

Multiplicity dependence of intra-jet properties in small collision systems with ALICE



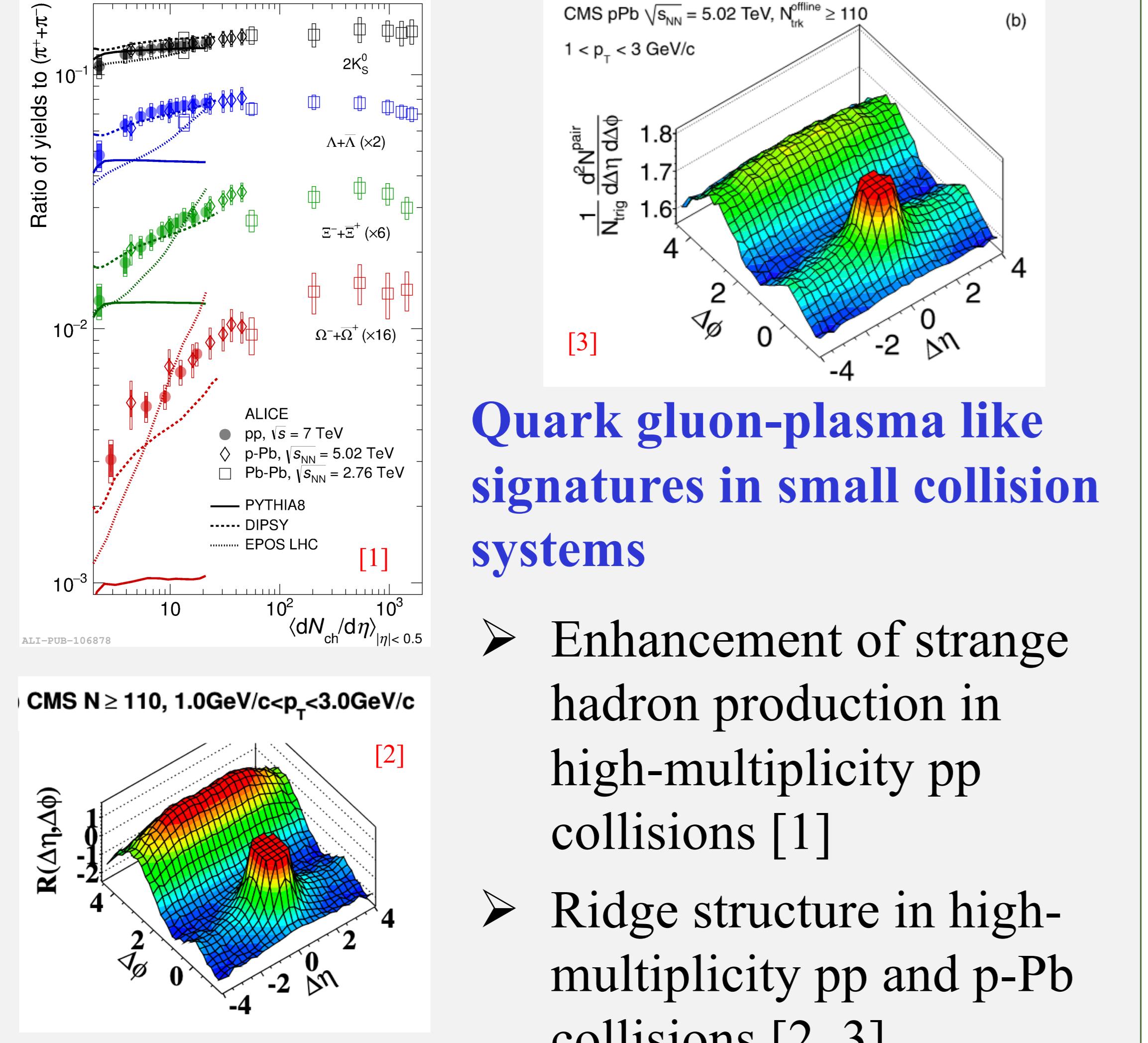
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Motivation



Analysis procedure

MB: Minimum bias; **HM:** High multiplicity

System	Event selection
pp $\sqrt{s} = 13 \text{ TeV}$	MB (V0A & V0C coincidence): 1801.64 M HM ($5 < V0M/V0M < 9$): 183.21 M
p-Pb $\sqrt{s_{NN}} = 5.02 \text{ TeV}$	MB (V0A & V0C coincidence): 515 M

Track selection: Charged track, $p_T^{\text{track}} > 0.15 \text{ GeV}/c$, $|\eta_{\text{track}}| < 0.9$

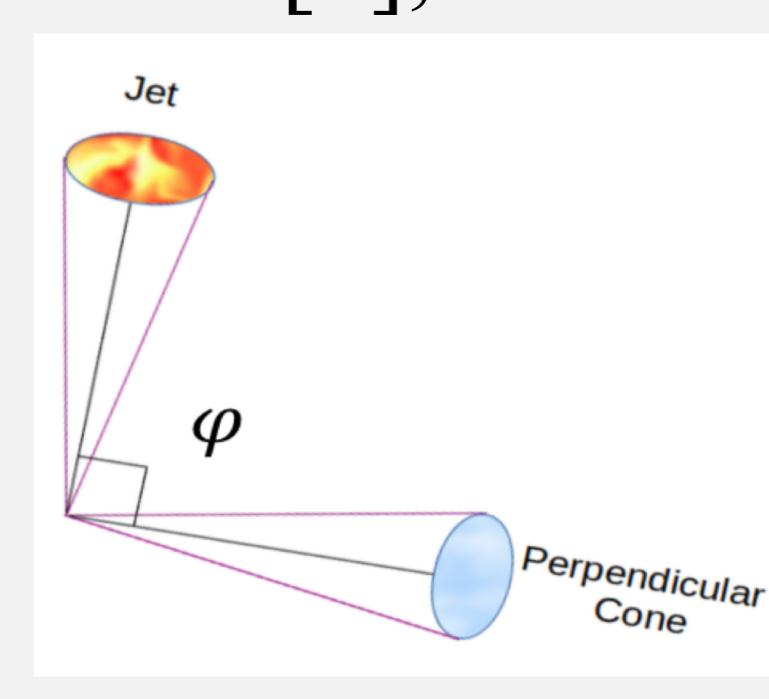
Jet selection: FastJet anti- k_T leading jets, $R = 0.4$, $|\eta_{\text{jet}}| < 0.5$

Correction procedure: 2D Bayesian Unfolding, RooUnfold

Underlying events (UE): Perpendicular cone method [4], UE subtracted on a statistical basis after unfolding

Sources of systematic uncertainties:

Uncertainty in tracking efficiency, Monte Carlo dependence, change in prior, choice of number of iterations, uncertainty in estimation of UE



Observables

Jet shape observable ($\langle N_{\text{ch}} \rangle$):

Mean charged-particle multiplicity within a leading jet cone [4].

$$\langle N_{\text{ch}} \rangle (p_T^{\text{jet}, \text{ch}}) = \frac{1}{N_{\text{jets}}} \sum_{i=1}^{N_{\text{jets}}} N_{\text{ch}}^i (p_T^{\text{jet}, \text{ch}})$$

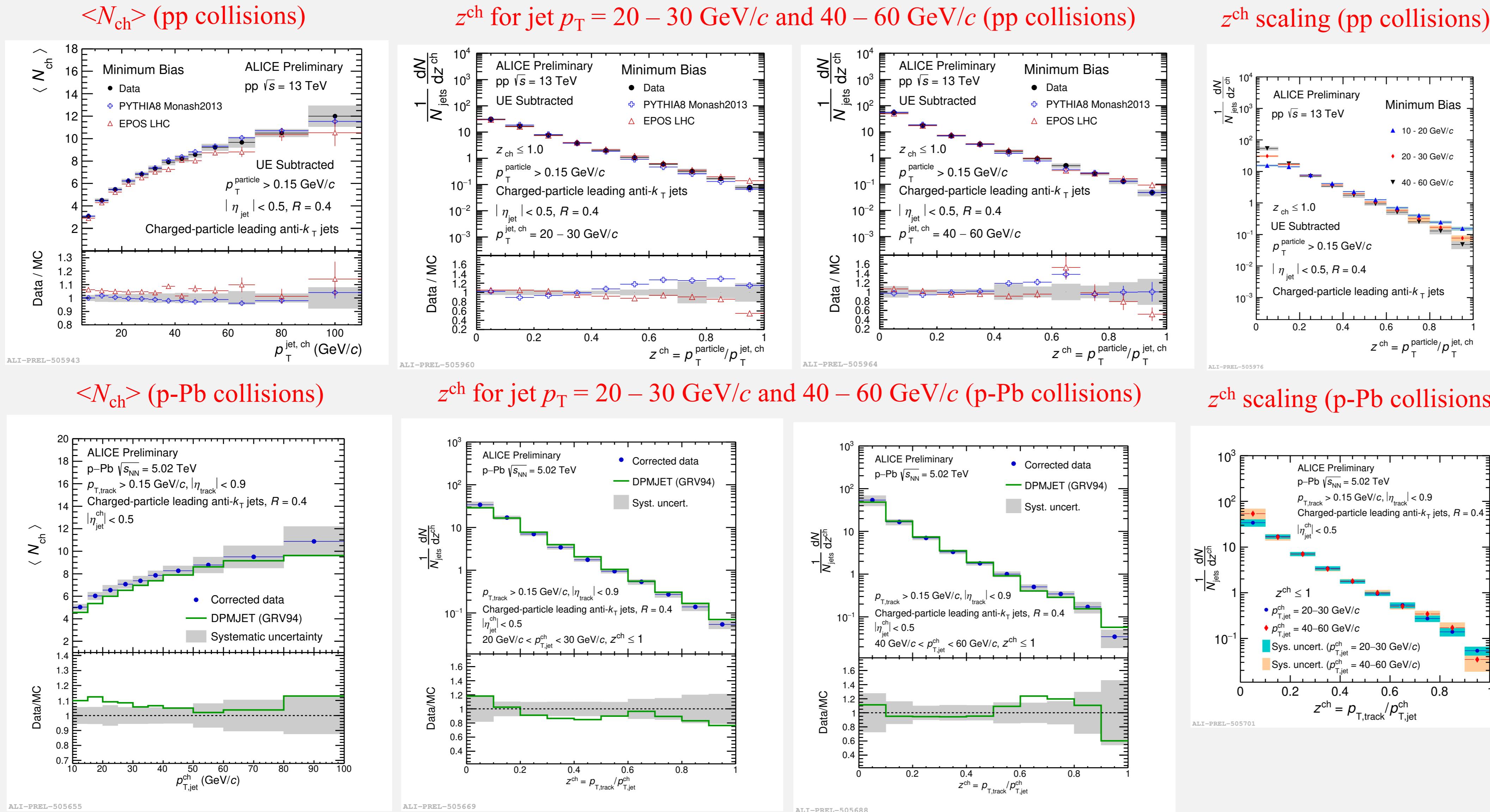
Jet fragmentation function (z^{ch}) [4]:

$$z^{\text{ch}} = p_T^{\text{track}} / p_T^{\text{jet}}$$

where,

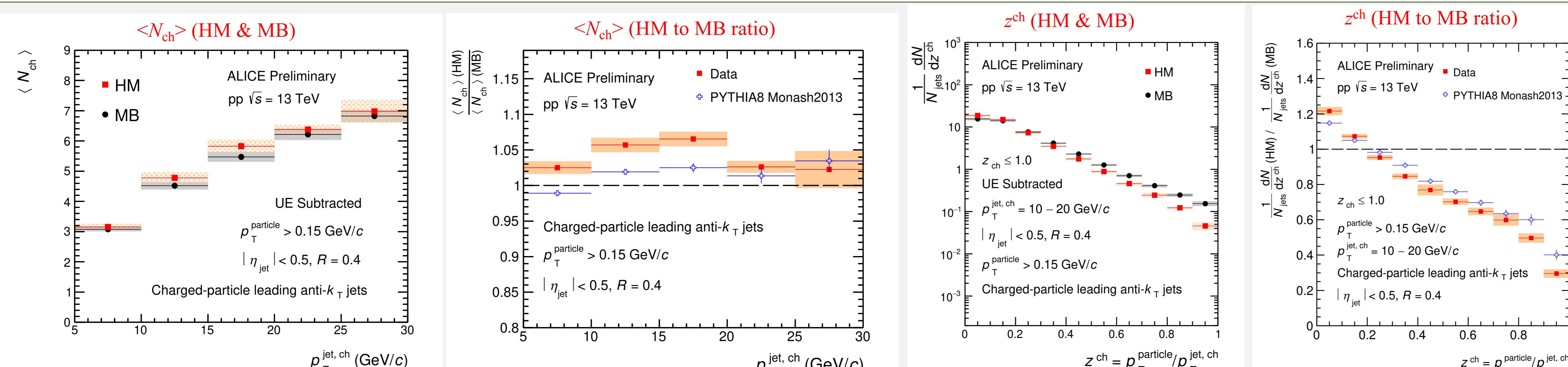
$$p_T^{\text{track}} = p_T \text{ of jet constituent}$$

Minimum bias results for pp and p-Pb collisions



- $\langle N_{\text{ch}} \rangle$ increases with jet p_T in pp and p-Pb collisions
- pp ($\langle N_{\text{ch}} \rangle$): EPOS LHC underestimates the data whereas PYTHIA8 explains the data within the systematic uncertainty
- pp (z^{ch}):
 - High - jet p_T :** Both models explain the data
 - Low - jet p_T :** EPOS LHC explains the data better than PYTHIA8 for $z^{\text{ch}} > 0.5$
- p-Pb: DPMJET explains both $\langle N_{\text{ch}} \rangle$ and z^{ch} distributions within the systematic uncertainty
- Scaling of z^{ch} distributions with jet p_T observed in pp and p-Pb collisions

Multiplicity dependence of jet properties in pp collisions



- $\langle N_{\text{ch}} \rangle$ is slightly large for HM
- z^{ch} distributions show softening of jets in HM compared to MB events

Summary

- Charged-particle jet properties ($\langle N_{\text{ch}} \rangle$ and z^{ch}) are measured with ALICE in pp collisions at $\sqrt{s} = 13 \text{ TeV}$ and p-Pb collisions at $\sqrt{s_{NN}} = 5.02 \text{ TeV}$
- $\langle N_{\text{ch}} \rangle$ increases with leading jet p_T in pp and p-Pb collisions
- Scaling of jet fragmentation with jet p_T observed in both pp and p-Pb collisions
- A slight increase in $\langle N_{\text{ch}} \rangle$ observed in HM jets compared to MB jets
- Significant softening of jet fragmentation observed in HM: beyond the effect due to change in jet p_T spectral shape
- Results are compared with theoretical Monte Carlo models in both pp and p-Pb collisions

References

[1] Nature Physics 13 (2017) 535-539 [2] CMS, Phys. Lett. B718, 795 (2013)

[3] CMS, JHEP 09 (2010) 091 [4] Phys. Rev. D 91 (2015) 112012

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