Ξ_c^0 production via semileptonic decay in pp collisions at $\sqrt{s} = 5.02$ TeV with ALICE

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Heavy Quarks

$m_c, m_b \gg \Lambda_{QCD}$ [1]

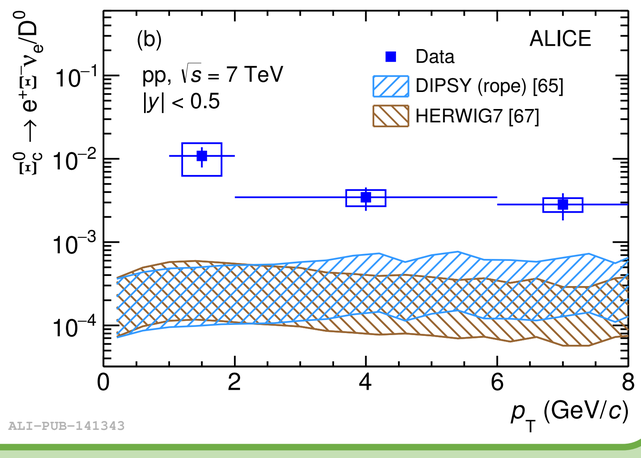
- Heavy quarks (beauty, charm) are produced via hard partonic scattering processes
- The mass of heavy quarks set a perturbative scale, which can be computed with perturbative QCD

Charm hadrons

(c. c.: Charge Conjugate)

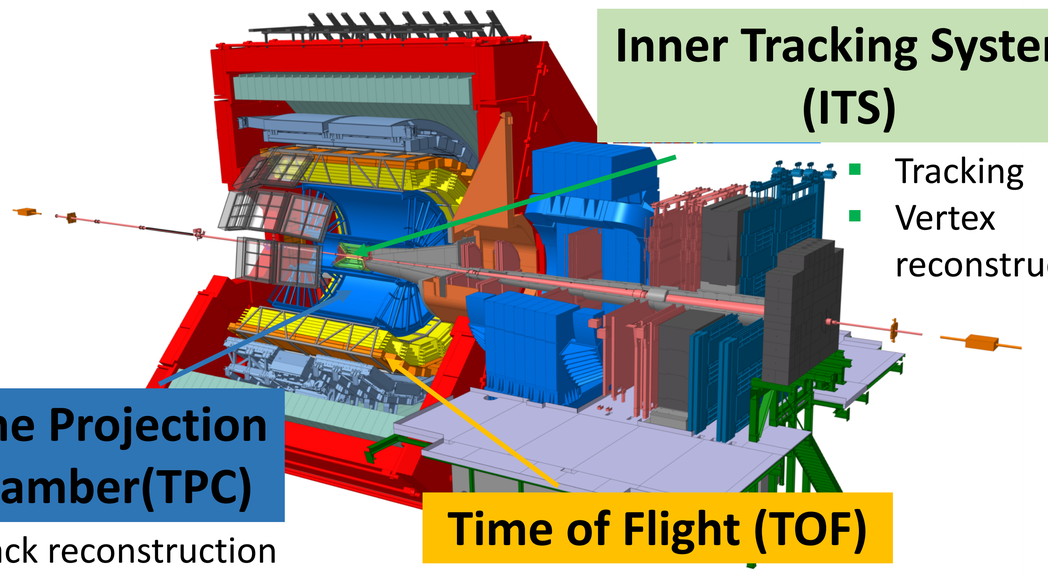
$$\Xi_c^0(dsc) \rightarrow e^+\Xi^-\nu_e \rightarrow e^+(\pi^-\Lambda)\nu_e \rightarrow e(\pi p\pi)\nu_e + c.c.$$

- Test models of the hadronization mechanism
- Investigate universality of fragmentation functions



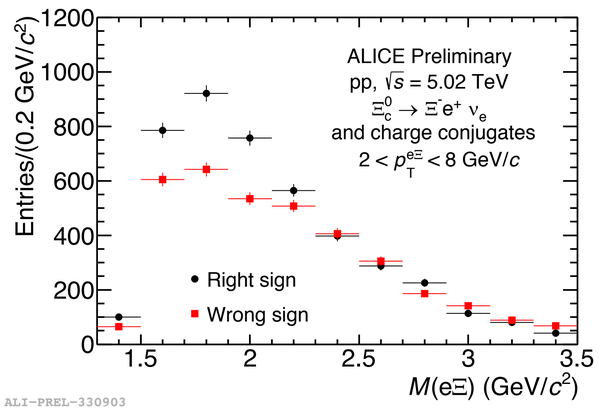
ALICE Detector

- pp collisions at $\sqrt{s}$ = 5.02 TeV collected in 2017
- Luminosity: $L_{int} = 19.2 \pm 0.3\ nb^{-1}$

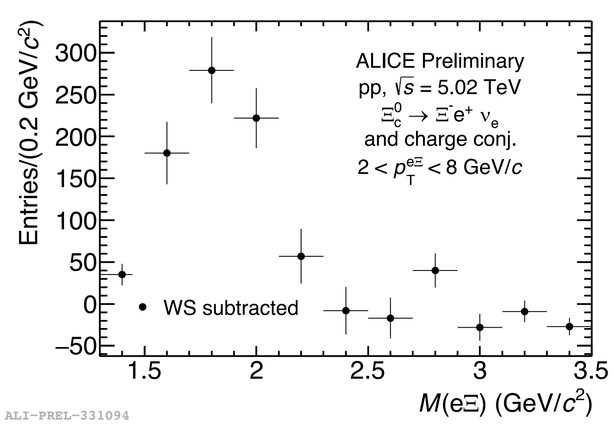


Signal extraction

- The Ξ_c^0 candidates are defined from $e^+\Xi^-$ pairs
  - Electrons are identified using the dE/dx measurement in the TPC and the time-of-flight measurement of the TOF detector.
  - The Ξ^- baryons are reconstructed from the decay chain: $\Xi^- \rightarrow \pi^-\Lambda$, followed by $\Lambda \rightarrow p\pi^-$



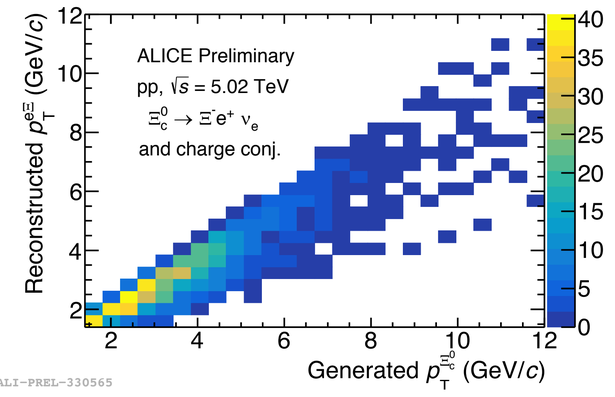
Right sign: $e^+\Xi^-$, $e^-\bar{\Xi}^+$



Wrong sign: $e^+\bar{\Xi}^+$, $e^-\Xi^-$

Unfolding

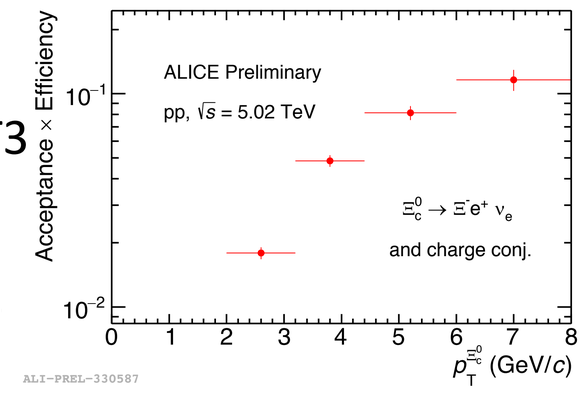
- The response matrix obtained from the simulation is used to correct for the missing neutrino momentum
  - Correlation between the p_T of the Ξ_c^0 baryon and the reconstructed $e^+\Xi^-$
- The Bayesian unfolding technique is used



Efficiency

- The efficiency correction is calculated using the GEANT3 transport code

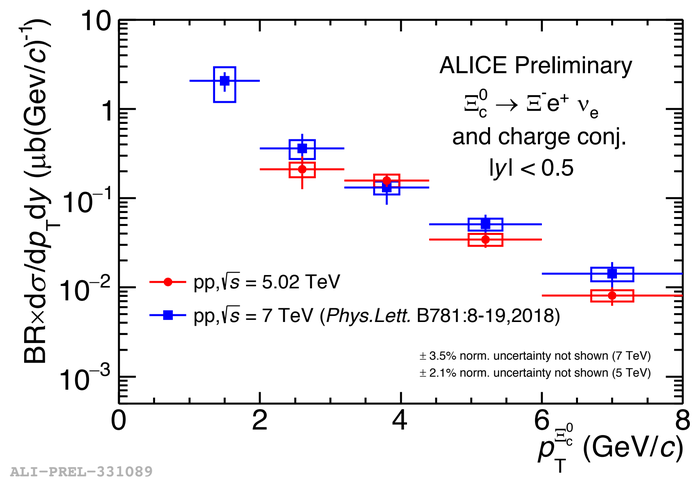
$$(Acc \times \varepsilon) = \frac{N^0_{MC,reco}}{N^{\Xi_c^0}_{MC,gen}\big|_{|y|<0.5}}$$



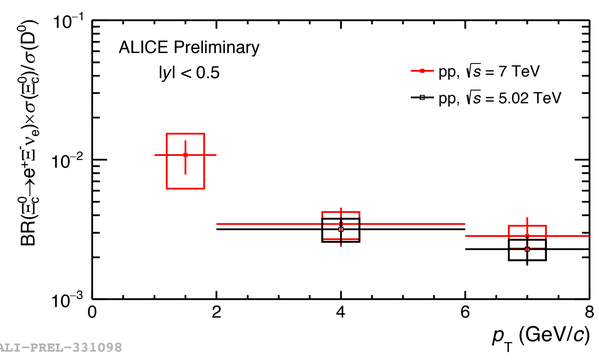
Results

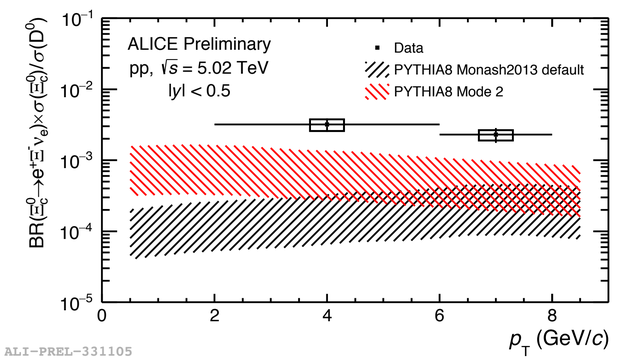
- Measurement of Ξ_c^0 p_T spectrum, $2 < p_T < 8$ GeV/c

$$BR \cdot \frac{d\sigma^{\Xi_c^0}}{dp_T dy} = \frac{N_{\Xi_c^0}}{2 \cdot \Delta p_T \Delta y \cdot (Acc \times \mathcal{E}) \cdot L_{int}}$$



- The measurement of the Ξ_c^0 cross section at 5 and 7 TeV provides constraints on models calculations





- The ratios at 5 TeV and 7 TeV are fully compatible
- PYTHIA8 with various tunes underestimates the measured ratio

Reference

[1] *J.Phys.G: Nucl.Part.Phys.* 43 093002
[2] *Phys.Lett.* B781:8-19,2018

Acknowledgement

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