = 8$ TeV, EMCal triggered events

Large statistics is needed for $D$ meson and jet studies

The EMCal triggered samples provide larger jet (see figure) and $D$ meson samples with respect to min. bias interactions

D$^*$ in Run 1 and perspective for Run 2

10-30% relative statistical uncertainty on signal yield for L1-jet trigger (integrated luminosity $= 70$ nb$^{-1}$)

Expected integrated luminosity from triggered data in Run 2, pp at $\sqrt{s} = 13$ TeV: 40 pb$^{-1}$

factor $\sim 500$ larger statistics $\rightarrow$ few percent relative statistical uncertainty on signal

Summary and outlook

- D$^*$ in jet signal extracted in pp EMCal triggered events at $\sqrt{s} = 8$ TeV collected with the ALICE detector
- Current $z_{\text{obs}}$ region covered: $0.3 < z_{\text{obs}} < 1$
- Next steps: apply corrections ($D^*$ efficiency, jet unfolding), perform this analysis on 2011 Pb-Pb data sample

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