Charm Baryon Production in ALICE Experiment at LHC

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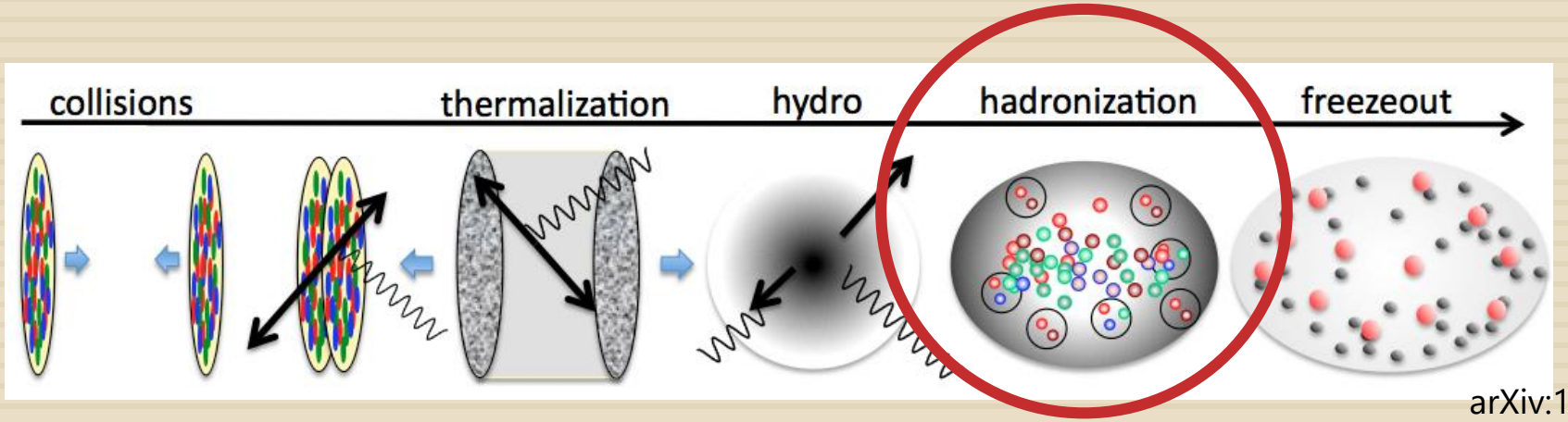
Physics motivation

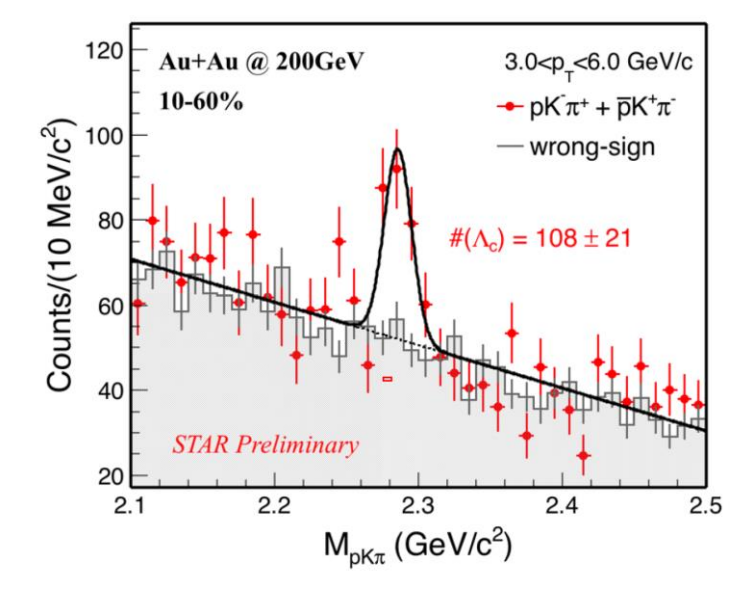
- Charm baryons
  - Baryons containing at least one charm quark, such as Λ_c^+ (cud), Ξ_c^0 (csd), Ξ_{cc}^{++}(ccu).
  - Most of the cross section measurements are still limited to mesons at LHC
  - Experimentally challenging: small signal-to-background ratio
- Understanding of the hadronization mechanism from QGP
  - Different from vacuum fragmentation?
  - Recombination with surrounding light quarks in QGP?



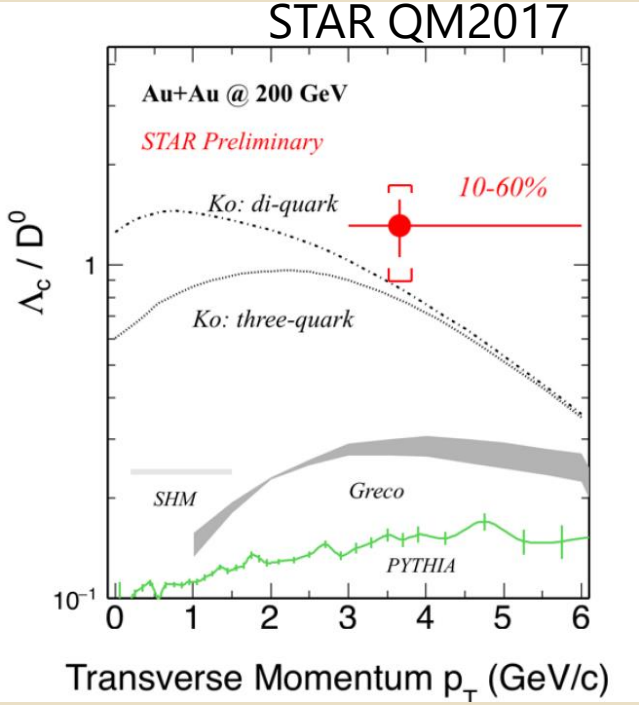
arXiv:1204.4795

Charm baryon in heavy ion collisions

STAR QM2017



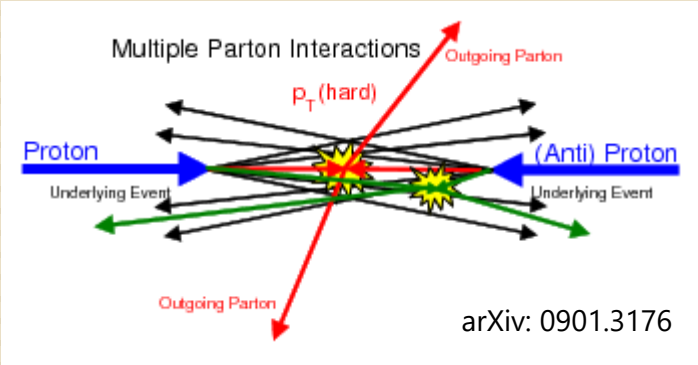
STAR QM2017

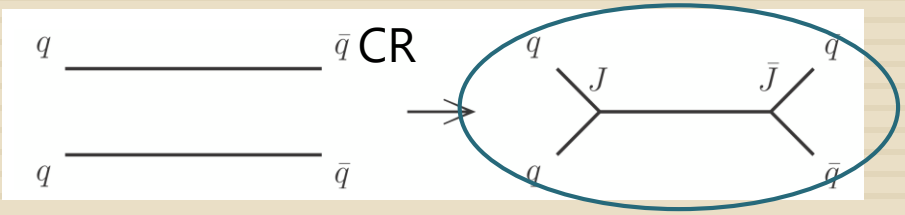


- STAR collaboration reported the first measurement of Λ_c in heavy ion collisions at Quark Matter 2017 (held in Chicago)
  - Significant enhancement w.r.t. PYTHIA is observed
- Measurements in pp and p-Pb collisions offer a crucial reference for the measurements in heavy ion collisions

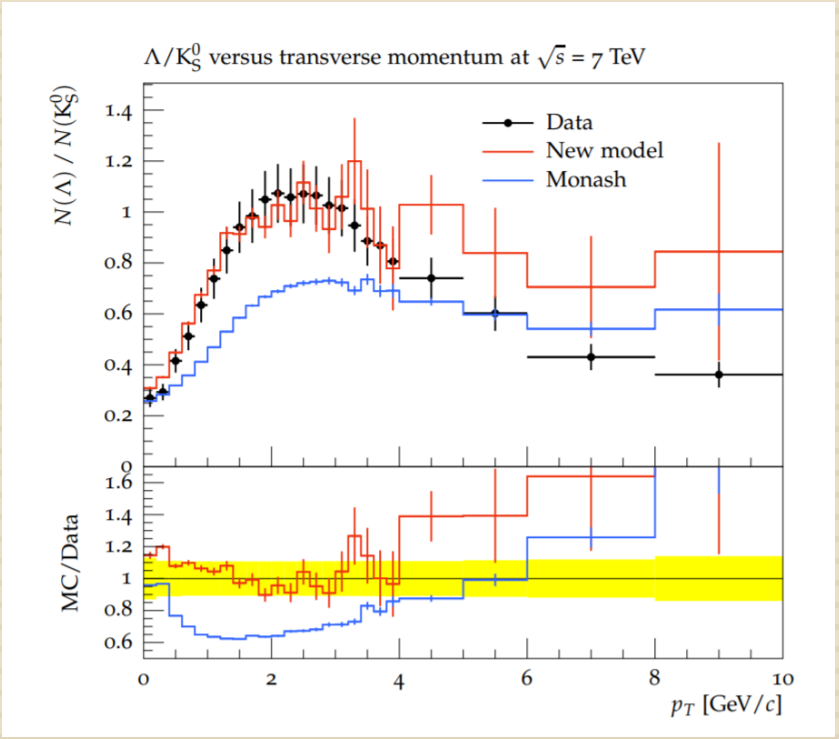
pp and p-Pb collisions

- Fragmentation in to charm baryons are well studied in e^+e^- collisions
- Do we expect the fragmentation to be the same in ee and pp/p-Pb collisions?
  - Multiple parton interaction (MPI) and color reconnection (CR) could increase the baryon-to-meson ratio
- pPb collisions are further affected by cold nuclear matter effect or small "QGP" effects



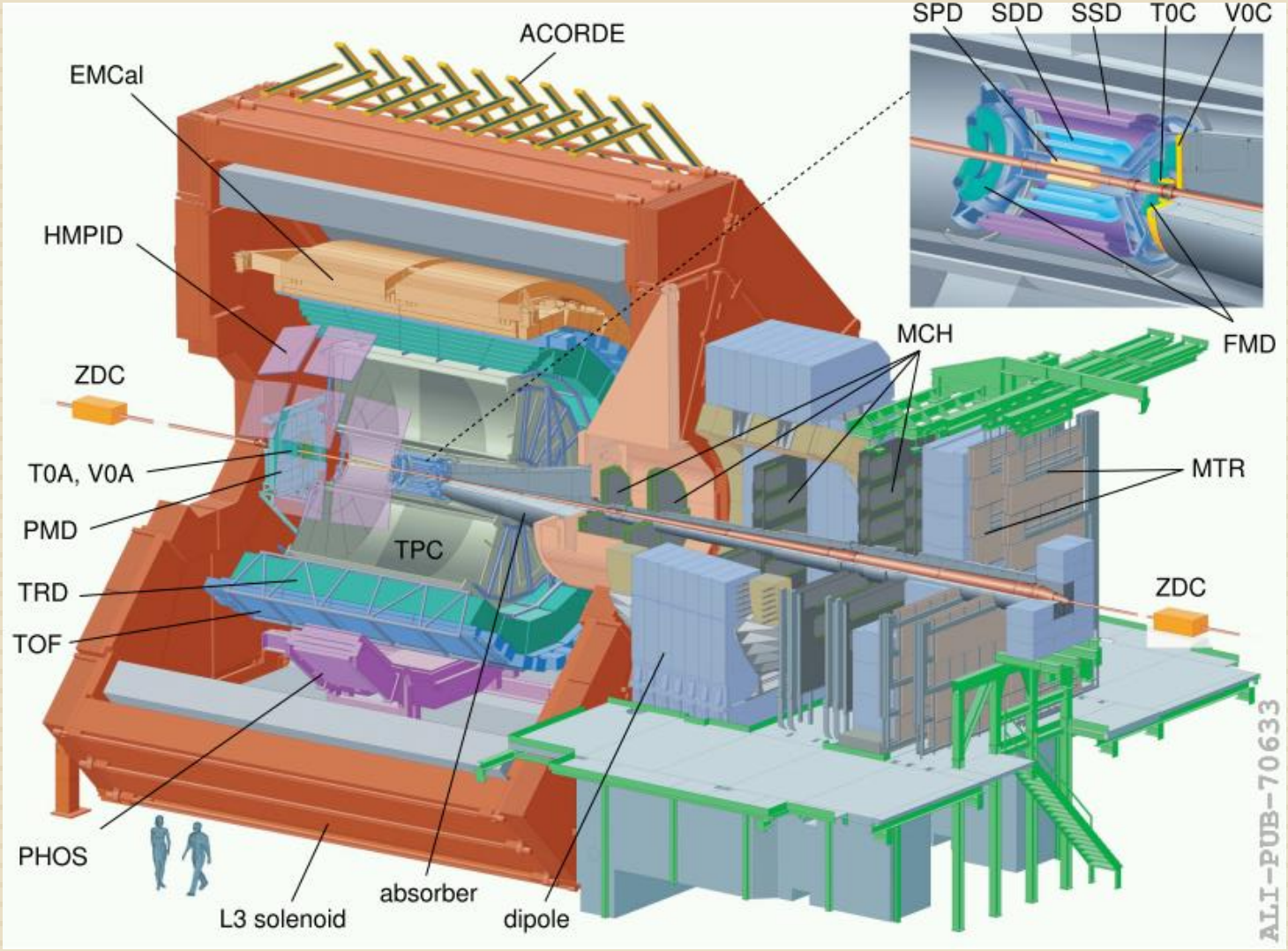


Additional source of baryons



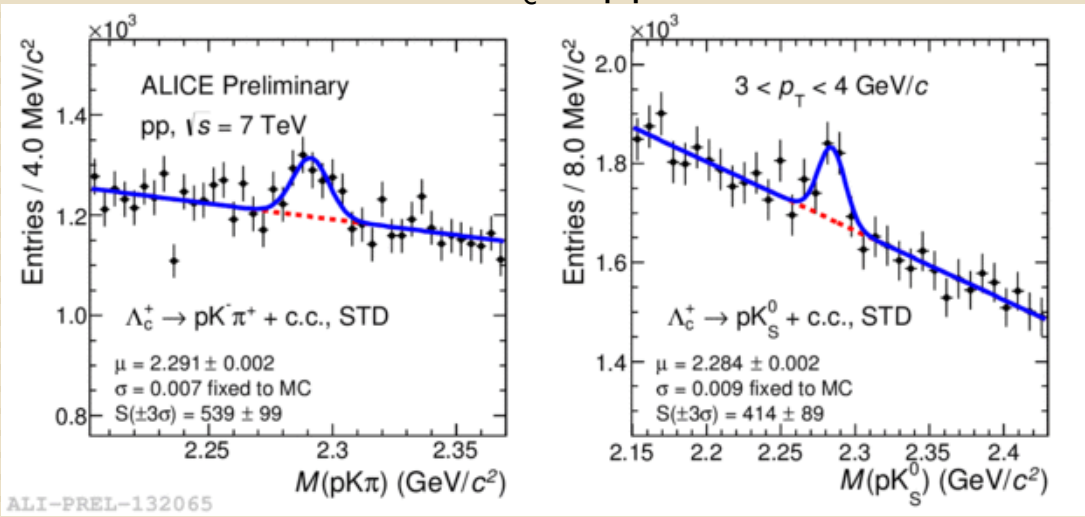
J. R. Christiansen and P. Z. Skands, JHEP 08 (2015) 003 ,
http://home.thep.lu.se/~torbjorn/talks/ChristiansenKarlsruhe14.pdf

ALICE detector

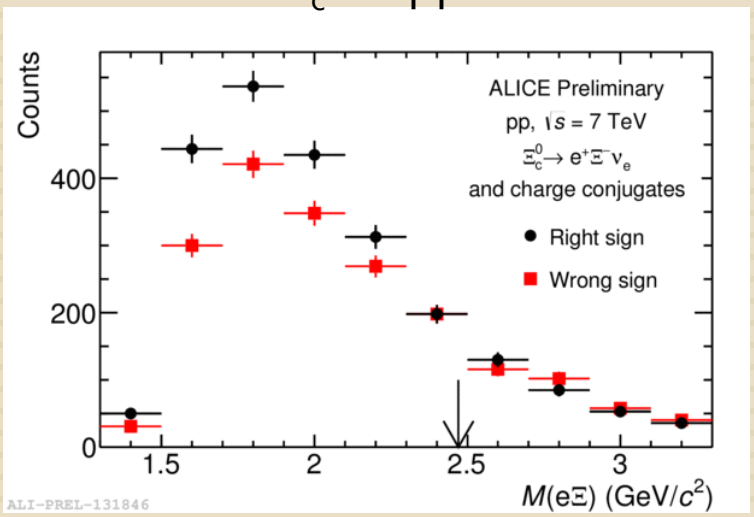


Charmed baryon @ ALICE

Λ_c in pp

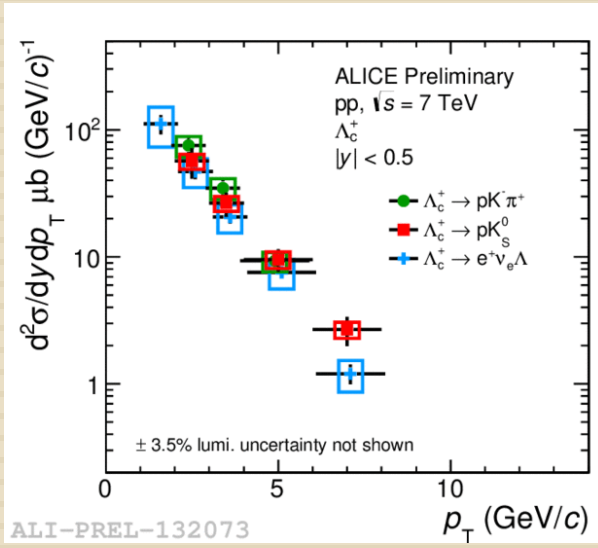


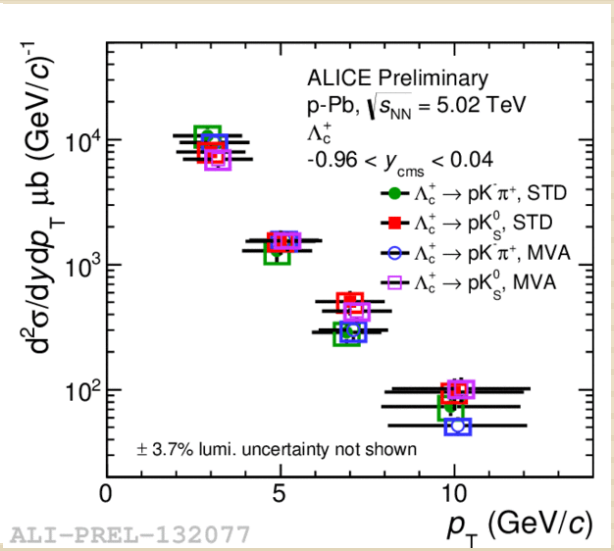
Ξ_c^0 in pp



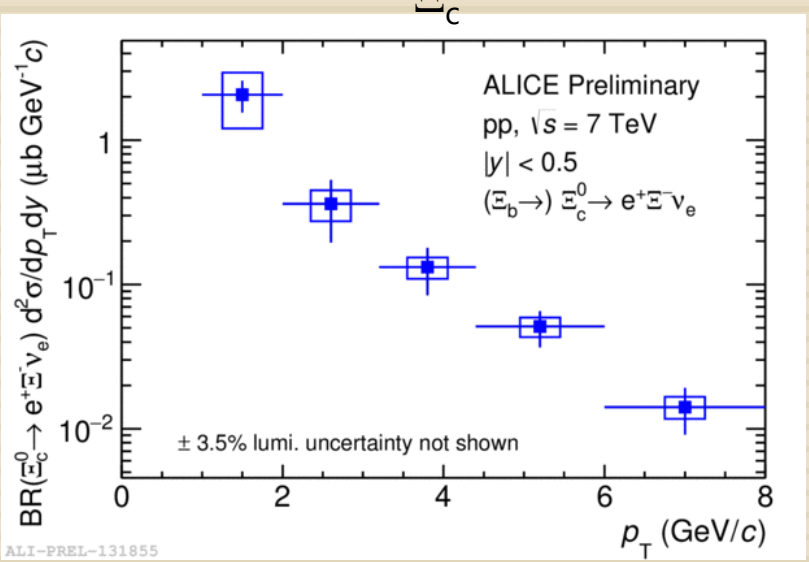
p_T-differential cross sections

Λ_c



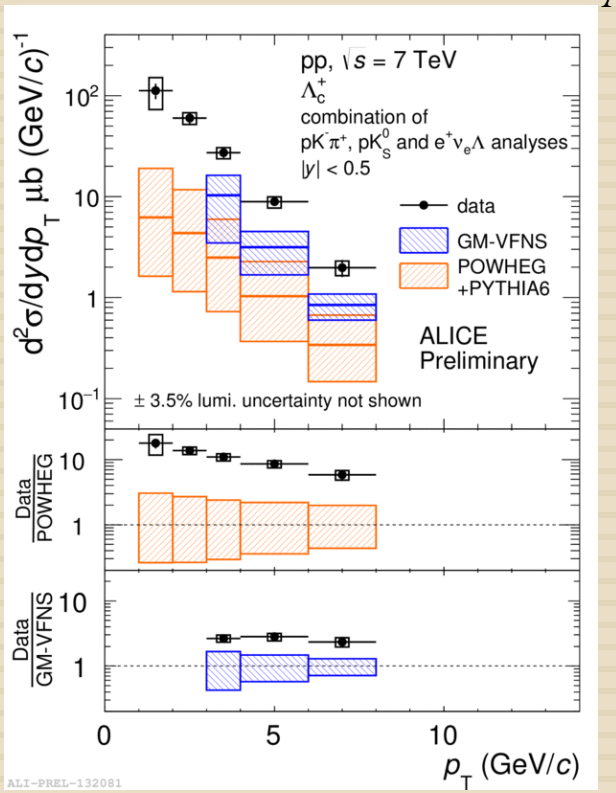


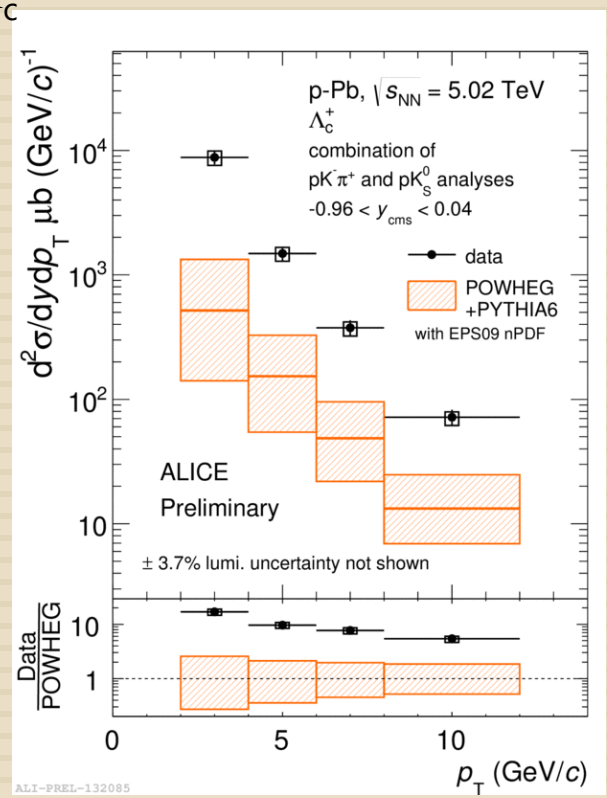
Ξ_c^0



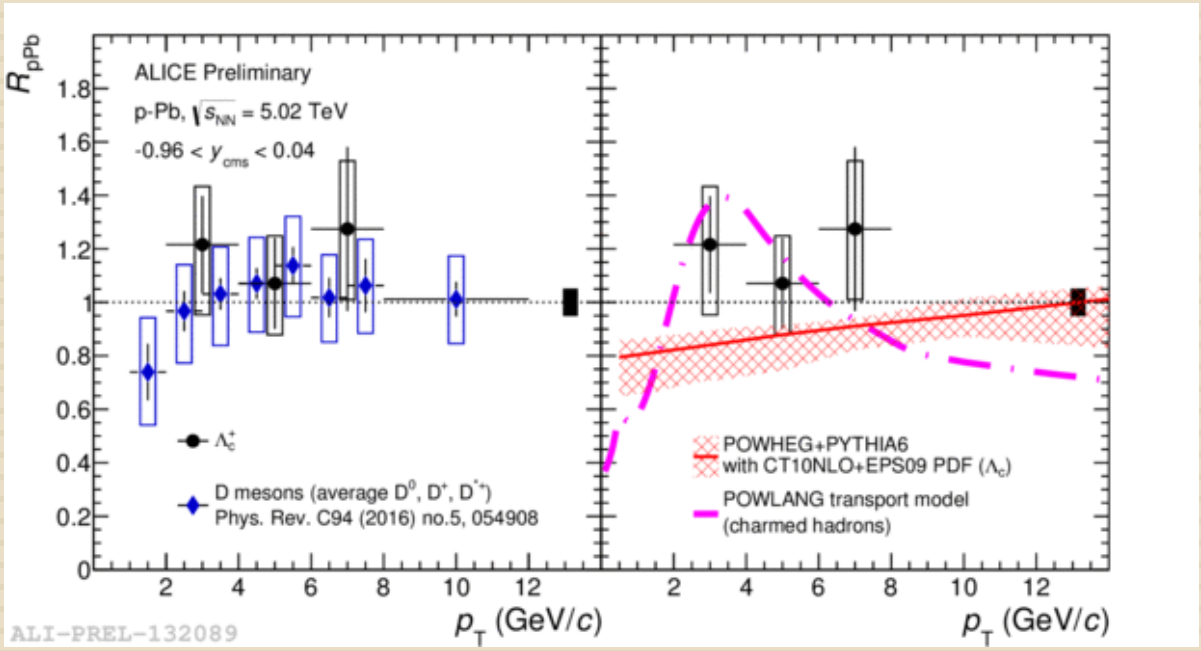
Model comparisons

Λ_c





R_{pPb}



$$\frac{\text{Yield in p + A}}{\langle N_{\mathrm{coll}} \rangle \times \text{Yield in p + p}}$$

Λ_c/D^0 ratio, Ξ_c^0/D^0 ratio