Broad η Range Survey of dN_{ch}/dη at the LHC

ALICE

MOTIVATION

- Insight into overall particle production
- Whether N_{ch} scale with N_{part} or N_{coll} or both
- Model benchmark and discriminator

FORWARD MULTIPLICITY DETECTOR (FMD)

- Silicon strips, $51\,200$ channels
- $-3.5 < \eta < -1.7$ and $1.7 < \eta < 5$.

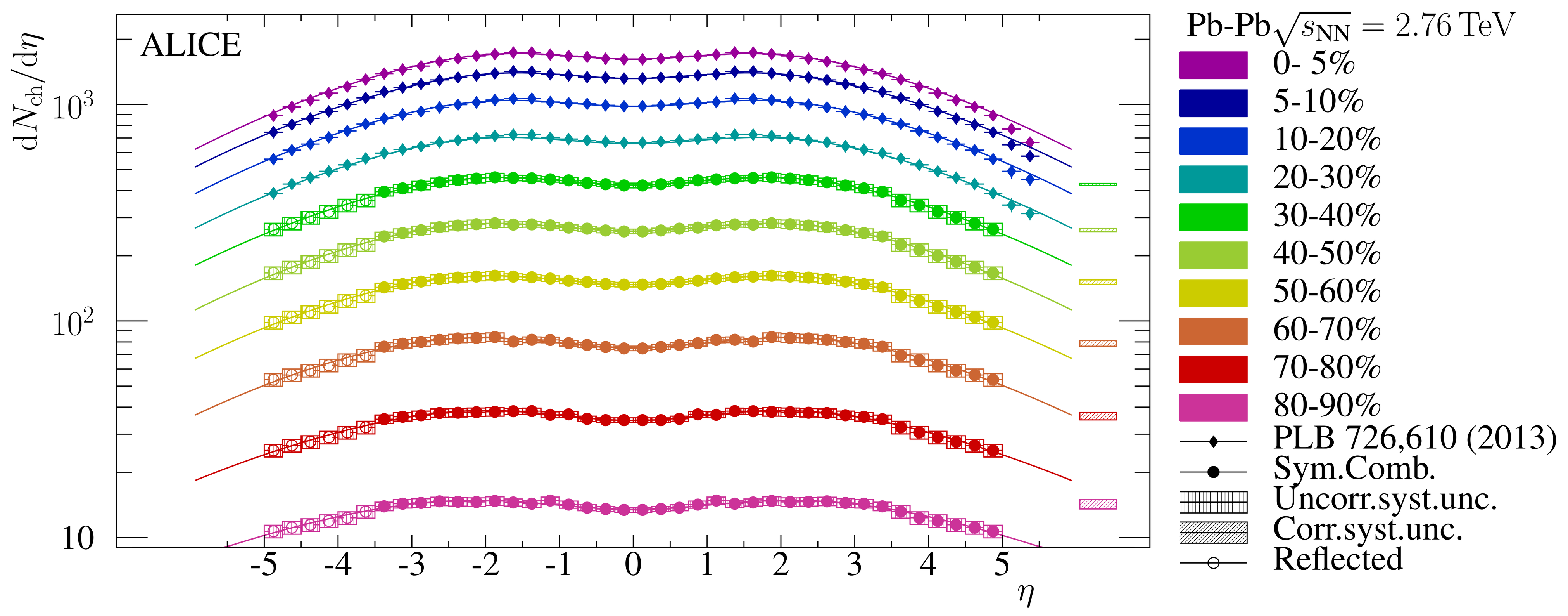
CORRECTION FOR SECONDARIES IN FMD

- Material enhances measured N_{ch} by up–to 300%
- Hard to simulate accurately
- Data–driven correction, based on previous results [1, 2]

SILICON PIXEL DETECTOR (SPD)

- Silicon pixels, 9.8×10^6 channels.
- $|\eta| < 2$

dN_{ch}/dη IN Pb–Pb



Combined and symmetrised charged–particle pseudorapidity density for the 90% most central collisions in 10 centrality classes [1].

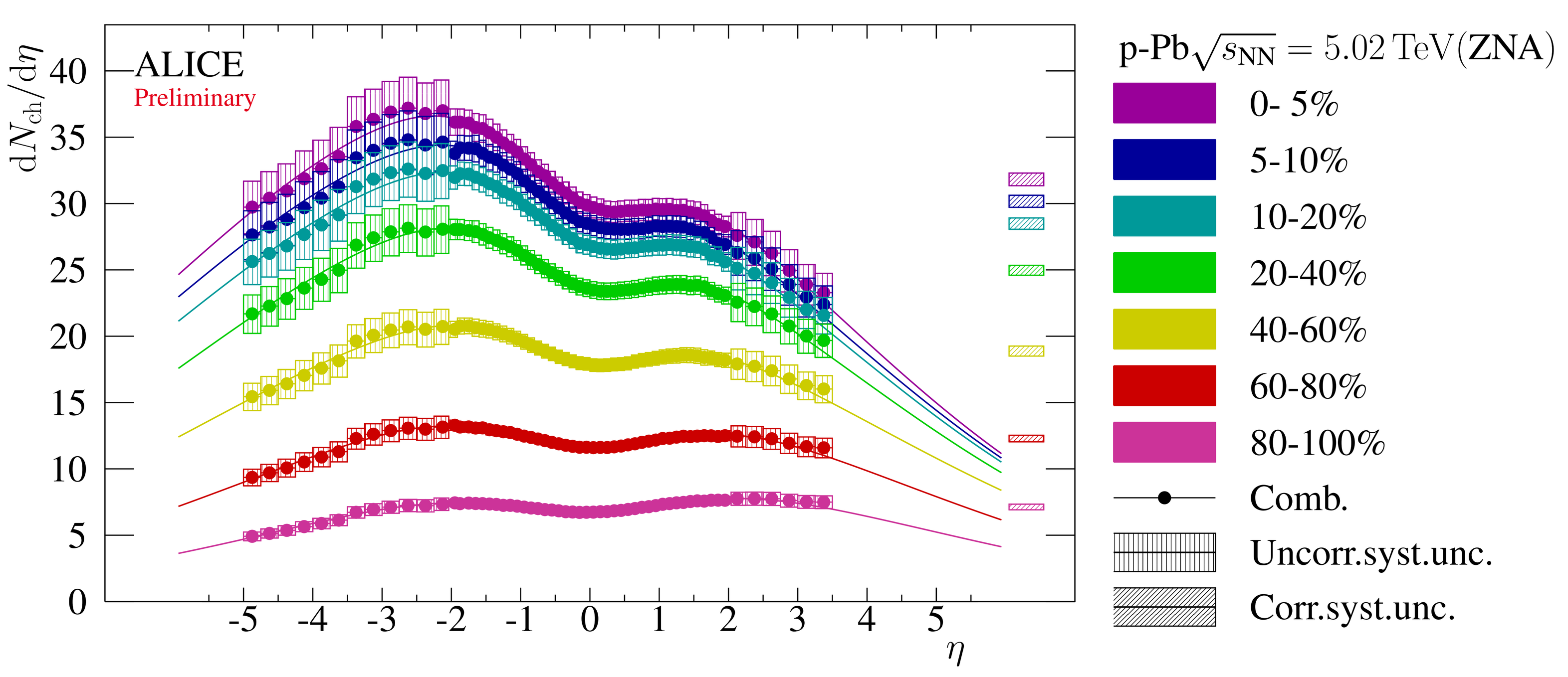
MEASUREMENTS

- Combined FMD & SPD
- Broad pseudorapidity coverage ($-3.5 < \eta < 5$)
- Extend previous results to higher centralities [2, 3, 4]
- Pb–Pb at $\sqrt{s_{NN}} = 2.76$ TeV
- p-Pb at $\sqrt{s_{NN}} = 5.02$ TeV, two centrality estimators [4]
  - ZNA — forward ($\theta \approx 0$) neutrons
  - V0A — forward ($2.8 < \eta < 5.1$) N_{ch}.

FITTED FUNCTIONS

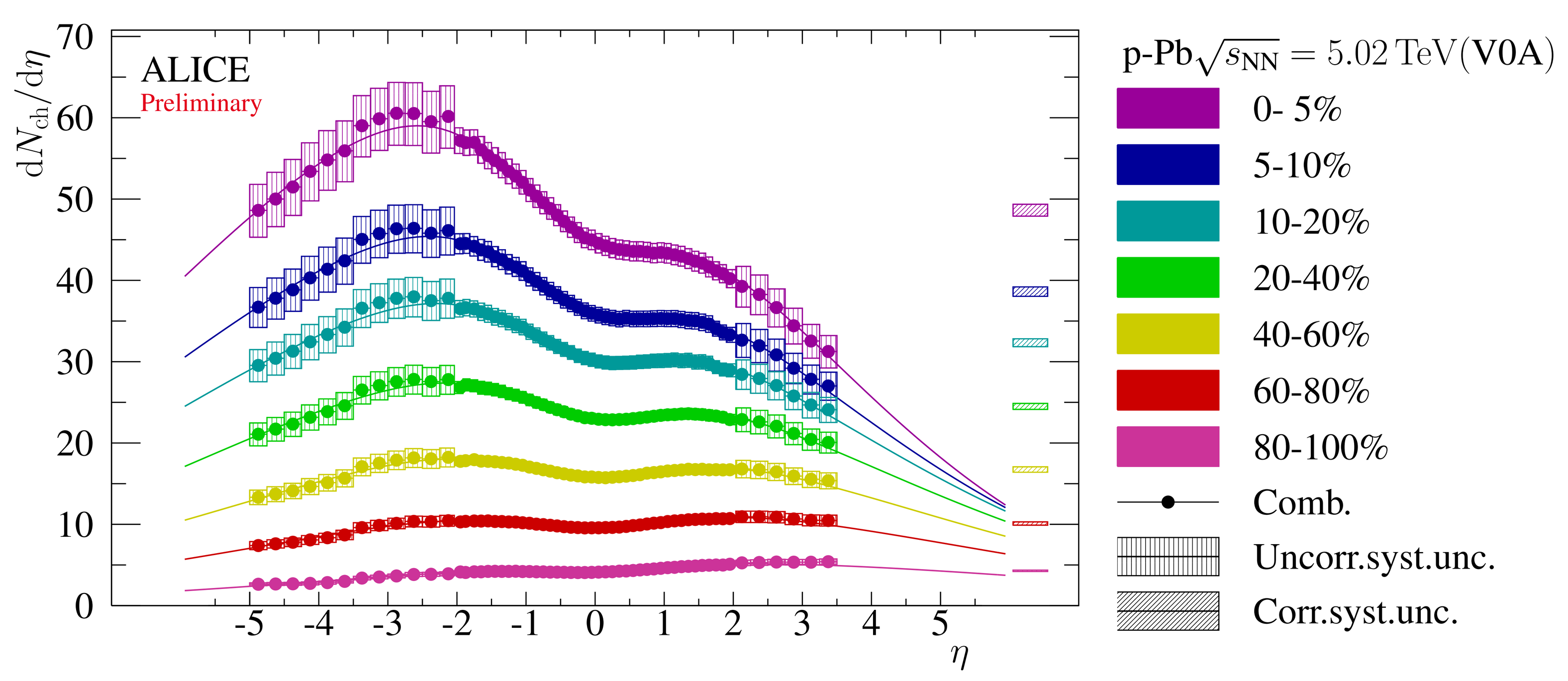
- For Pb–Pb: $f_{GG}(\eta) = A_1 e^{-\frac{\eta^2}{2\sigma_1}} - A_2 e^{-\frac{\eta^2}{2\sigma_2}}$
- For p-Pb: $f_{LGG}(\eta) = (a\eta + b) f_{GG}(\eta)$
- Find A_2/A_1 and σ_2/σ_1 roughly constant in both cases.
- Strong constrains on shape — mid– and forward rapidities constrain one another

dN_{ch}/dη IN p-Pb — ZNA



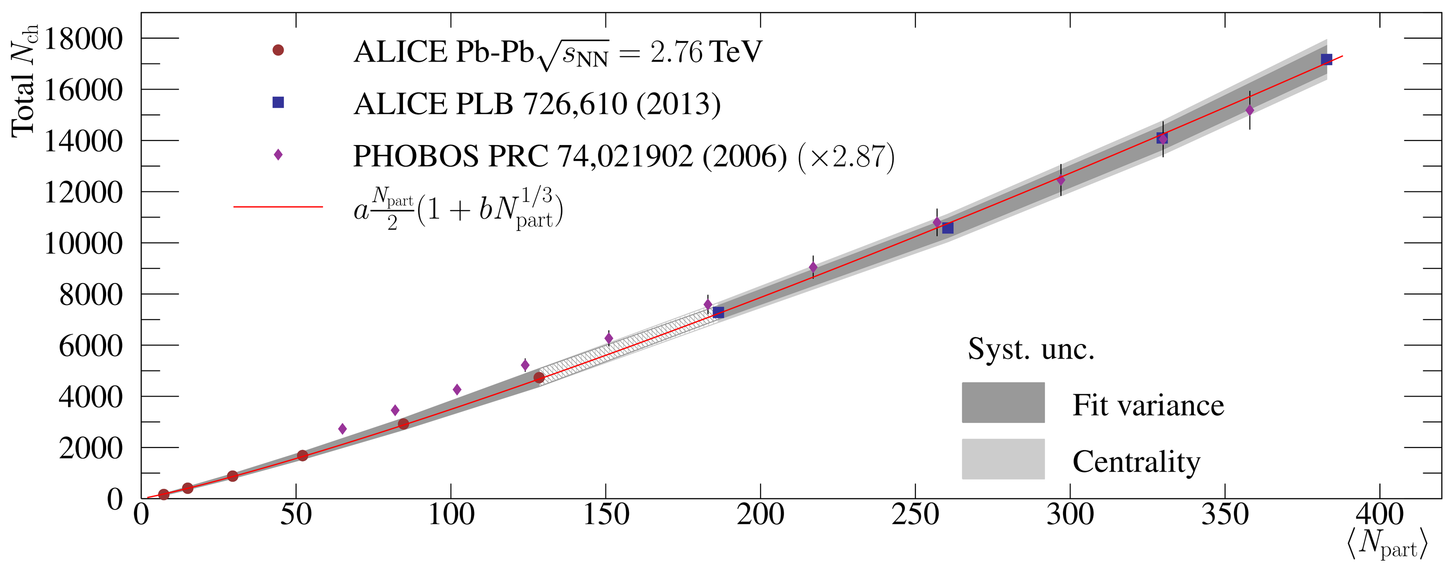
Combined charged–particle pseudorapidity density selecting on forward neutrons (ZNA)

dN_{ch}/dη IN p-Pb — V0A



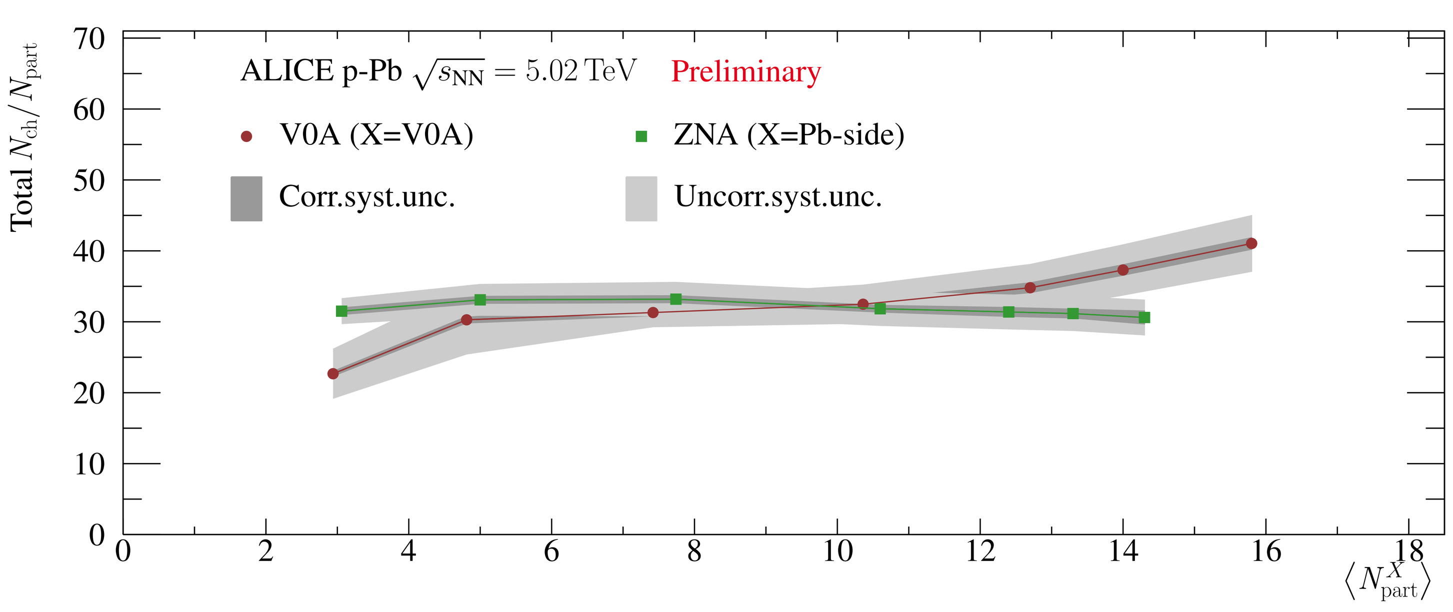
Combined charged–particle pseudorapidity density selecting on forward N_{ch} (V0A)

TOTAL N_{ch} IN Pb–Pb



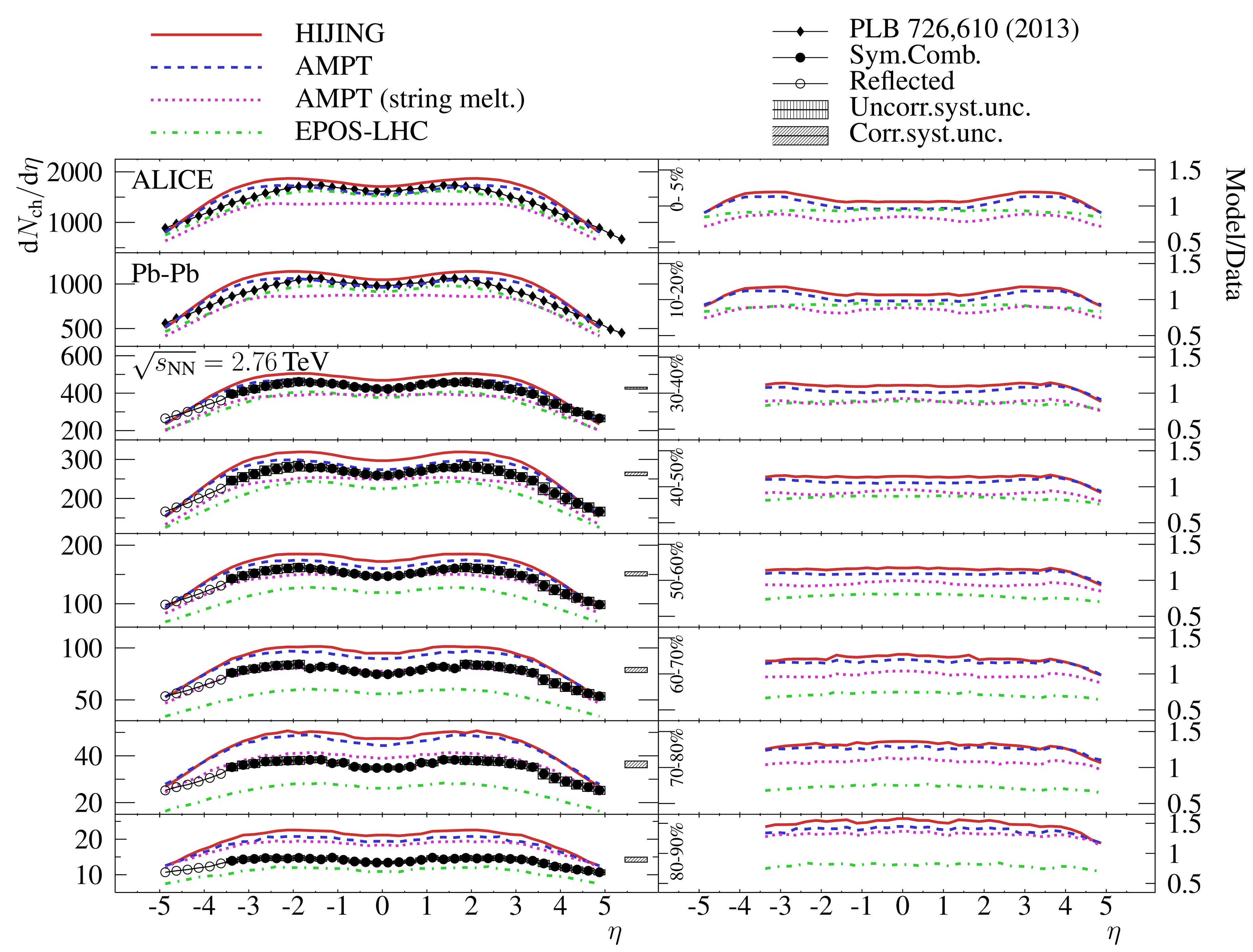
Total charged–particle production in Pb–Pb as a function of N_{part} [1]. Particle production is observed to scale near–linearly with N_{part}, similar to lower energy data [5].

TOTAL N_{ch} IN p-Pb SCALED BY $\langle N_{part}\rangle$



Total charged–particle production in p-Pb per participant. Particle production is observed to scale near–linearly with N_{part} when using the ZNA estimator.

MODEL COMPARISONS FOR Pb–Pb



HIJING [6], AMPT (with and without string melting) [7], & EPOS-LHC [8] compared to data [1]. HIJING generally overestimates the number of charged particles, while AMPT only come close in selected centrality classes. EPOS-LHC generally underestimates the number of charged particles produced, but captures the overall shape of the distributions.

REFERENCES

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CONCLUSIONS

- Similar characteristic shape in both systems
- $\langle N_{part}\rangle$ scaling in both systems
- Models do not get shape or level of Pb–Pb