(Multi-)strange particle production in jets and underlying events in pp collisions at $\sqrt{s}$ =13 TeV

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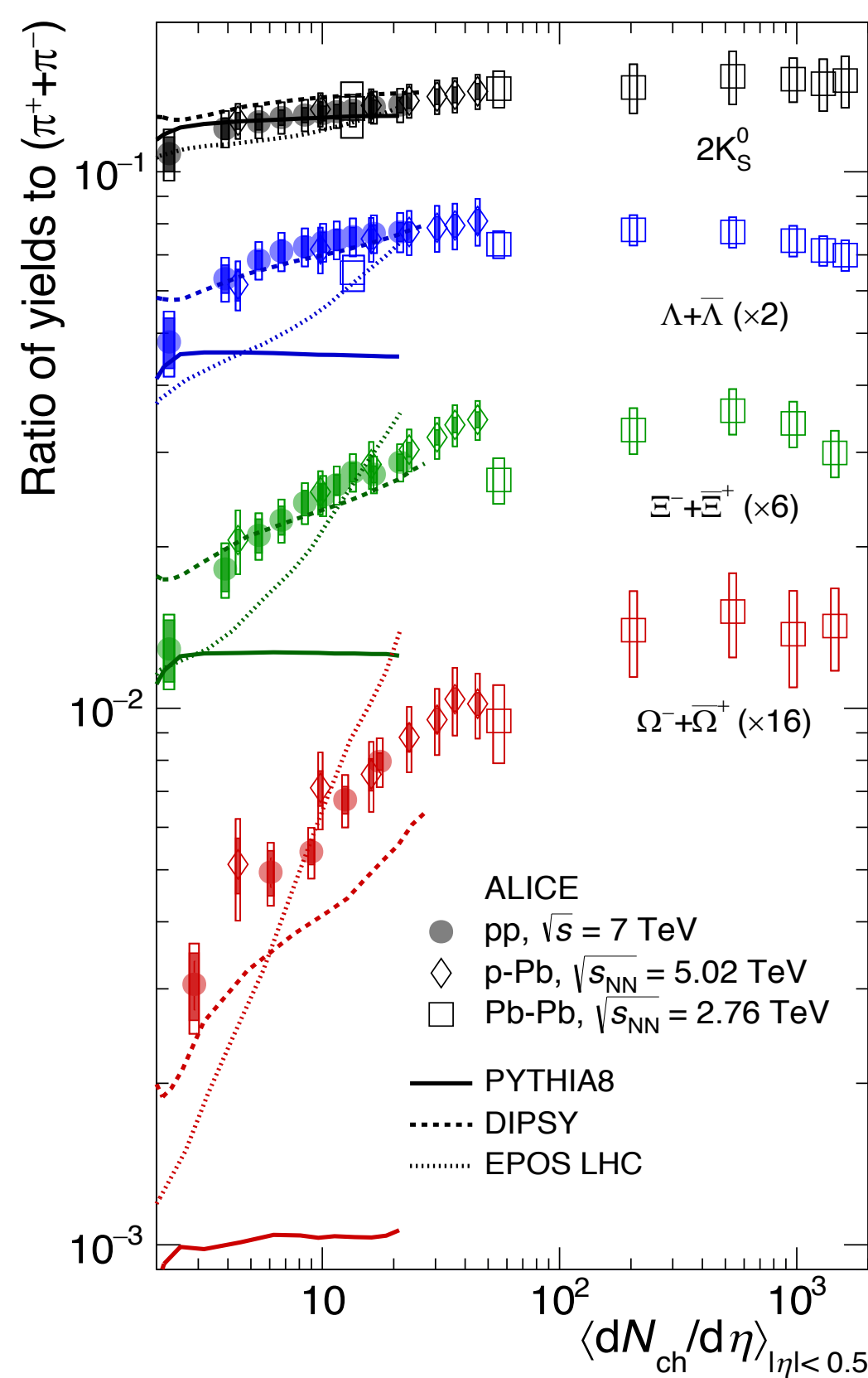Email: pengyao.cui@cern.ch

Motivation

- **Production of multi-strange particles increase with multiplicity[1]**

- **V^0s production in jets and UE has been measured in various collision systems[2]**
  - p-Pb at 5.02 TeV: To understand the origin of flow-like correlations at high multiplicity in small systems
  - pp at 7 TeV and Pb-Pb at 2.76 TeV: investigation of medium modified jet fragmentation (using V^0s as the probes) and potential medium-excitation
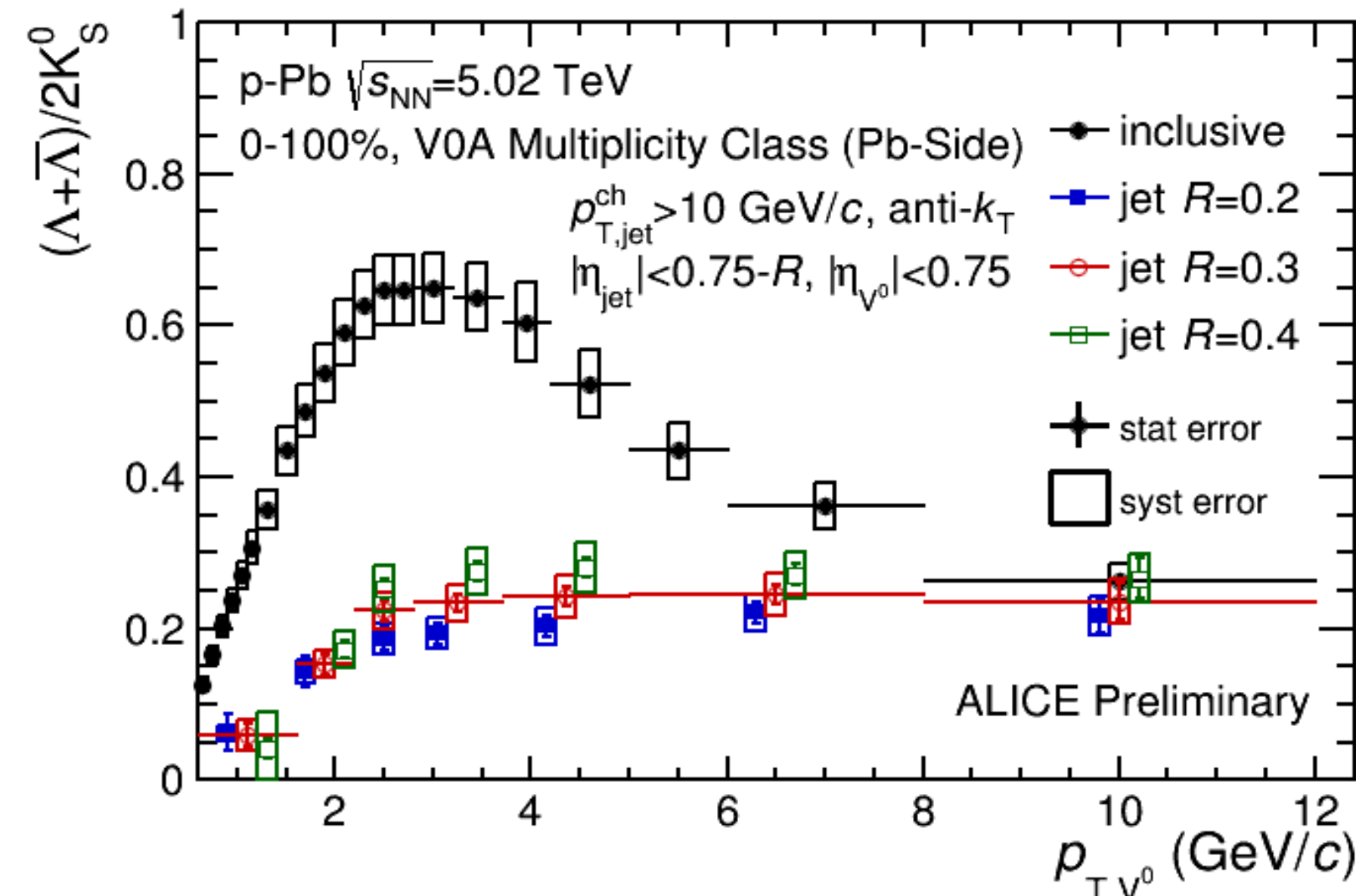

- **This analysis: V^0 and $\Xi^{\pm}$ production in pp at 13 TeV with ALICE LHC RUN-II data**
  - Improved precision as compared to 7 TeV result
  - Further constrain on particle production mechanism in jets and UE by extending the study to multi-strange particle sector
  - Constraint on feed-down estimation of $\Lambda(\overline{\Lambda})$ in jets
  - New insight to strange baryon and meson production and its interplay with the hardness of the event
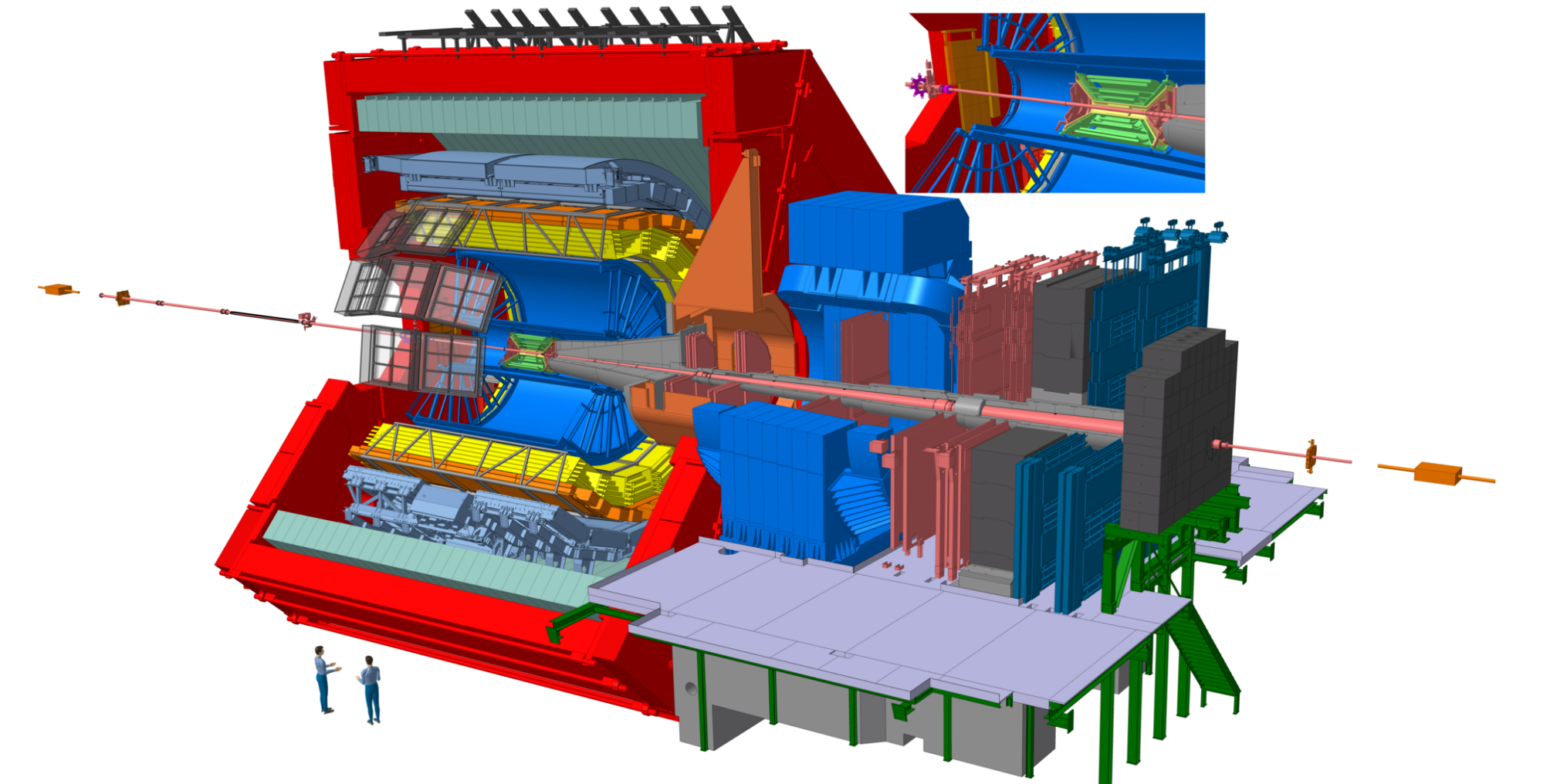
Analysis strategy

- Tag the hard scattering with charged particle jets[3]
  - $p_T^{jet} > 10$ GeV/c
  - Anti-k_T method and R = 0.4
- Reconstruct V^0s (Λ, $\overline{\Lambda}$ and K_S^0) and Ξ (Ξ^- and $\overline{\Xi}^+$) within the "jet region"
  - $R(V^0/\Xi, \text{jet}) < R_{match}$ ($R_{match} = 0.4$)
- Underlying Events estimator: reconstruct V^0s and Ξ within the UE region
  - PC : perpendicular cone
  - OC : $R(V^0/\Xi, \text{jet}) > R_{cut}$ ($R_{cut} = 0.6$)
  - NJ : events w/o jet in $p_T^{jet} < 5$ GeV/c
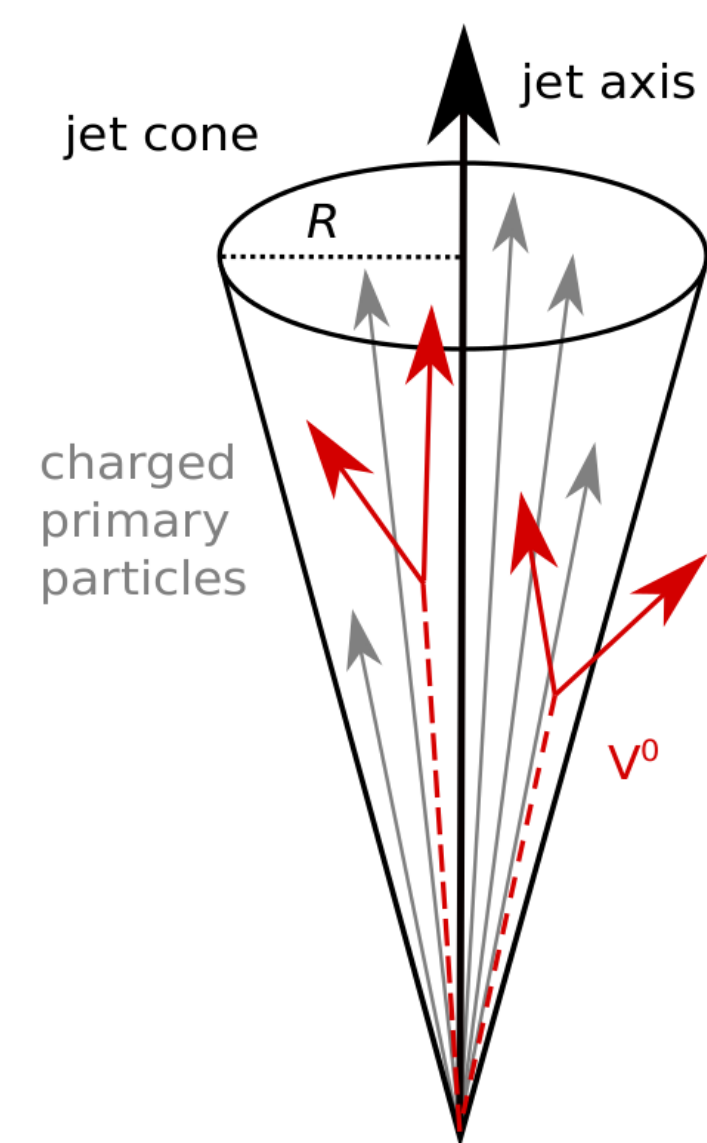
- Normalization

$$\frac{d\rho}{dp_T} = \frac{1}{N_{ev}} \times \frac{1}{<\text{Area}>} \times dN/dp_T$$
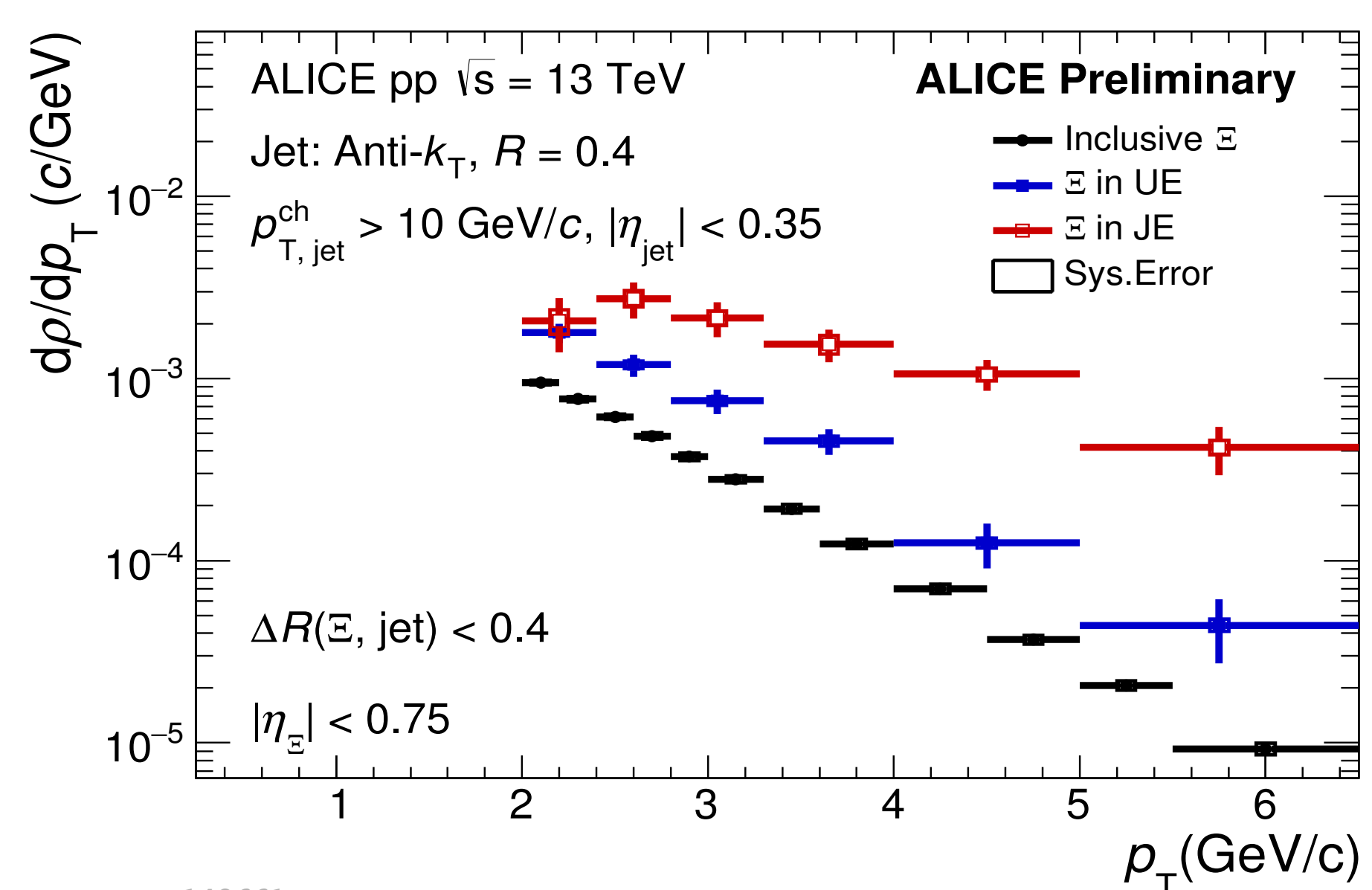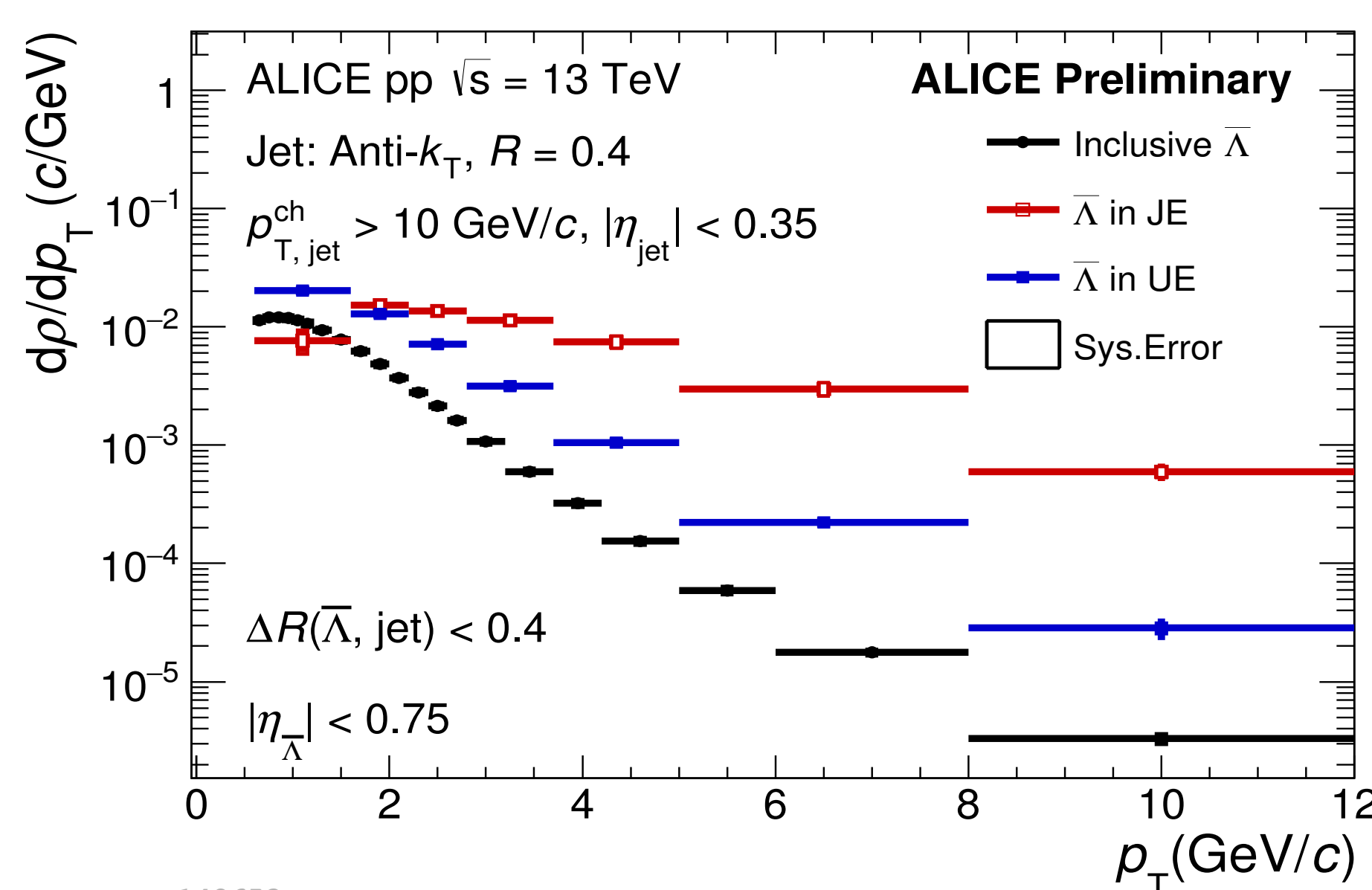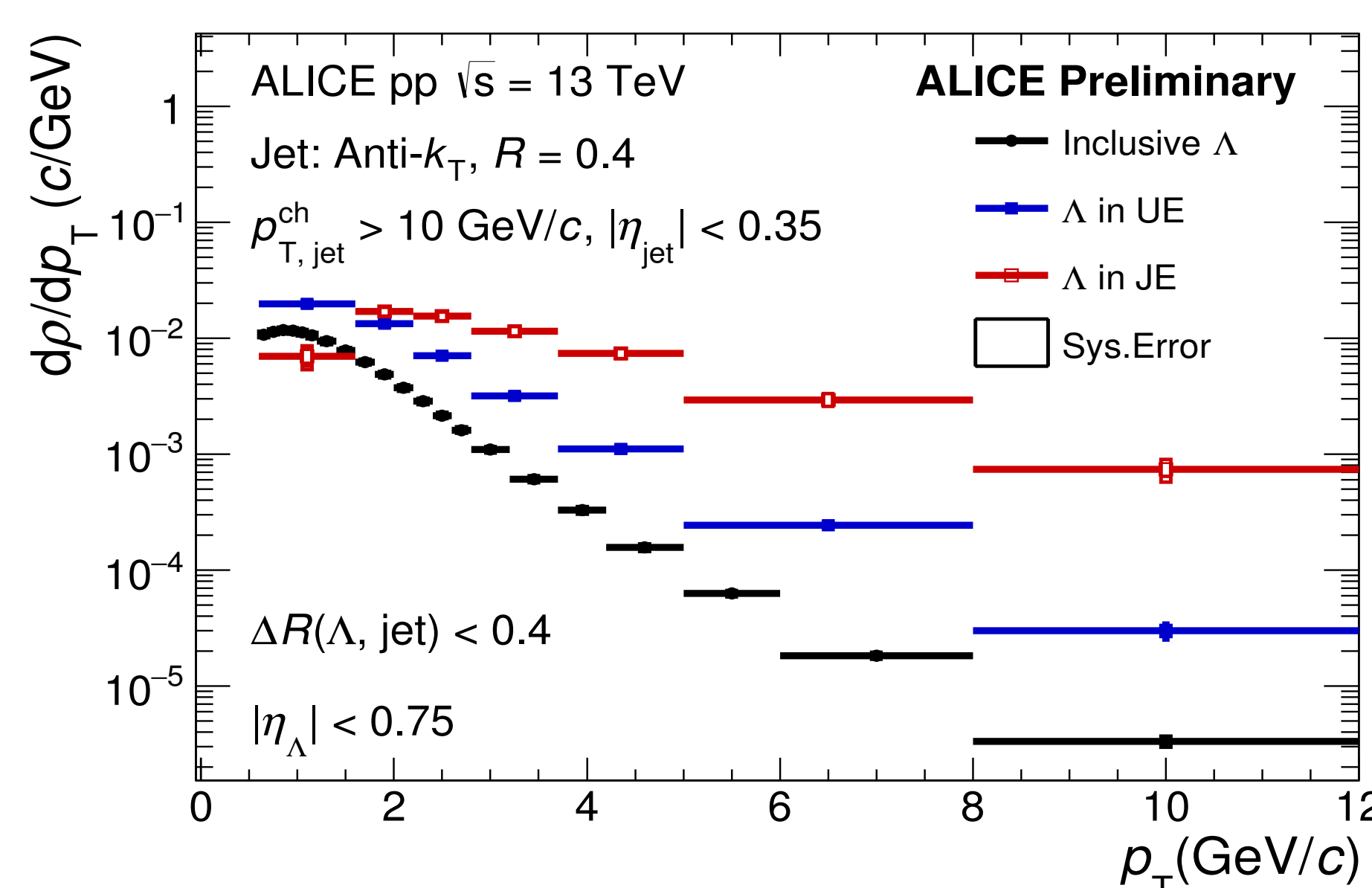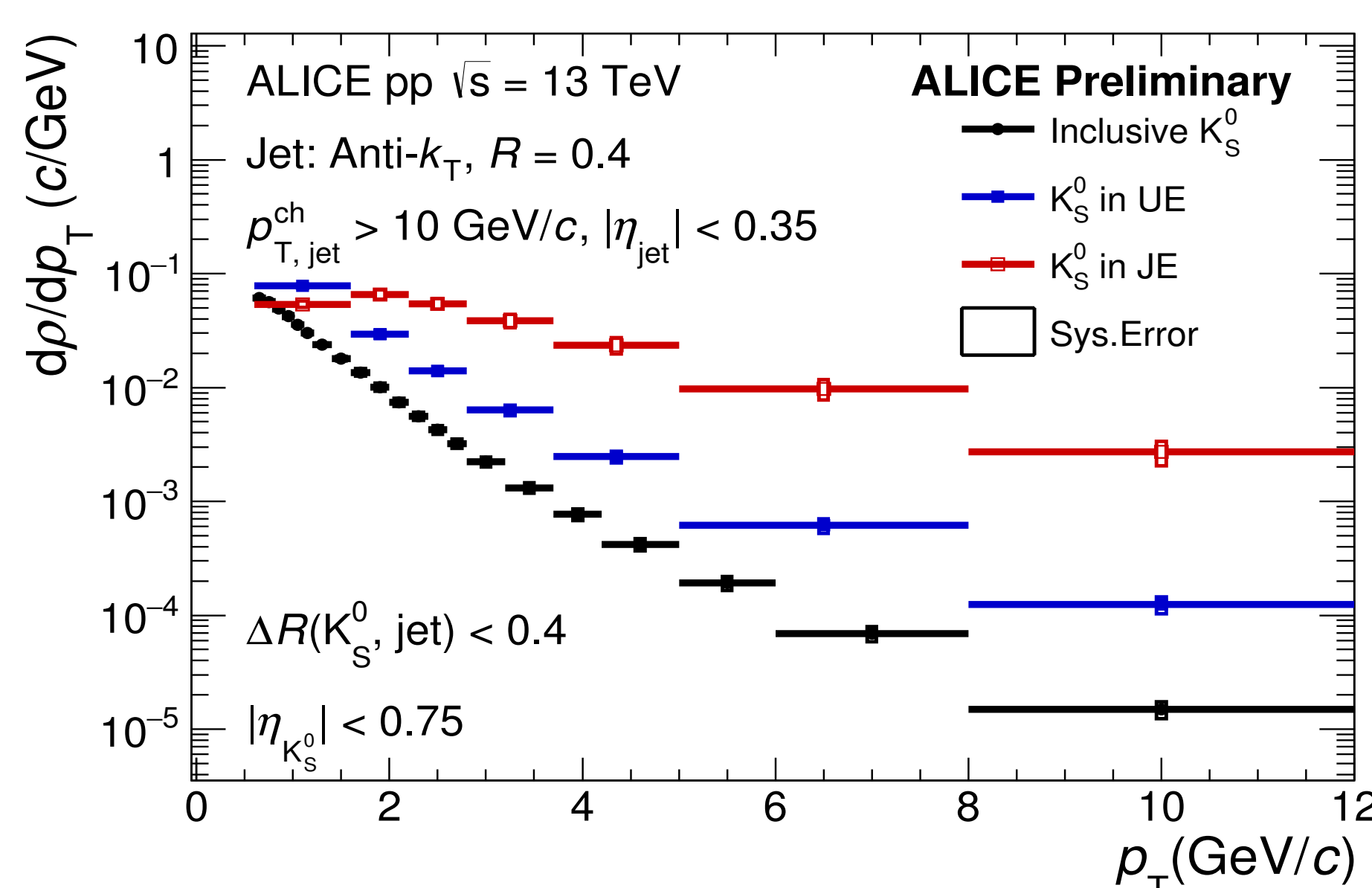
- Efficiency correction
- Feed-down correction (for $\Lambda(\overline{\Lambda})$)
  - Scaled MC according to the measured Ξ spectrum in jets in data

$$\Lambda_{JE}^{prim} = \Lambda_{JC-UE}^{corr} - \sum_j F_{ij} \int_{p_T(\text{bin})} \frac{dN}{dp_T}(\Xi) \left(F_{ij} = \frac{N_{gen}(\Lambda)_{\text{from}\ \Xi\ \text{bin}\ j}^{\text{in bin}\ i}}{N_{gen}(\Xi)_{\Xi\ \text{bin}\ j}} \right)$$
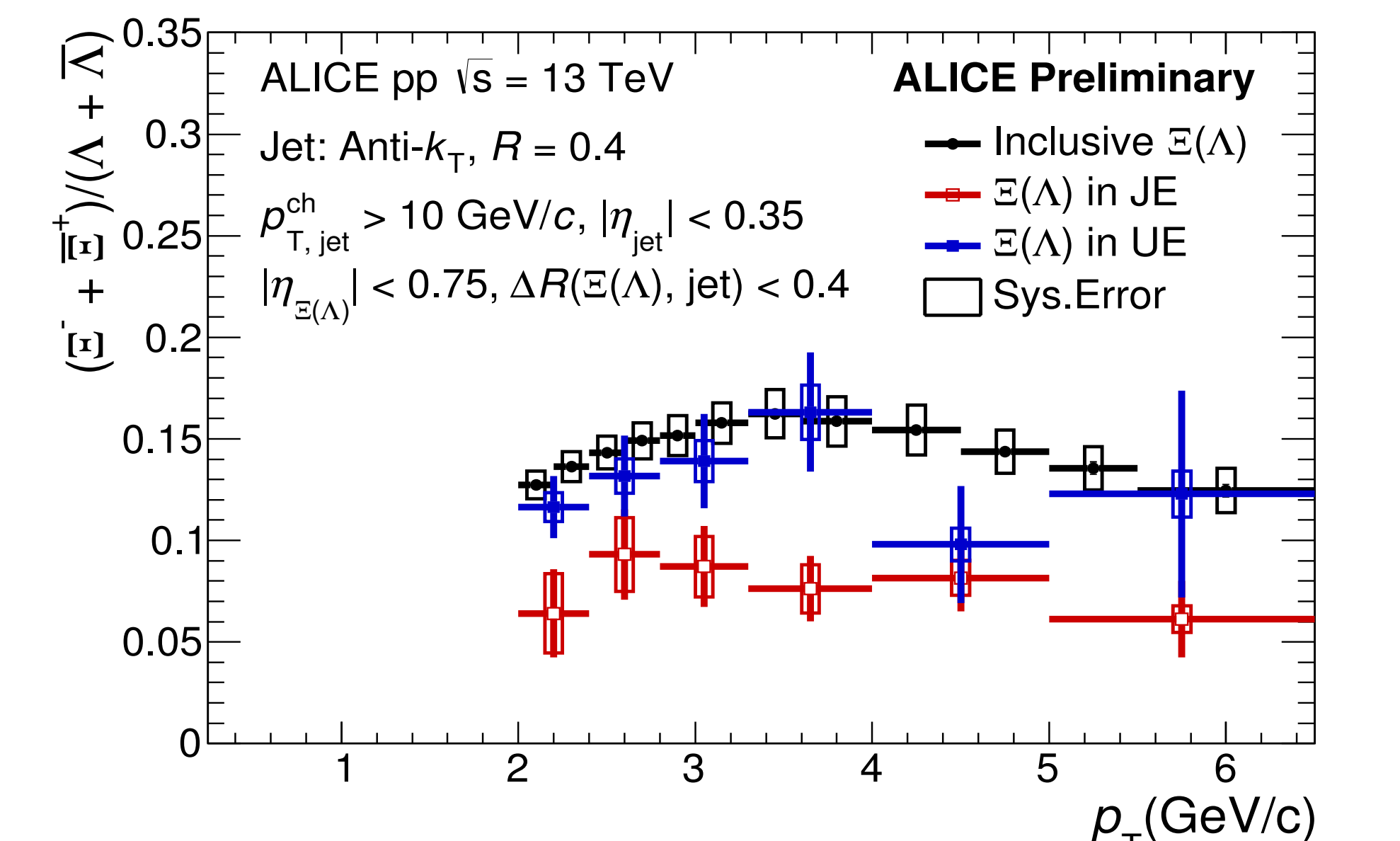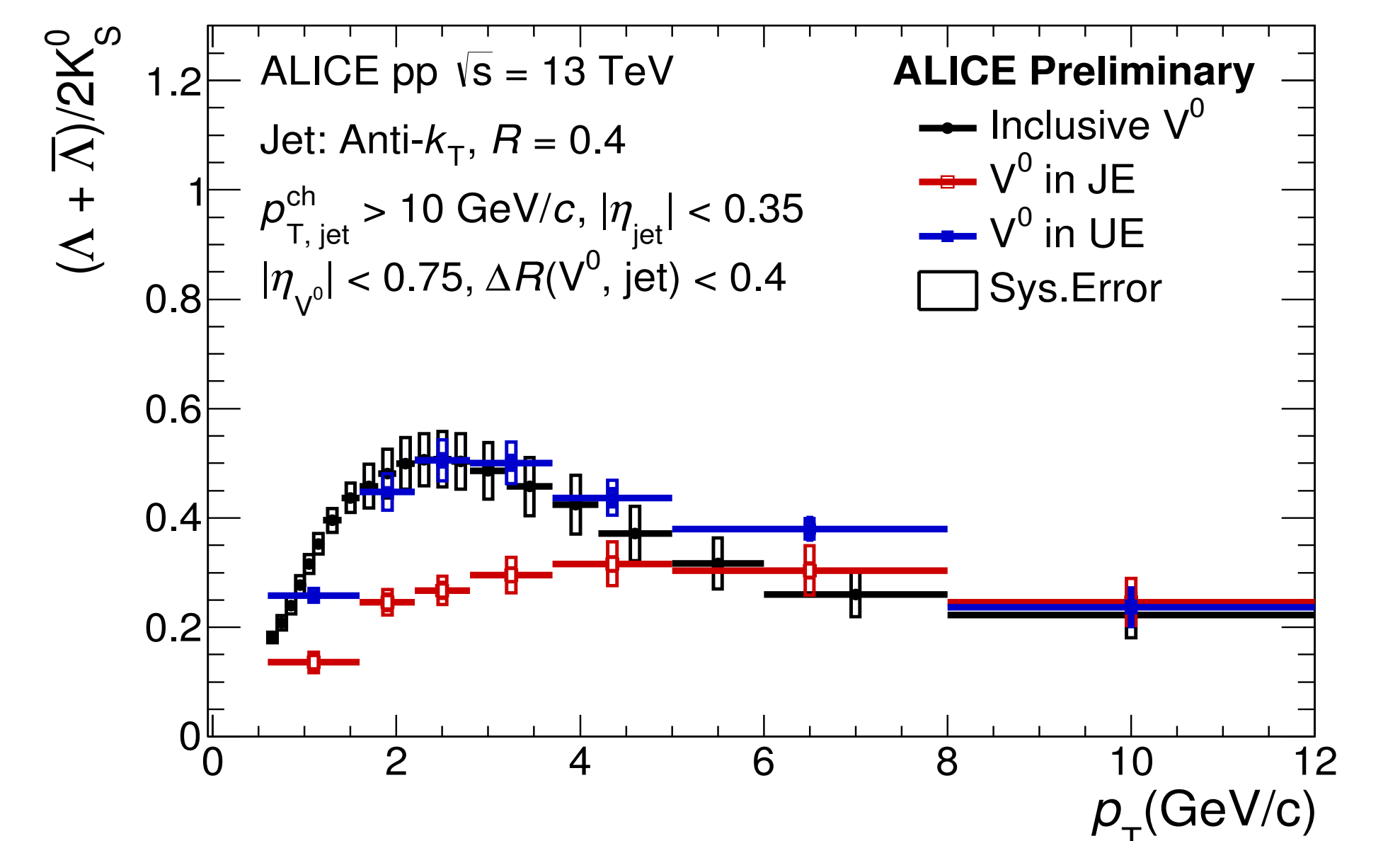
Results

Strangeness spectra in jets and the UE

- The production density of strangeness in jets is harder than that in underlying events
- The UE is harder than inclusive distribution - the presence of a jet biases UE

The ratios in jets and the UE

- The Λ/K_S^0 enhancement may be attributed to the soft component of the collision
- Inclusive and UE Ξ/Λ has an enhancement at intermediate p_T region
- Ξ/Λ is almost p_T independent in JE

Conclusion

- Production of V^0s (K_S^0 and Λ) and Ξ has been investigated in jets and the UE in pp collisions at 13 TeV
- The first look at Ξ^-($\overline{\Xi}^+$) production and the Ξ/Λ ratio in jet and the UE in pp collisions with ALICE
- Baryon to meson enhancement not present when the particles are in coincidence with a jet

Outlook

- Study (multi-)strange particle production in jets and UE in high multiplicity pp and p-Pb collisions

Reference

[1] Adam, Jaroslav et al. (ALICE Collaboration)
    Nature Phys. 13 (2017) 535-539.
[2] X. Zhang (ALICE Collaboration)
    Nucl. Phys. A931 (2014) 444-448.
[3] S. K. Prasad (ALICE Collaboration)
    J. Phys. Conf. Ser. 389 (2012) 012005.

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