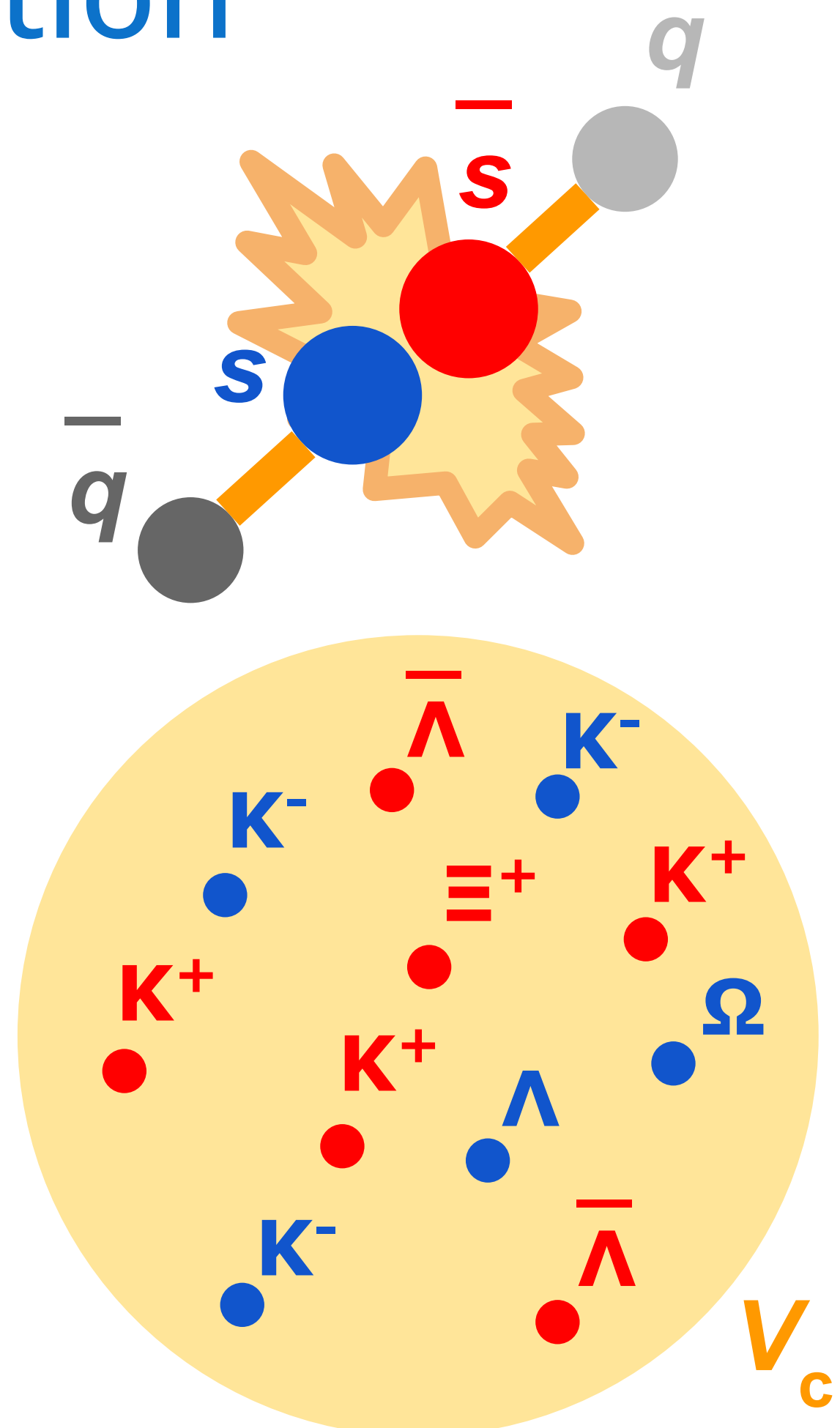


Hadronisation and strangeness conservation

- String fragmentation [1]
 - Short-range rapidity correlations
 - Mostly correlation of unlike-sign charges
- Canonical statistical hadronisation (CSM) [2]
 - Thermalised hadronic system with long-range rapidity correlations
 - Symmetry of like- and unlike-sign correlations



Event-by-event observables

- Cumulants κ_1 , κ_2 , and κ_{11}

$$\kappa_1 = \langle n \rangle \rightarrow \text{average}$$

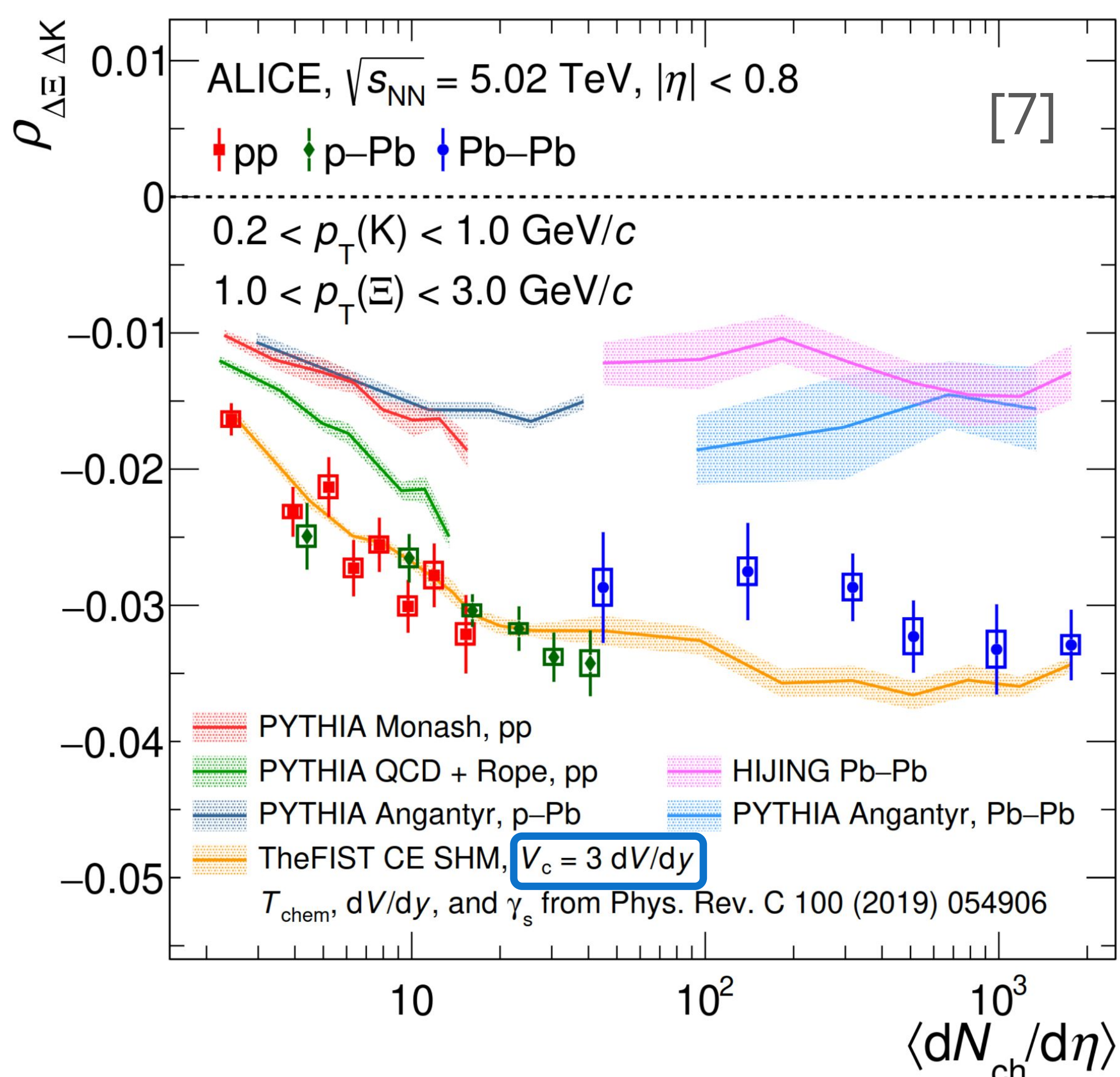
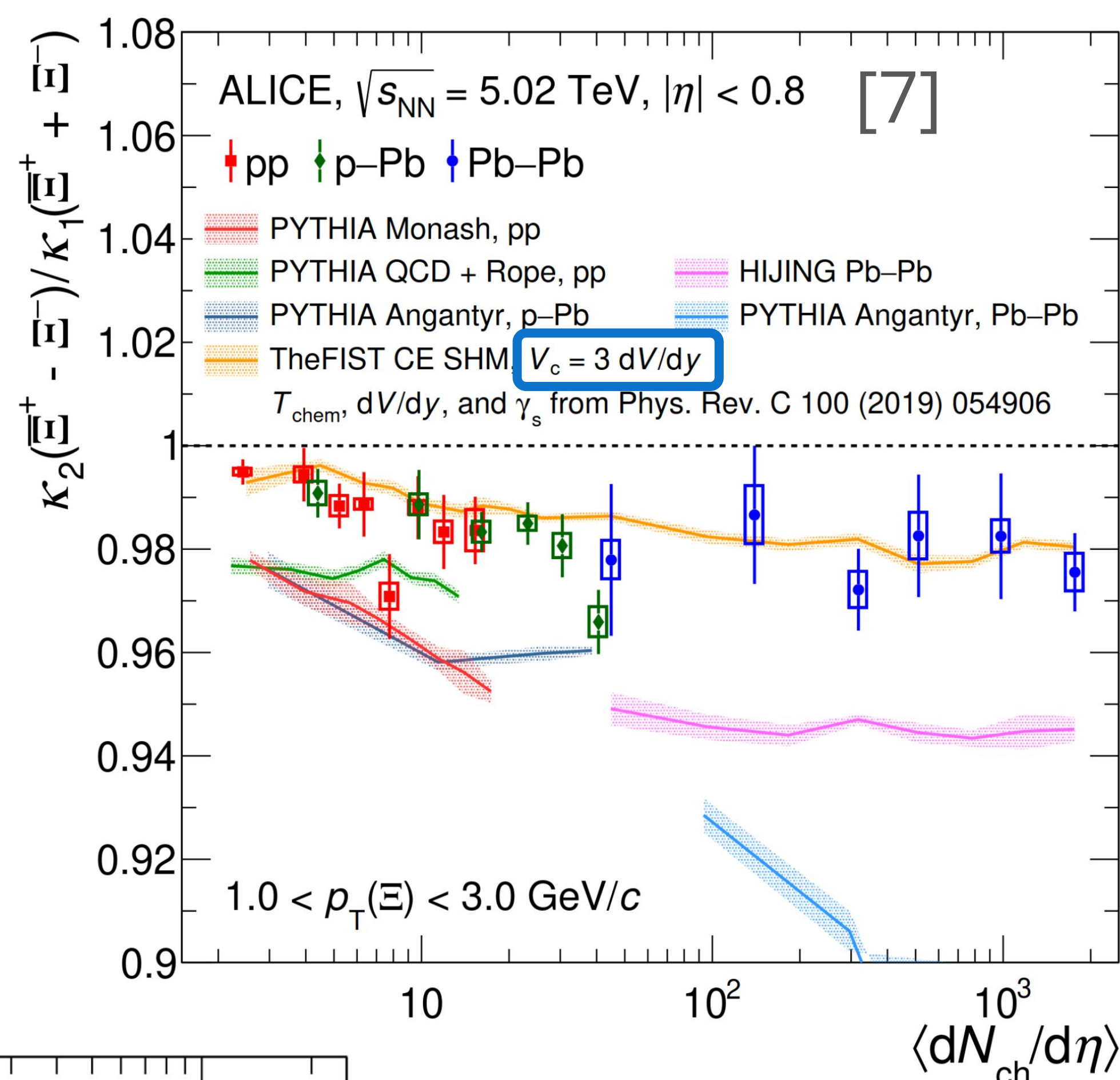
$$\kappa_{11}(m, n) = \langle (m - \langle m \rangle)(n - \langle n \rangle) \rangle$$

$$\kappa_2 = \langle (n - \langle n \rangle)^2 \rangle \rightarrow \text{(co)variance}$$
- Correlation ρ

$$\rho(m, n) = \frac{\kappa_{11}(m, n)}{\sqrt{\kappa_2(m)\kappa_2(n)}}$$
- Net-particle number Δn
 - At the LHC, $\mu_B \sim 0$ [3] → matter balances antimatter → cancellation of the effect of volume fluctuations [4]

Results

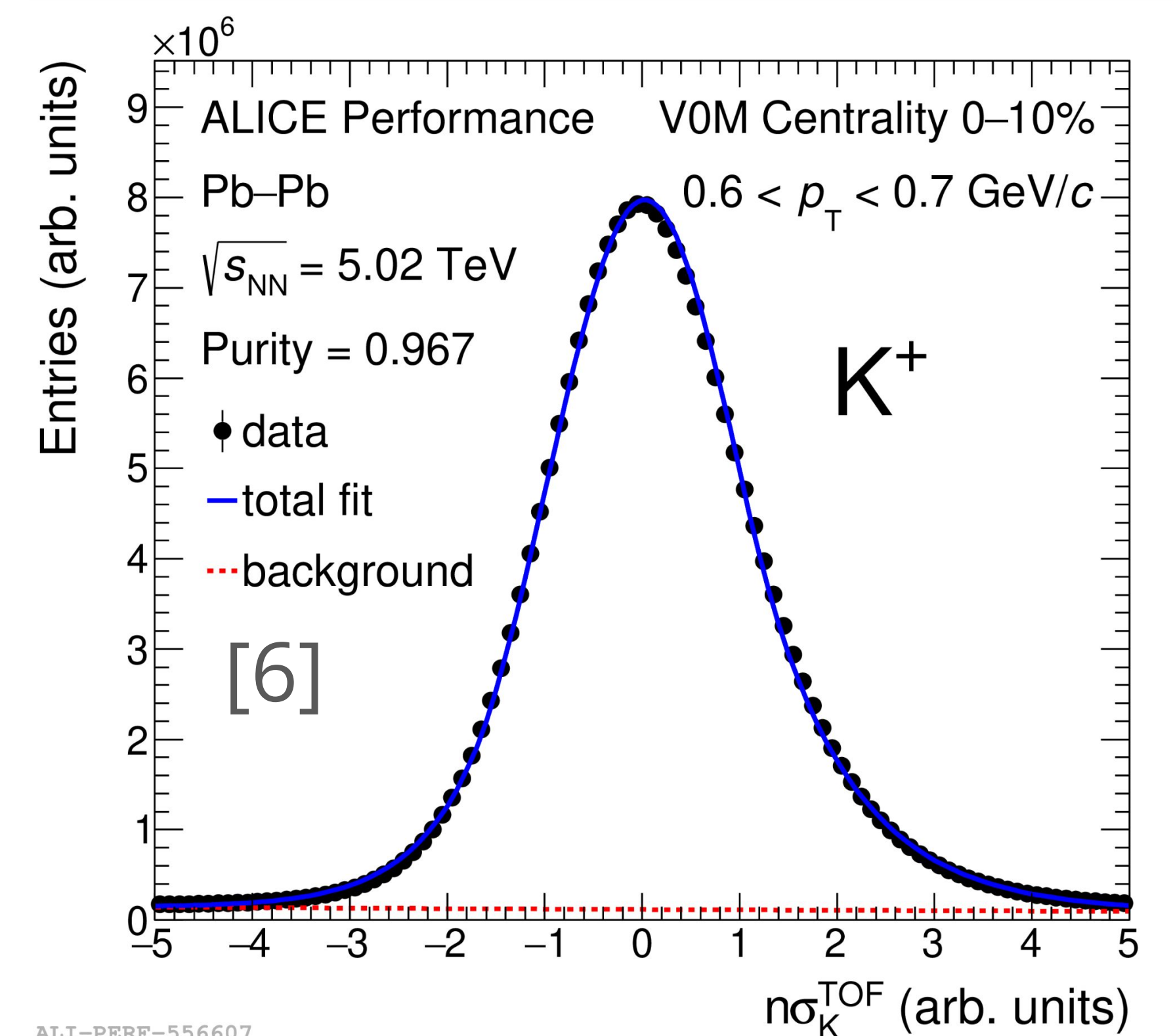
- Second-to-first order cumulant ratio of net- Ξ
 - Sensitive to unlike-sign strangeness correlation
 - Smooth evolution across multiplicity
 - Indication of longer-range rapidity correlations → ~3 units of rapidity compared to ~1 unit of rapidity for string fragmentation



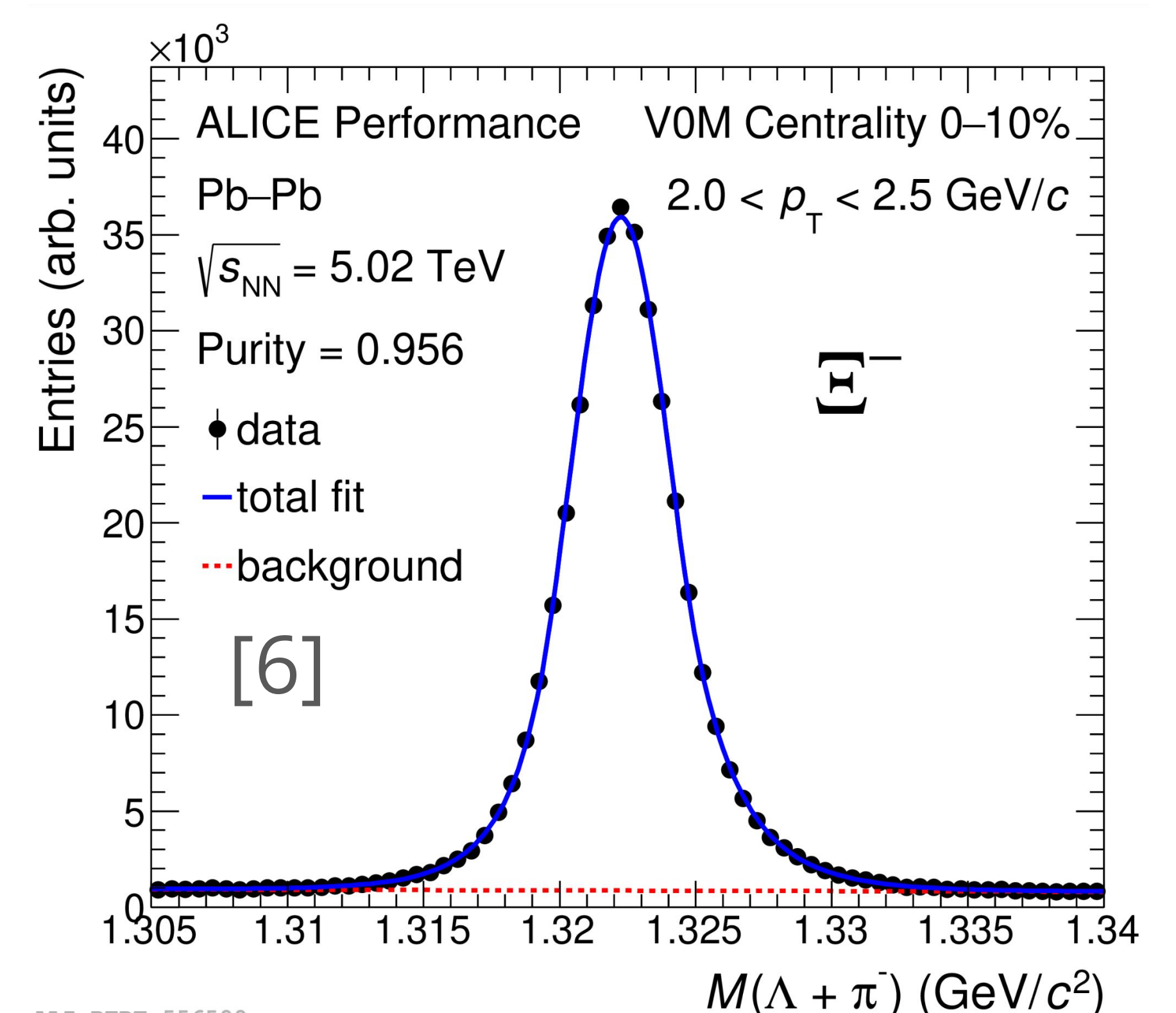
- Net- Ξ -net-kaon correlation
 - Sensitive to like- and unlike-sign correlations
 - Results are consistent with CSM, $V_c \sim 3$ dV/dy
 - Indication of a significant ss correlation
 - Pythia 8 + Rope hadronisation reproduces yields but fails to describe fluctuations

Candidate selection

- Charged kaons
 - dE/dx with Time Projection Chamber
 - Velocity with Time-of-Flight detector



- Charged Ξ baryons
 - Cascade decay $\Xi^- \rightarrow \Lambda (\rightarrow p + \pi^-) + \pi^- + cc$
 - Selection based on Boosted Decision Trees [5]



References

- [1] T. Sjostrand et al., arXiv:2203.11601 [hep-ph]
 [2] V.Vovchenko et al., Phys. Rev. C 100, 054906 (2019)
 [3] A. Rostamov et al., Nucl. Phys. A 960 (2017) 114-130
 [4] ALICE Collaboration, arXiv:2311.13332 [nucl-ex]
 [5] Chen et al., (2016) arXiv:1603.02754 [cs.LG]
 [6] ALICE Collaboration, ALICE-PUBLIC-2023-003 (2023)
 [7] ALICE Collaboration, arXiv:2405.19890 [nucl-ex]