Ω_c^0 production cross section in pp collisions at 13 TeV with ALICE

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Introduction

Why to study charm-hadron production in pp?
- Test pQCD calculations based on the factorisation approach
- Charm baryon-to-meson ratio sensitive to hadronization
- Fragmentation functions from e+e- and ep work well for D-meson production. What about charm baryons?
- Enhanced Λ+c & Ξ0c observed in pp w.r.t. e+e-[1, 2, 3, 4]
- Essential for charm total cross section and fragmentation fractions measurement

Why to measure Ωc0?
- Complete the study of the ground-state charm baryons
- Ωc0 decay chain: Ωc0 → Ω−π+ → (ΛK−)π+ → ((pπ−)K−)π+

Overview of theoretical calculations

PYTHIA 8 [5, 6]
- Monash (multiparton interaction based color reconnection (CR))
- CR beyond leading color (CR-BLC)

Quark (re-)combination mechanism (QCM) [7]
- charm quark can pick up a co-moving light antiquark or two co-moving quarks to form a single-charm meson or baryon

Catania [8]
- Transport model with hadronization via coalescence + fragmentation
- At pT ≈ 0, a charm quark can hadronize only by coalescence

Reconstruction with Kalman Filter (KF) Particle package [9]
- Particle identification and topological selection with machine learning to reduce combinatorial background
- Signal extraction from invariant mass fit
- Acceptance x efficiency correction

First measurement of $\Omega_c^0$ production at the LHC
- No measurement of $\text{BR}(\Omega_c^0 \rightarrow \pi^+\Omega^-)$
  - $\text{BR}(\Omega_c^0 \rightarrow \pi^+\Omega^-) = (0.51 \pm 0.07)\%$ theoretical calculation used for the models [10]
- Underestimated by PYTHIA 8 Monash and color reconnection (CR) beyond leading color (BLC)

ALICE Preliminary
pp, $\sqrt{s} = 13$ TeV
$|y| < 0.5$
$\sigma = 8$ MeV/c$^2$
S = 75 ± 18
and charge conj.
$6 < p_T < 12$ GeV/c

Analysis strategy

BR x cross section

Charm baryon-to-meson ratio:
\((BR \times \Omega_c^0)/D^0\)

- \(BR(\Omega_c^0 \rightarrow \pi^+\Omega^-)\) used for the models
- No \(p_T\) dependence
- PYTHIA 8 with CR-BLC enhances \(\Omega_c^0\) production w.r.t. standard PYTHIA Monash
- ALICE result underestimated by all current models
- Sizable contribution to charm total cross section at the LHC?