Strangeness production in jets and underlying events in pp, p-Pb and Pb-Pb collisions with ALICE at LHC

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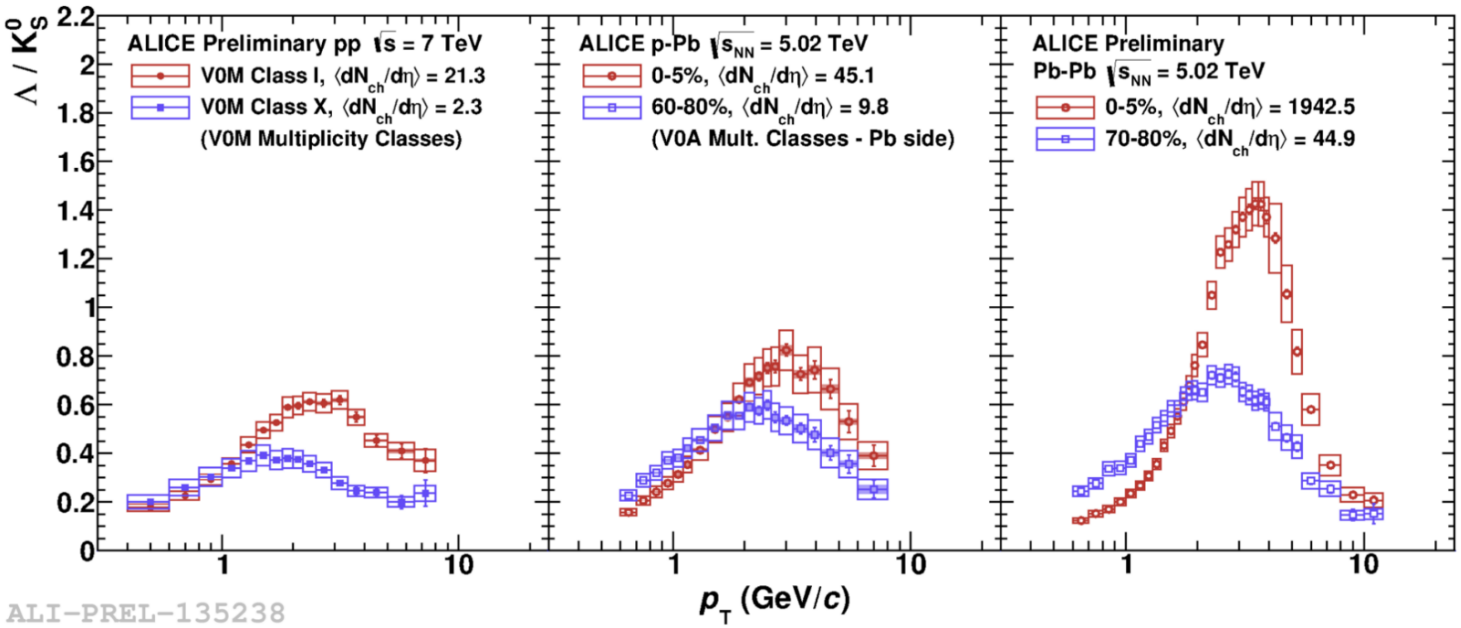
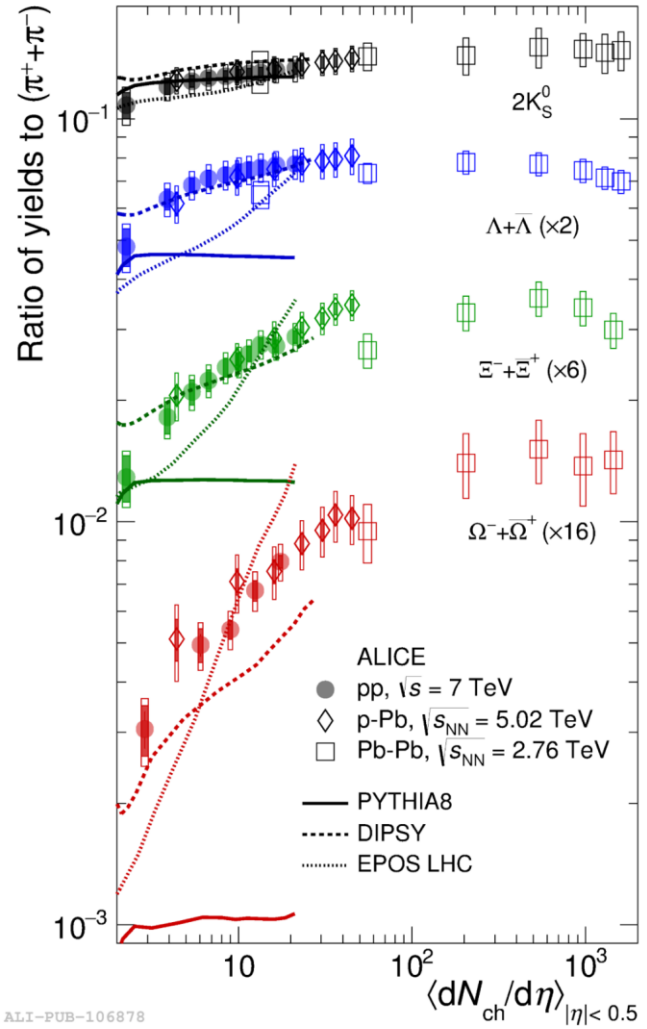
Motivation

- Enhancement of Λ/K^0_S ratio observed at intermediate p_T at high multiplicity in pp, p-Pb and Pb-Pb collisions w. r. t that at low multiplicity
- Production of multi-strange particles increases with multiplicity
  - Similar behavior among different systems





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  - Provide reference for p-Pb and Pb-Pb systems
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  - A new insight into understanding the origin of flow-like behavior observed at high multiplicity in small systems
- Pb-Pb
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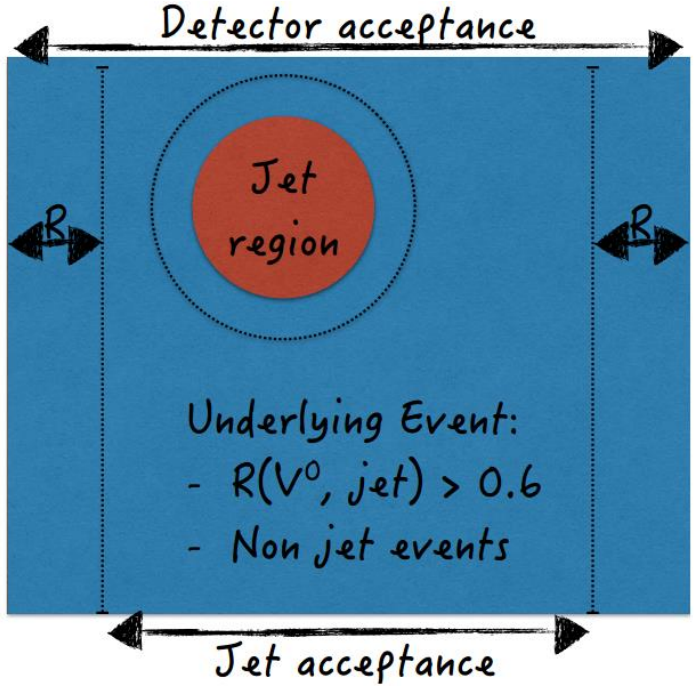
- Strange particle in Jet Cone (JC particles)
  - R(Str, jet) < 0.4



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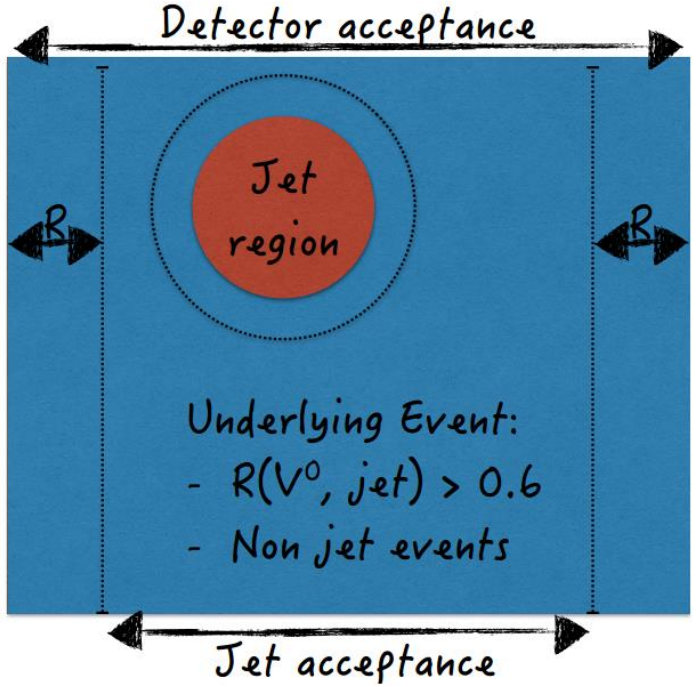
  - PC: strange particles in Perpendicular Cone w. r. t. jet axis
  - OC: strange particles Outside jet cone
  - NJ : strange particles in events without jet in $p_{\mathrm{T}} > 5$ GeV/c



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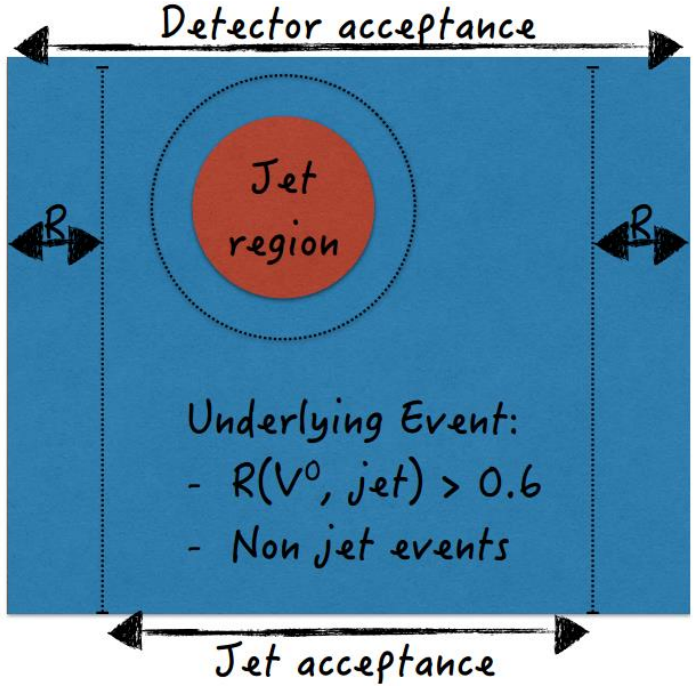
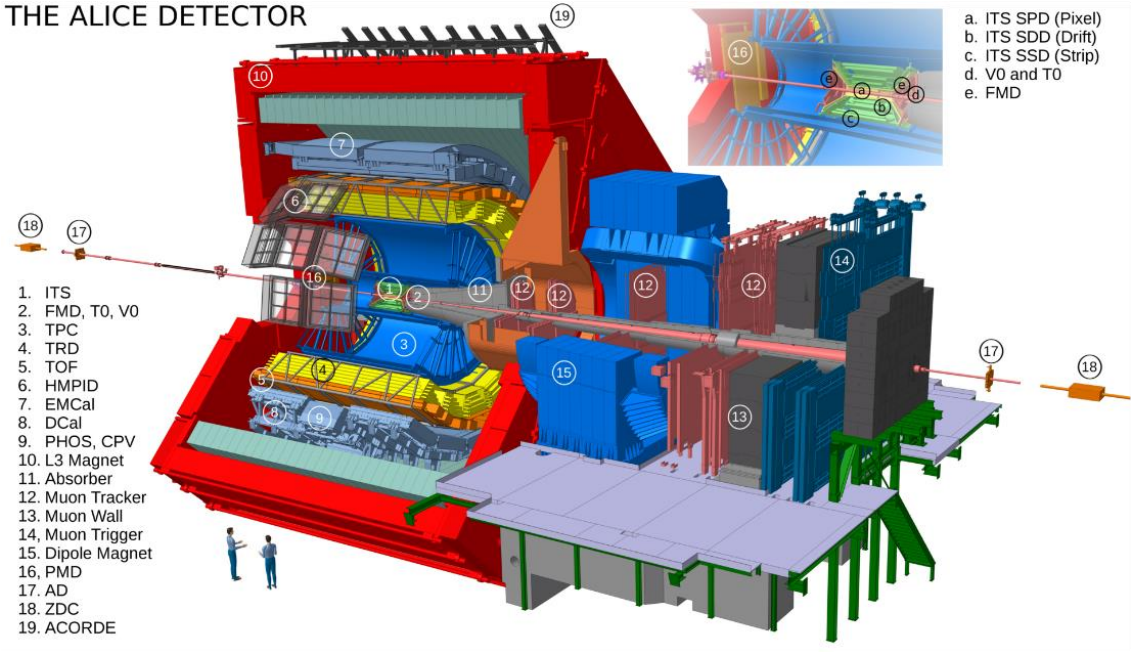


JE = JC - UE

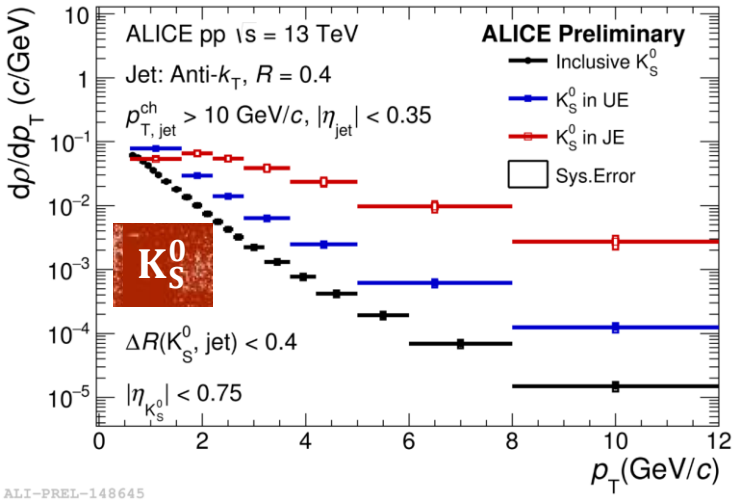
ALICE setup and data samples

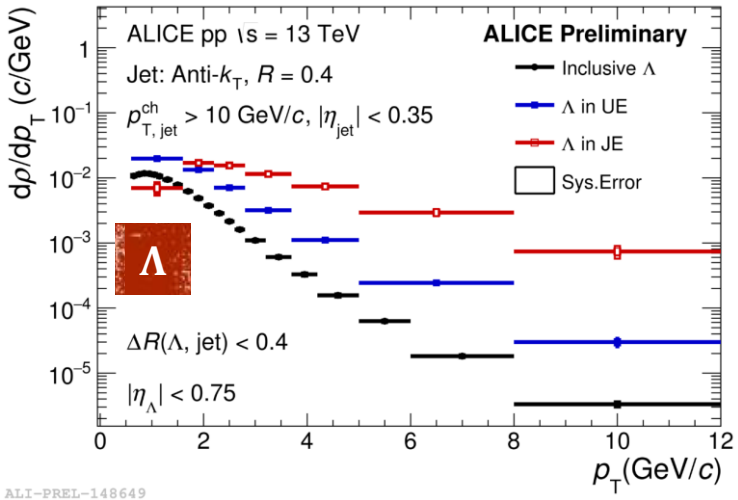


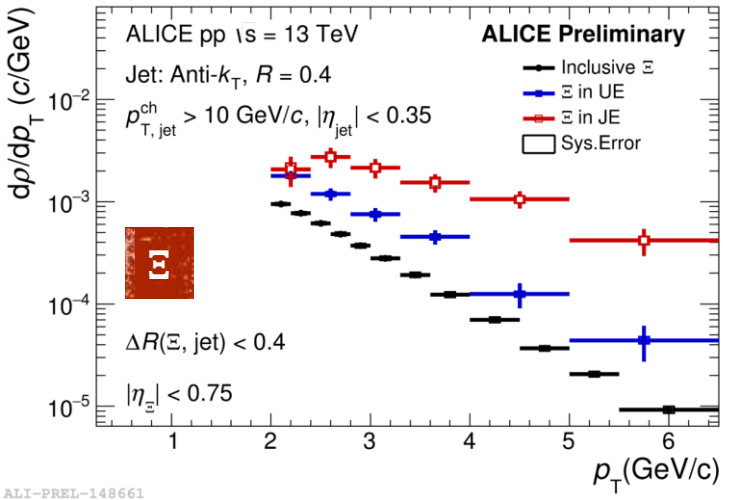
- Strangeness reconstruction
  - $K^0_S \rightarrow \pi^+ + \pi^-$ (BR 69.2%)
  - $\Lambda \rightarrow p + \pi^-$ (BR 63.9%)
  - $\Xi^- \rightarrow \Lambda + \pi^- \rightarrow p + \pi^- + \pi^-$ (BR 63.9%)
- Jet reconstruction
  - Charged track selection: $|\eta| < 0.9$, $p_T > 0.15$ GeV/c
  - Jet finder: anti-k_T, $R = 0.4$, $|\eta_{jet}| < 0.35$

- Data samples
  - pp collisions at $\sqrt{s}$ = 13 TeV
  - p-Pb collisions at $\sqrt{s_{NN}}$ = 5.02 TeV
  - Pb-Pb collisions at $\sqrt{s_{NN}}$ = 2.76 TeV
- TPC(Time Projection Chamber)
  - $|\eta|$<0.9
  - Charged particle tracking
  - Particle identification
- ITS(Inner Tracking System)
  - $|\eta|$<0.9
  - Vertex reconstruction
  - Event trigger
- V0A + V0C
  - 2.8 < η < 5.1 and -3.7 < η < -1.7
  - Event multiplicity class determination
  - Event trigger

Results of pp collisions







$$\frac{d\rho}{dp_{\mathrm{T}}} = \frac{1}{N_{ev}} \times \frac{1}{< \mathrm{Area} >} \times dN/dp_{\mathrm{T}}$$

- The production density of strange hadrons in jets (JE) is harder than in the underlying event (UE)
- UE distributions harder than inclusive --- bias in events with the presence of jets

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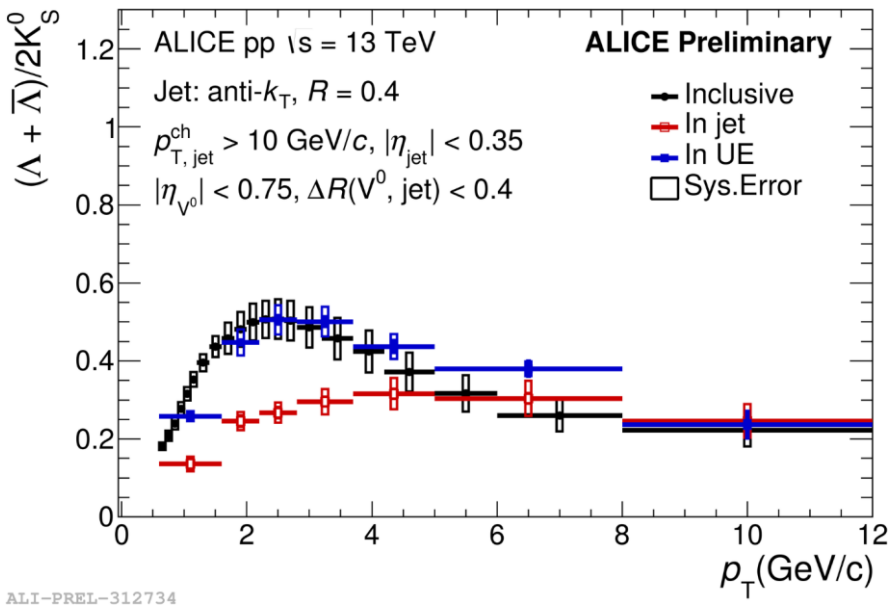

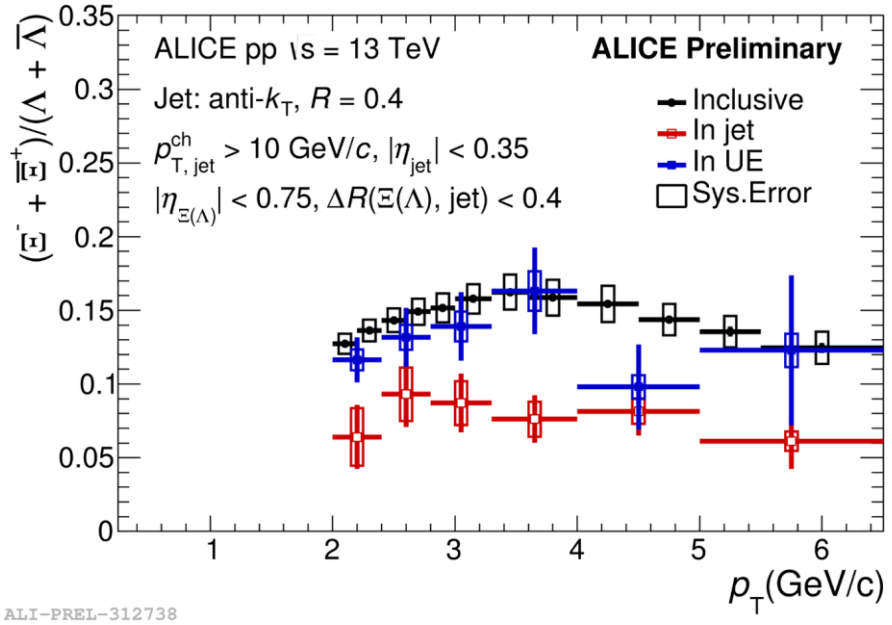

- The Λ/K^0_S ratio in UE is consistent with the inclusive one
- The ratio in jets is clearly different from the inclusive one at low and intermediate p_T
- Ξ/Λ --- further exploration of production mechanisms in jets and UE with multi-strange particles
- Ξ/Λ is almost p_T independent in JE

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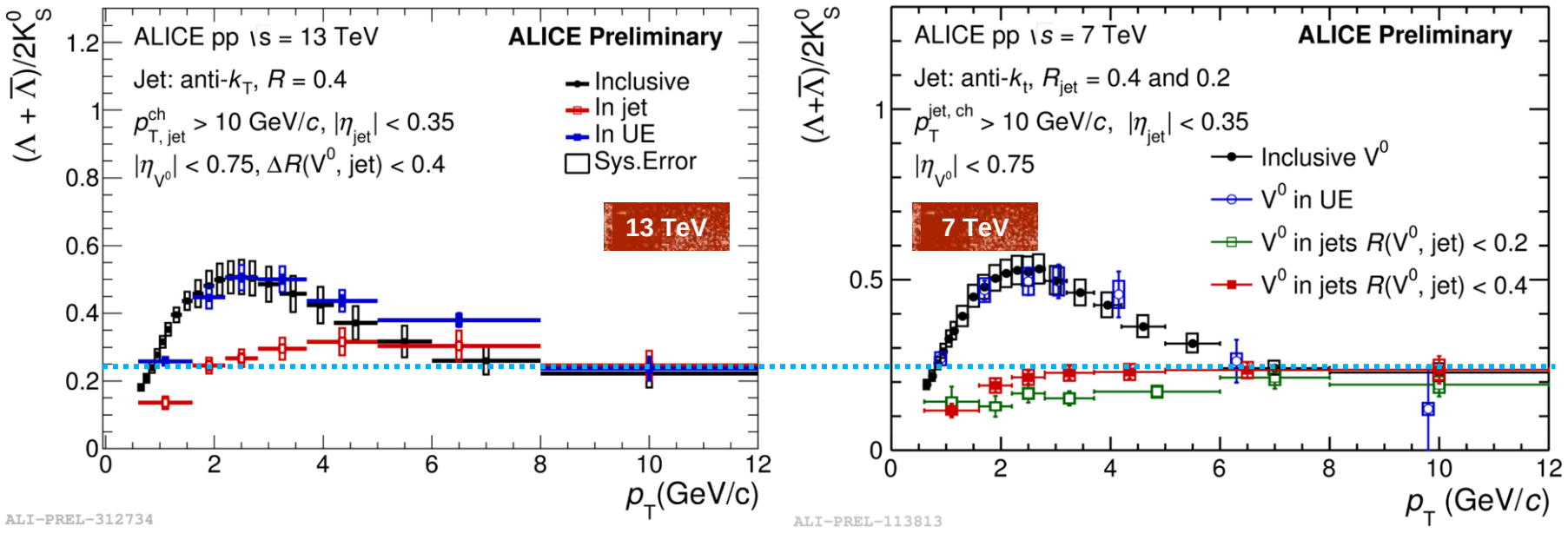

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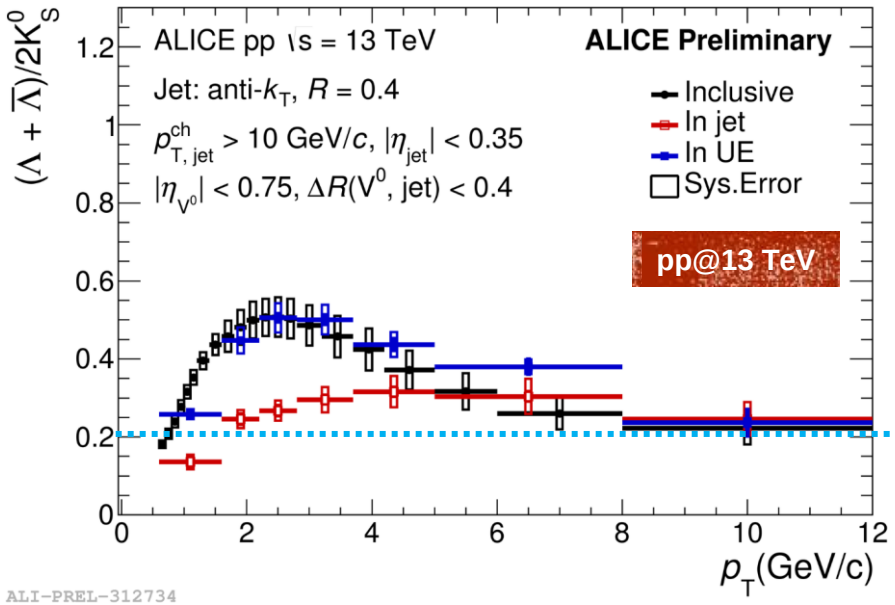
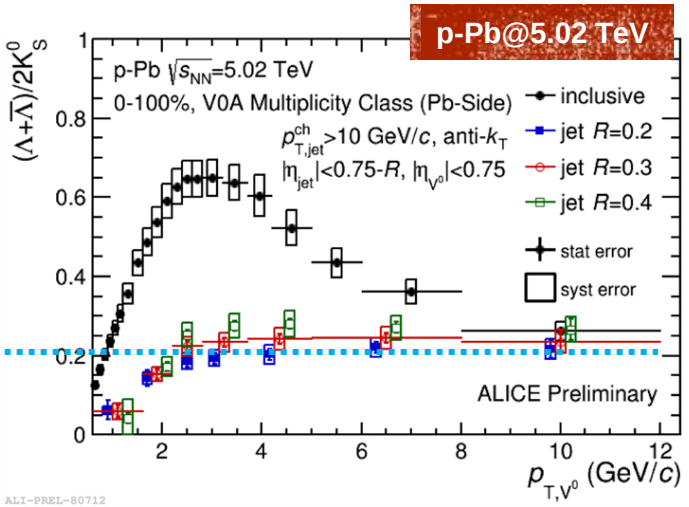
- Results at $\sqrt{s}$ = 7 TeV are consistent with that at $\sqrt{s}$ = 13 TeV within uncertainties
- Measurements at $\sqrt{s}$ = 7 TeV: a hint of R_{jet} (Str, jet) dependence
  - Caveat: the potential residual UE background effect (?)

Results of pp and p-Pb collisions





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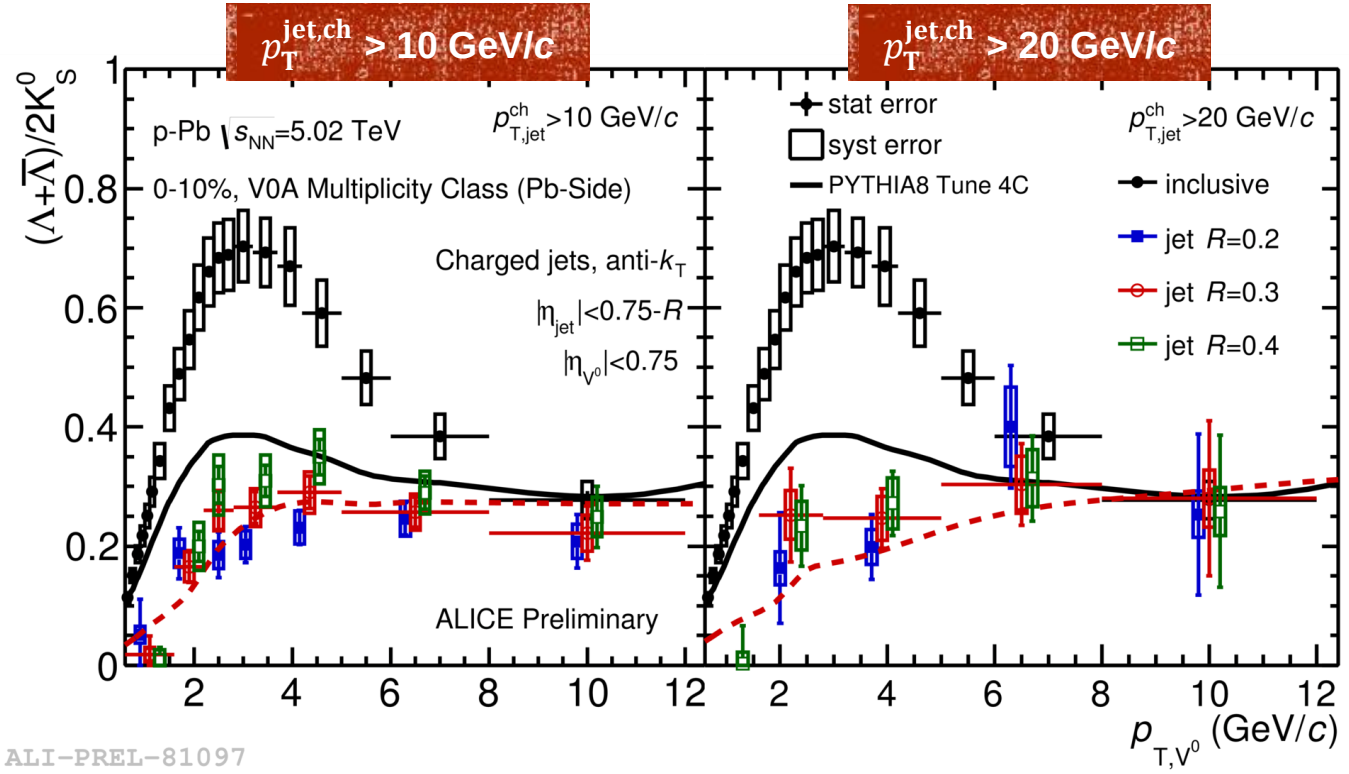
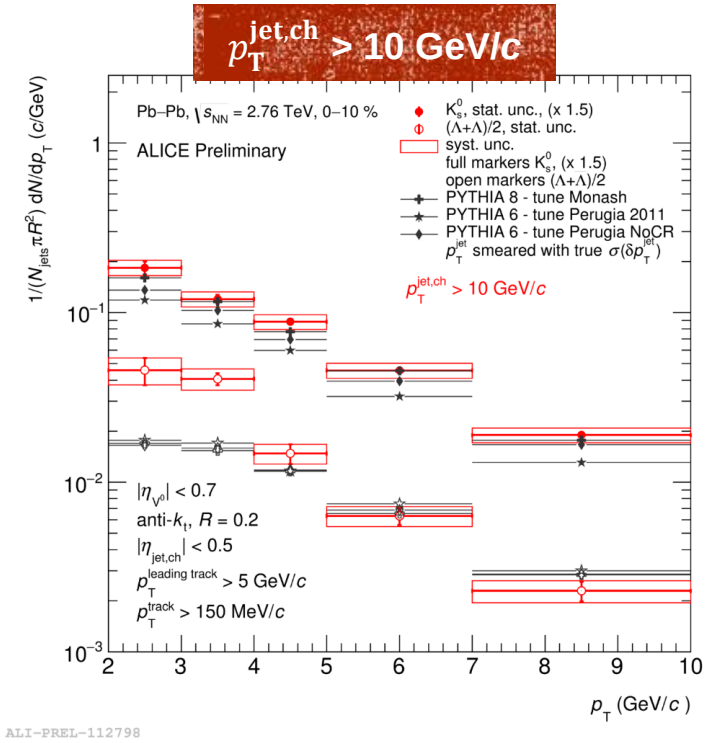
- Measurements at $\sqrt{s}$ = 7 TeV: a hint of R_{jet} (Str, jet) dependence
- The Λ/K^0_S in JE in pp consistent with p-Pb within uncertainties in R = 0.4

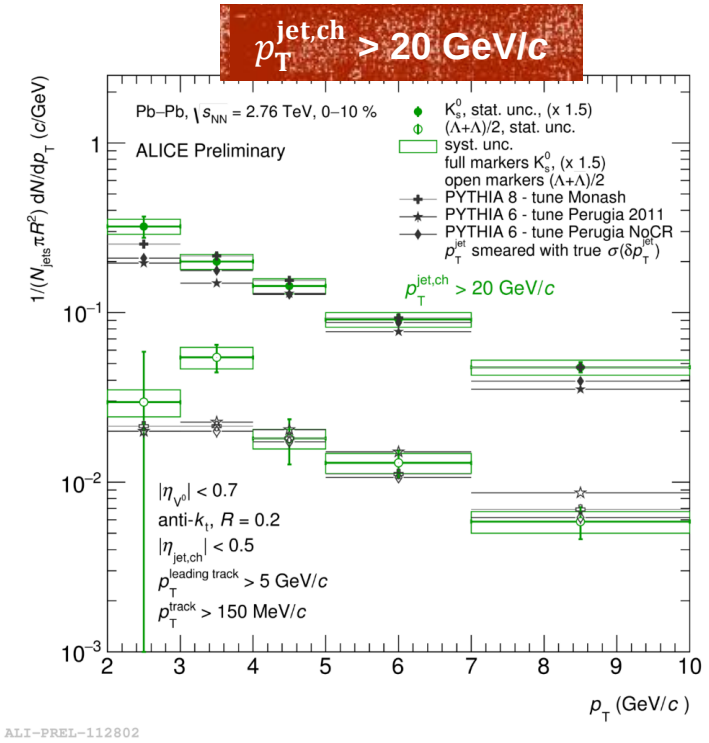
Result of p-Pb collisions

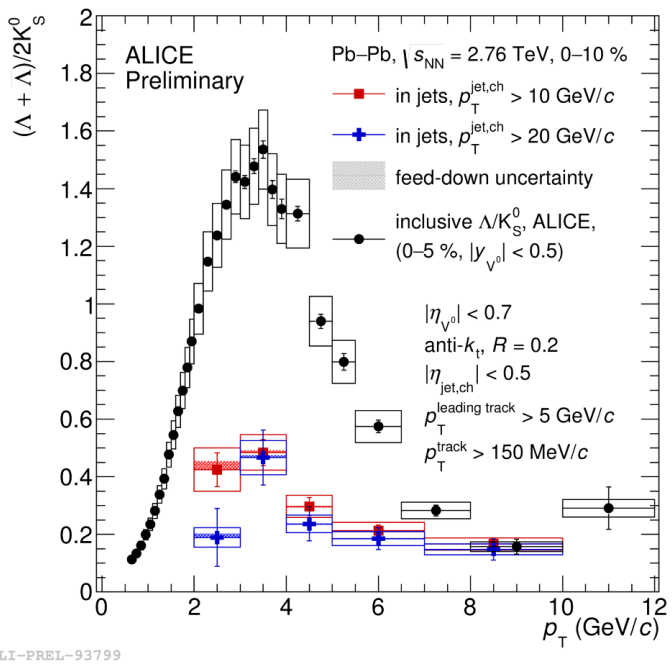


- The ratios depend only slightly on the jet resolution parameter R and do not vary with $p_T^{jet,ch}$
- The Λ/K_S^0 in JE are compatible with PYTHIA8 predictions in pp collisions

Result of Pb-Pb collisions







- The different behavior from PYTHIA is seen in both K^0_S and Λ at low p_T in Pb-Pb central
- The ratio in jets is far below the inclusive one in Pb–Pb collisions
- The ratio in jets is compatible within systematical and statistical errors to that in pp collisions

Summary

- Production of V^0s (K^0_S and Λ) and Ξ has been investigated in jets and the UE in pp collisions at $\sqrt{s}$ = 13 TeV
- The Ξ/Λ ratio has been investigated in jet and the UE in pp collisions with ALICE
- Λ/K^0_S ratio enhancement is not present when the particles are within an energetic jet in pp, p-Pb and Pb-Pb collision systems
- These measurements provide a new constrain on Ξ production mechanism

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Thanks for your attention !