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

Annalena Kalteyer on behalf of the ALICE Collaboration
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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].

$\Rightarrow$ Further colour reconnection string topologies in pp collisions due to larger number of multiparton interactions?

$\Rightarrow$ 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.

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

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[3] [hipe4ml](https://www.hipe4ml.com)
[4] [xgboost](https://xgboost.readthedocs.io/en/latest/)
Λ⁺ cross section

Baryon-to-meson ratio

An enhanced Λ⁺/D⁰ 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.

First measurement of Λ⁺ down to \( p_T = 0 \).


Nuclear modification factor

Comparison baryons and mesons:
- Agreement with unity for non-strange D mesons.
- Suppression of \(~3\sigma\) 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.

\[ R_{pPb} = \frac{d\sigma_{pPb}/dp_T}{A \cdot d\sigma_{pp}/dp_T} \]

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