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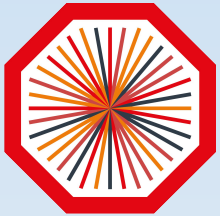

# $\Lambda_c^+$ cross section in pp and p-Pb collisions down to $p_T = 0$ at $\sqrt{s_{NN}} = 5.02$ TeV measured with ALICE

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**Large Hadron Collider Physics Conference**

07th - 12th June 2021

# Why measure $\Lambda_c^+$

**$\Lambda_c^+$ Production:**

- Baryon/meson ratio is sensitive to the charm hadronisation process.
- An enhanced $\Lambda_c^+$ baryon production was observed in pp and p-Pb collisions with respect to $e^+e^-$ and ep collisions [1].

➔ **Further colour reconnection string topologies in pp collisions due to larger number of multiparton interactions?**

➔ **Formation of a hot deconfined medium in small systems? Hadronisation via coalescence?**

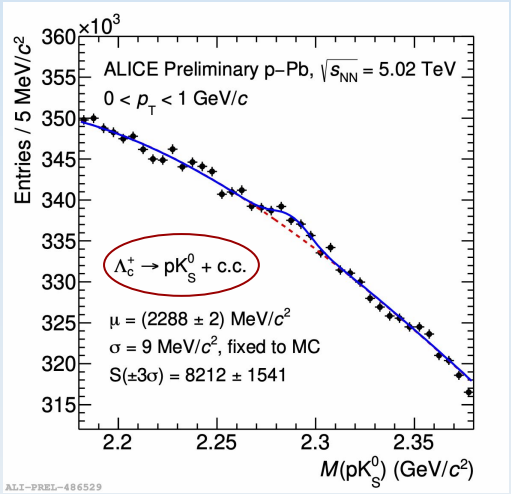
**Data Sample:**

- MB p-Pb collisions at $\sqrt{s_{NN}}$ = 5.02 TeV, collected in 2016. 600 million events.

# $\Lambda_c^+$ Reconstruction

**Analysis Strategy:**

- Candidates $\Lambda_c^+ \rightarrow pK_S^0$
- Reconstruction with KFParticle package [2].
- Particle identification and topological selections reduce combinatorial background [3],[4].

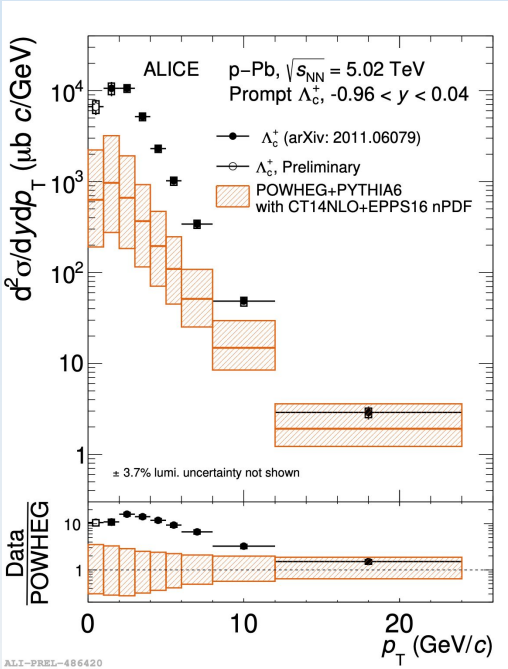



- Extract signal from invariant mass fit.
- Acceptance and Efficiency Correction.
- Subtract $\Lambda_c^+$ from decays of beauty hadrons.

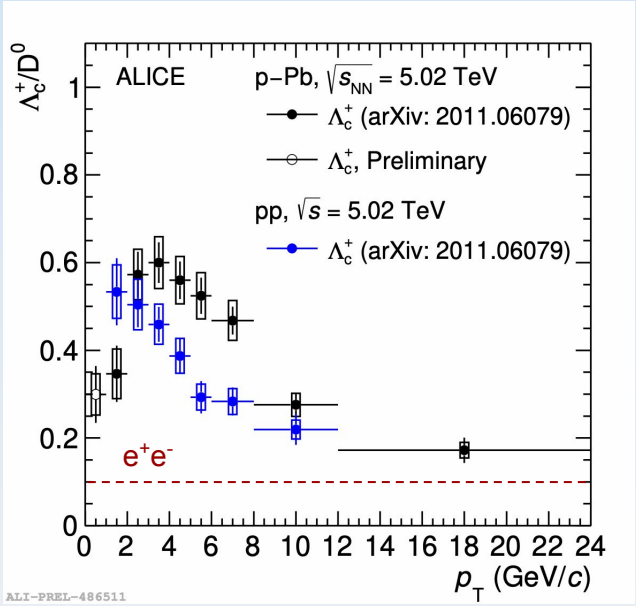
➔ **First measurement of $\Lambda_c^+$ down to $p_T$ = 0.**


[1] ALICE Collaboration, arXiv: 2011.06079
[2] I.Kisel, I.Kulakov, M.Zyzak, IEEE Transactions on Nuclear Science 60, 5, 3703 (2013)
[3] hipe4ml
[4] xgboost

# $\Lambda_c^+$ cross section




# Baryon-to-meson ratio




**First measurement of $\Lambda_c^+$ down to $p_T$ = 0.**

An enhanced $\Lambda_c^+/D^0$ ratio is observed in pp and p-Pb collisions with respect to $e^+e^-$ collisions.

➔ Charm fragmentation not a universal process.

Shift of $p_T$ spectrum in p-Pb compared to pp collision systems.

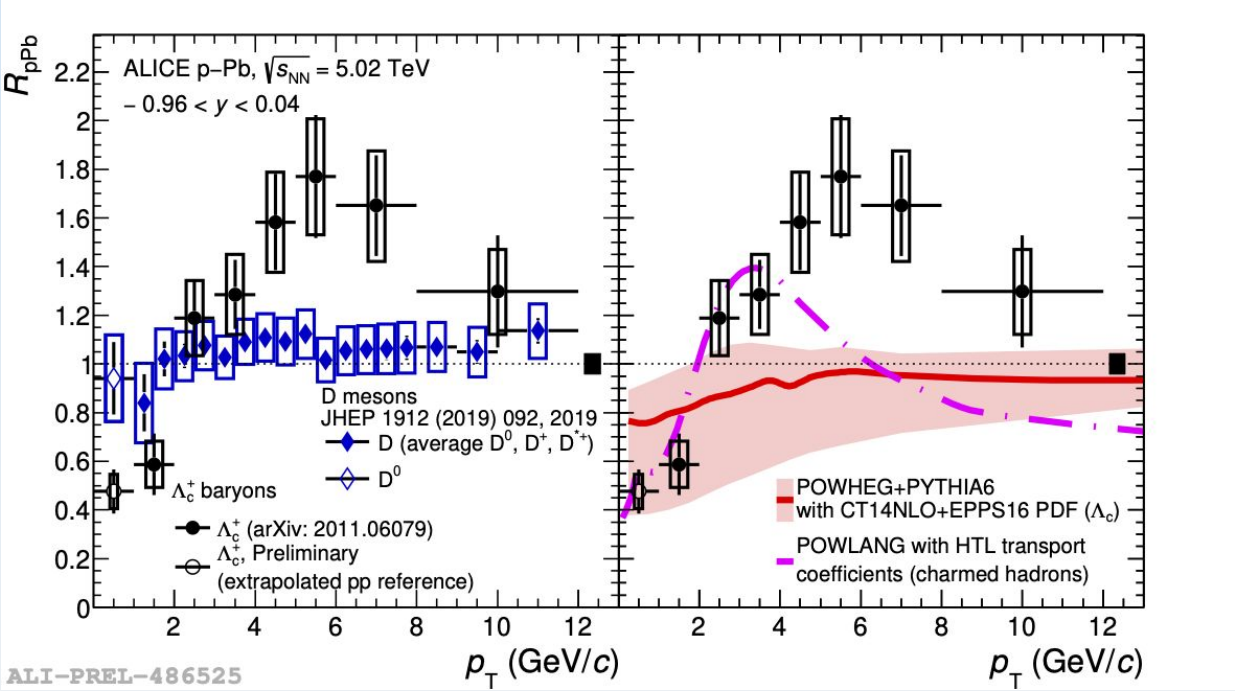
➔ Radial flow or multiplicity dependence of hadronisation? Hardening of $p_T$ spectra predicted in the presence of a medium and observed in the strange sector [6].

- POWHEG+PYTHIA6 [5] calculation is based on fragmentation function tuned on data from $e^+e^-$ collisions.
- Model underestimates the measurement.

**Hint of collective behaviour in p-Pb collisions?**


[5] S. Frixione, G. Ridolfi, P. Nason, JHEP 2007.09 (2007) 126
[6] CMS: Phys. Rev. C 101, 064906 (2020)

# Nuclear modification factor




$$R_{\mathrm{pPb}} = \frac{\mathrm{d}\sigma_{\mathrm{pPb}}/\mathrm{d}p_{\mathrm{T}}}{A \cdot \mathrm{d}\sigma_{\mathrm{pp}}/\mathrm{d}p_{\mathrm{T}}}$$

$R_{pPb}$ compares the $p_T$-differential cross section in pp collisions scaled by the lead mass number A = 208 and p-Pb collisions.

**Comparison baryons and mesons:**

- Agreement with unity for non-strange D mesons.
- Suppression of ~3σ for $\Lambda_c^+$ at low $p_T$ and enhancement at intermediate $p_T$.

**Comparison to models:**

- POWLANG [7] transport model: Agreement at low $p_T$. Shape in data is not described at intermediate and high $p_T$.
- POWHEG+PYTHIA6 $R_{pPb}$ shape is not described by the model.

[7] A. Beraudo et al., JHEP 2016.3 (2016) 123