D-meson production measurements in p-Pb collisions at $\sqrt{s_{\rm NN}}$=5.02 TeV with ALICE

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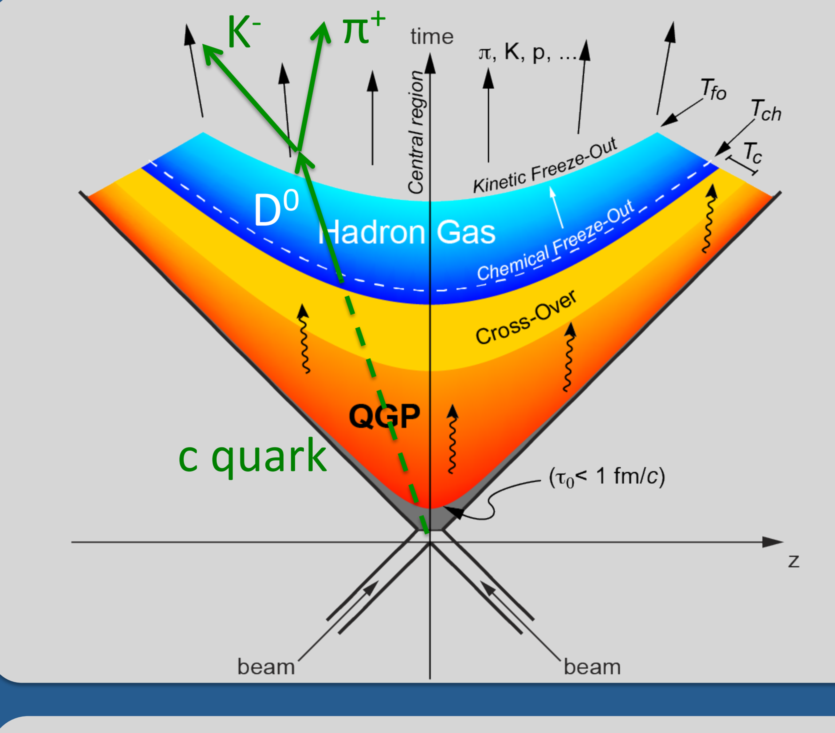
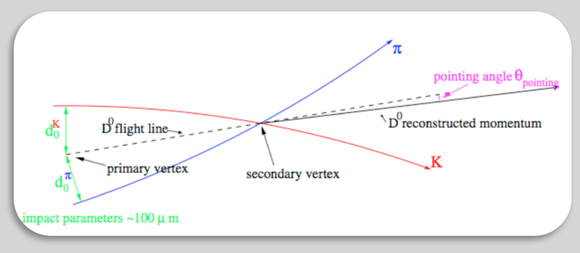


Due to their large masses, heavy quarks are produced in hard partonic scattering processes on a short time-scale. In Pb-Pb collisions, initially-produced **charm** and **beauty** propagate through the medium interacting with its constituents. Heavy quarks are sensitive probes of the

- ✓ **transport properties** of the medium
- ✓ **parton energy-loss** mechanisms

The interpretation of the Pb-Pb results requires an understanding of **cold nuclear matter (CNM) effects** in the initial and final state (shadowing/gluon saturation at low parton fractional momentum, parton transverse momentum broadening, cold nuclear matter parton energy loss), which can be accessed studying **p-Pb collisions**.

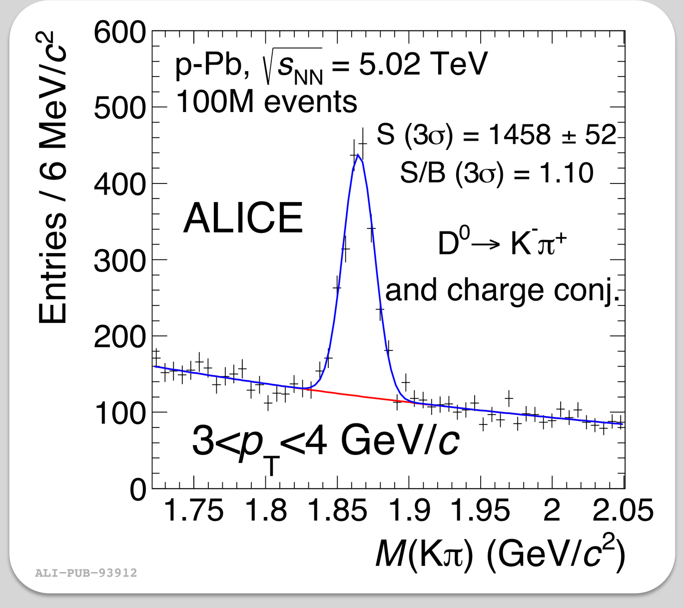
D mesons were reconstructed in p-Pb collisions at $\sqrt{s_{\rm NN}}$ = 5.02 TeV via their hadronic decay channels.

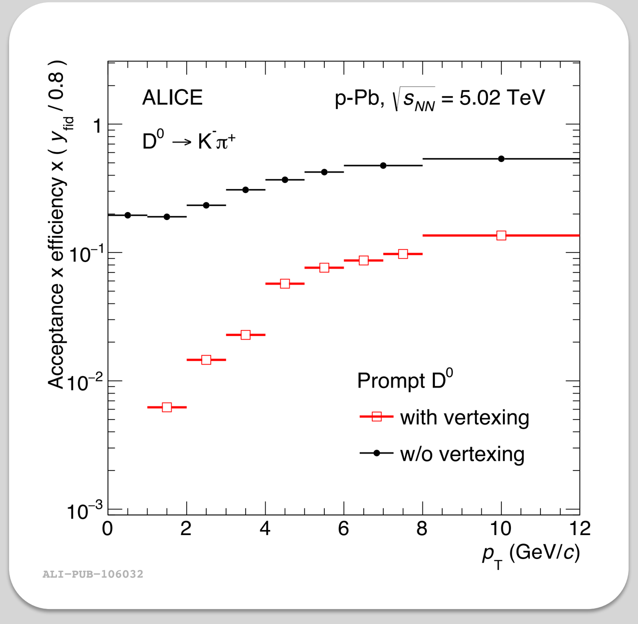


- $D^0 \rightarrow K^- \pi^+$
- $D^+ \rightarrow K^- \pi^+ \pi^+$
- $D^{*+} \rightarrow D^0 \pi^+$
- $D_s^+ \rightarrow \Phi \pi^+$

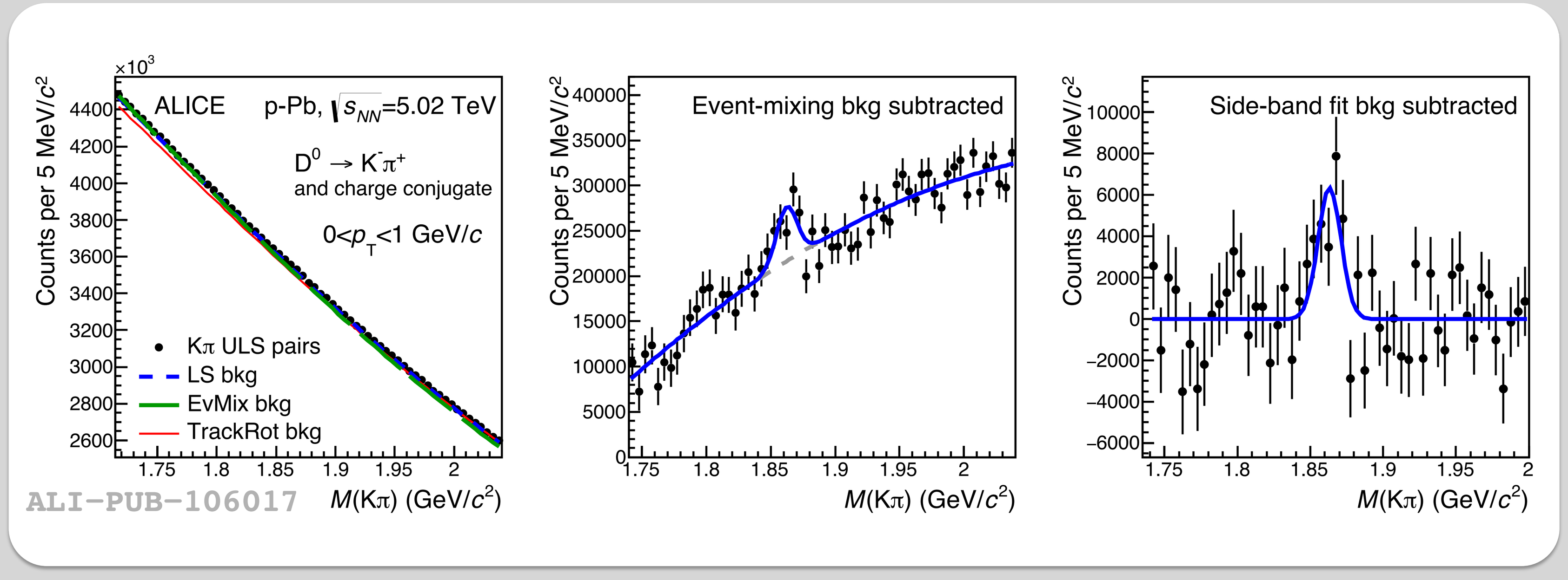
Yield extraction from an invariant-mass analysis of:

1. D-meson candidates selected on the basis of the **decay topology** by reconstructing the **secondary vertices** separated by a few hundred μm from the interaction point
2. pairs of kaons and pions with opposite charge (unlike sign) after **subtraction of the combinatorial background** estimated with like-sign pairs, event mixing, track rotation, side-band fit → it allows us to extend the D^0 measurement to $\boldsymbol{p_T<1}$ **GeV/*c***





Raw yields corrected for efficiency and subtraction of the contribution of D mesons from B decays

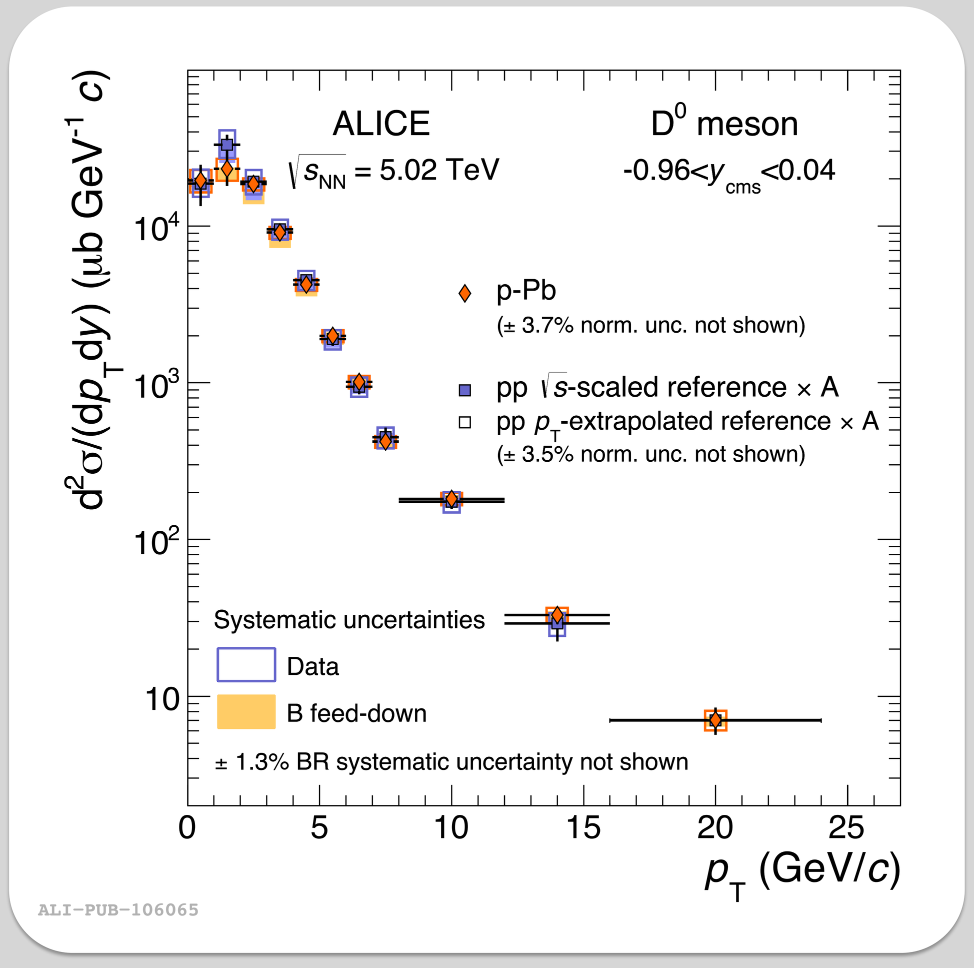


CROSS SECTION AND $R_{\rm pPb}$

D^0-meson p_T-differential cross section compared with the pp reference cross section scaled by the Pb mass number A = 208 [1]

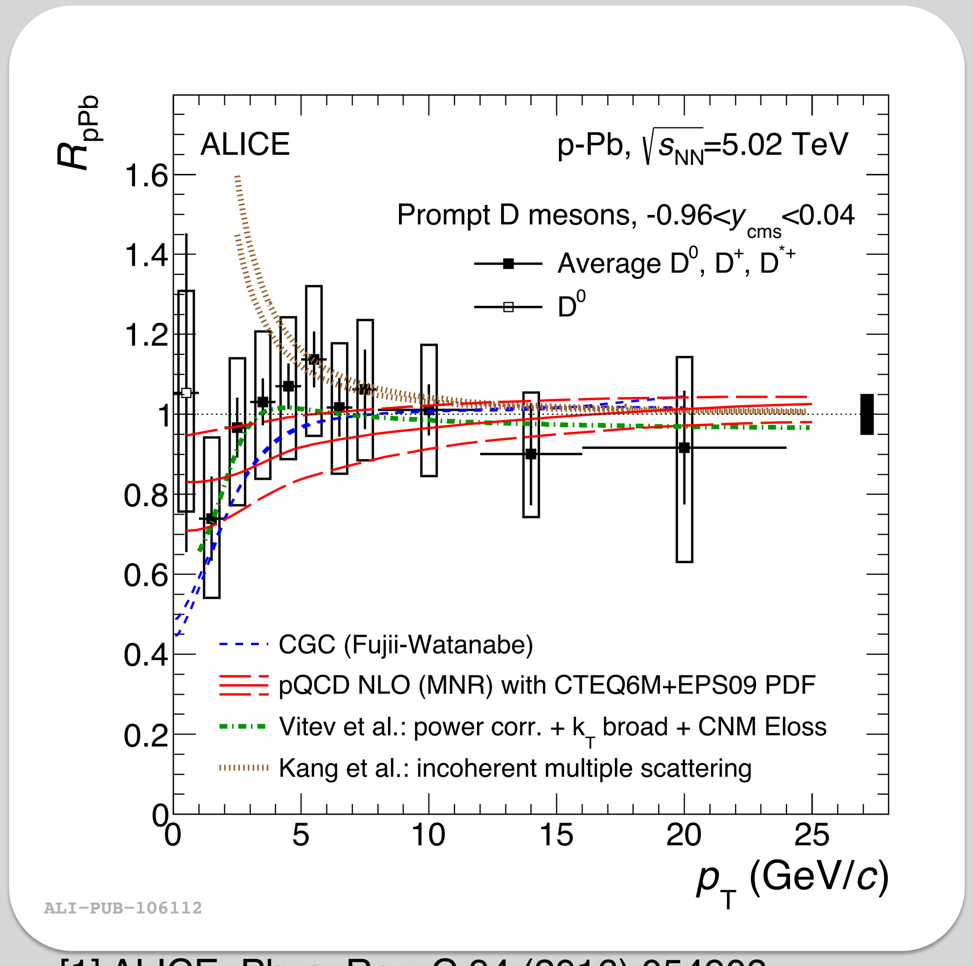
pp reference obtained by a pQCD-based energy scaling of the cross section measured at $\sqrt{s}$ = 7 TeV [2]

Most **precise** measurement obtained using the results of the analysis **without decay-vertex reconstruction in** $\boldsymbol{0<p_T<2}$ **GeV/*c*** and those of the analysis **with decay-vertex reconstruction for** $\boldsymbol{p_T>2}$ **GeV/*c***



$$d\sigma^{\rm prompt D^0}_{\rm p-Pb,5.02TeV}/dy = 79.0 \pm 7.3({\rm stat.})^{+7.1}_{-13.4}({\rm syst.}) \pm 2.9({\rm lumi}) \pm 1.0({\rm BR})\ {\rm mb}$$

$$d\sigma^{c\bar{c}}_{\rm p-Pb,5.02TeV}/dy = 151 \pm 14({\rm stat.})^{+13}_{-26}({\rm syst.}) \pm 6({\rm lumi}) \pm 7({\rm FF}) \pm 5({\rm rap.shape})\ {\rm mb}$$



Measurement of the **D^0, D^+, D^{*+} and D_s^+** mesons nuclear modification factor $\boldsymbol{R_{\rm pPb}}$ [3]

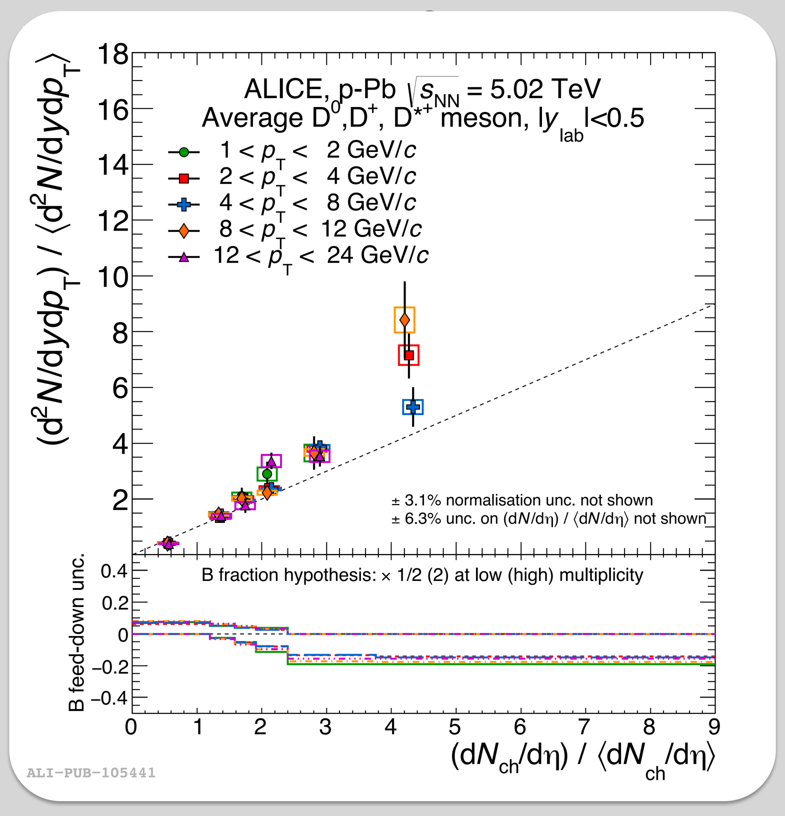
$$R_{\rm pPb} = \frac{(d\sigma/dp_T)_{\rm pPb}}{A \times (d\sigma/dp_T)_{\rm pp}}$$

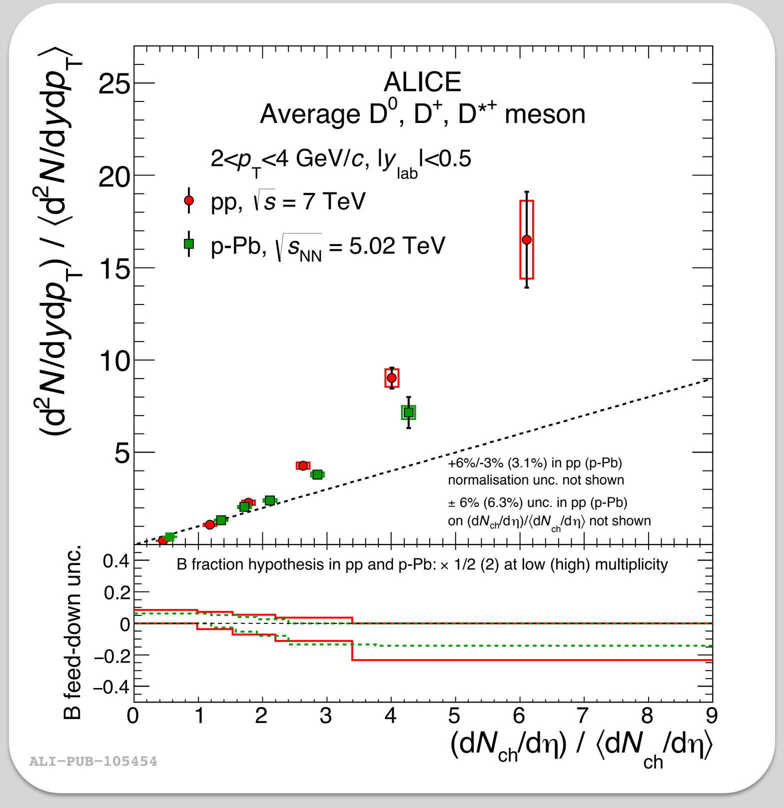
$R_{\rm pPb}$ consistent with **unity** within uncertainties
Models including CNM effects describe the data within uncertainties

Suppression observed in **central Pb-Pb** collisions at high p_T [4] due to **final-state effects** induced by the **hot partonic matter**

[1] ALICE, Phys. Rev. C 94 (2016) 054908
[2] R. Averbeck *et al.* arXiv:1107.3243
[3] ALICE, Phys. Rev. Lett. 113 (2014) 232301
[4] ALICE, JHEP 09 (2016) 112
[5] ALICE, JHEP 8 (2016) 1-44

D-MESON YIELDS vs. CHARGED-PARTICLE MULTIPLICITY





$$Y^{\rm corr} = \frac{Y^{\rm mult}/(\epsilon^{\rm mult} \times N^{\rm mult}_{\rm event})}{Y^{\rm tot}/(\epsilon^{\rm tot} \times N^{\rm tot}_{\rm event}/\epsilon^{\rm trigger})}$$

D-meson yields show a **faster-than-linear increase** with charged-particle multiplicity at central rapidity [5].

Same increasing trend within uncertainties in all p_T intervals.

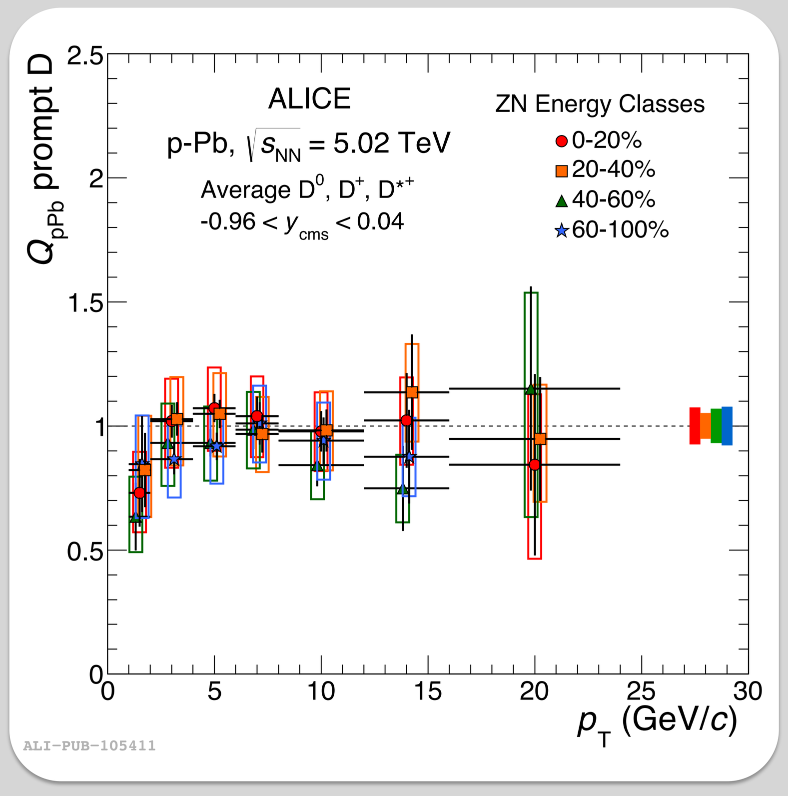
Similar behaviour observed in pp collisions but:

- high-multiplicity events in **pp** collisions affected by **multi-parton interactions**,
- high-multiplicity events in **p-Pb** collisions also originate from higher number of **binary nucleon-nucleon collisions** [min.bias p-Pb collisions:$\langle N_{\rm coll}\rangle$=6.9].

D-MESON $Q_{\rm pPb}$

D-meson nuclear modification factor measured in 4 **centrality classes**: 0-20%, 20-40%, 40-60% and 60-100% [5].
Classes obtained slicing the

- energy deposited in neutron calorimeter on Pb-going side [ZNA].



$$Q^{\rm mult}_{\rm pPb} = \frac{(dN/dp_T)_{\rm pPb}}{\langle T^{\rm mult}_{\rm pPb}\rangle (d\sigma/dp_T)_{\rm pp}}$$

$$\langle T^{\rm mult}_{\rm pPb}\rangle = \langle N^{\rm mult}_{\rm coll}\rangle / \sigma^{\rm inel}_{\rm NN}$$

$\boldsymbol{Q_{\rm pPb}}$ results in the different centrality classes are consistent with **unity** within the uncertainties.

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