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Event activity dependence of charm baryon production at LHC energies

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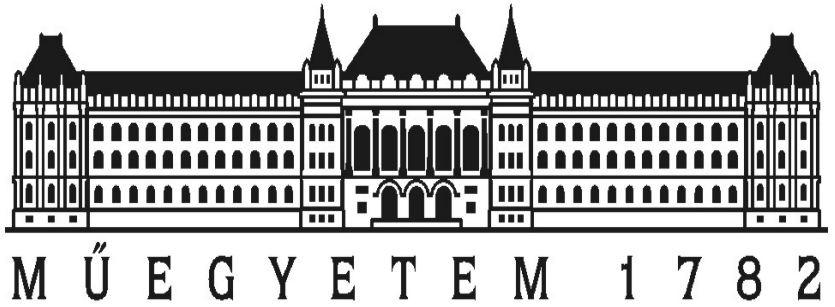


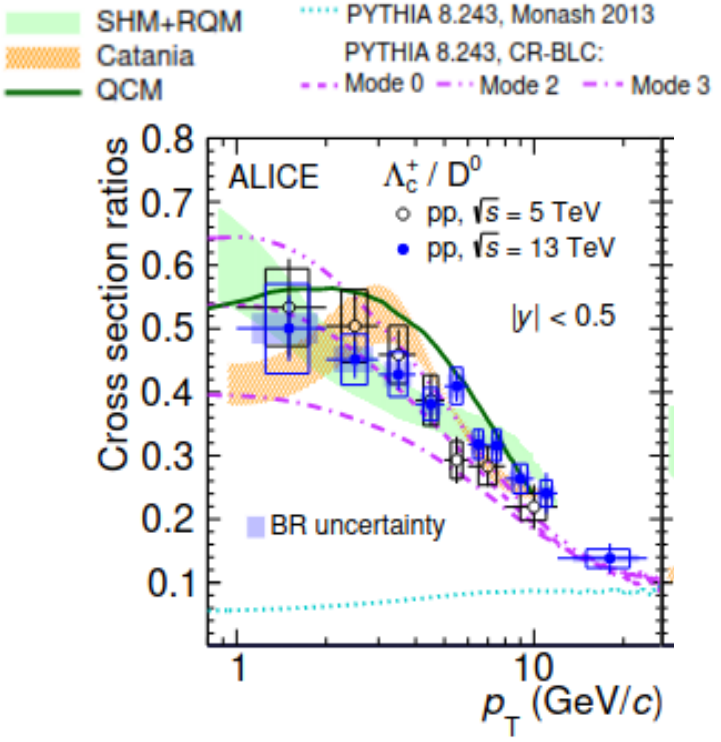
Production of heavy-flavor baryons

- Heavy-flavor production is usually described with the factorization approach: incoming **hadron PDFs**, hard **parton-parton scattering** and **fragmentation** are independent:

$$d\sigma^{hard}_{AB\to C} = \sum_{a,b} f_{a/A}(x_a, Q^2) \otimes f_{b/B}(x_b, Q^2) \otimes d\sigma^{hard}_{ab\to c}(x_a, x_b, Q^2) \otimes D_{c\to C}(z, Q^2)$$

Parton Distribution Function (PDF) | Partonic hard scattering cross-section | Fragmentation Function (FF)

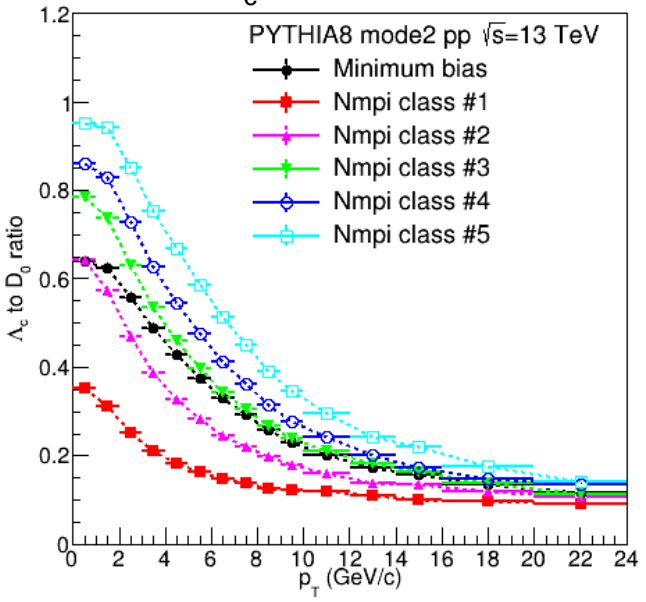
- Traditional assumption: fragmentation functions are universal for different collision systems.
- Experimental results (ALICE, CMS, LHCb): significant enhancement in the Λ_c/D^0 ratio in the semi-soft p_T range (2-8 GeV/c), compared to predictions from e+e-: **no universality**!
- **Color reconnection beyond leading color** (CR-BLC): Describes the multiplicity dependence.
- Multiplicity dependence: **connected to the event activity**! Needs to be better understood!



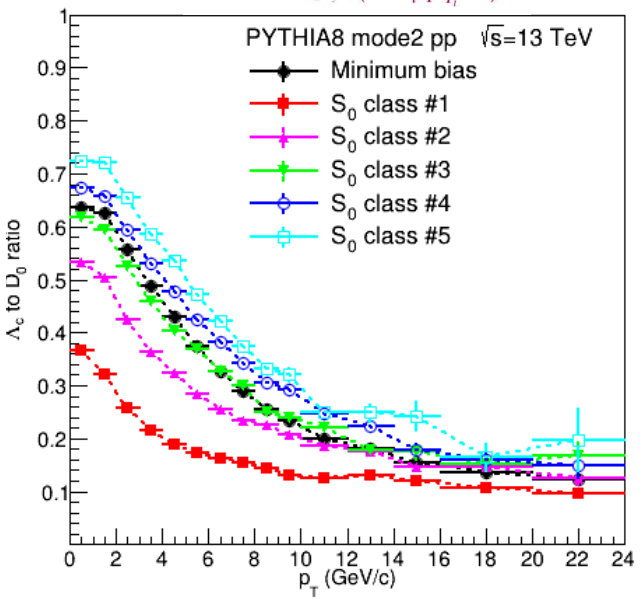
Λ_c/D^0 enhancement classified by spherocity and flatenicity

Z.V., R.V., J. Phys. G: Nucl. Part. Phys. 49 (2022) 075005 (arXiv:2111.00060)

Λ_c(qqc), I = 0

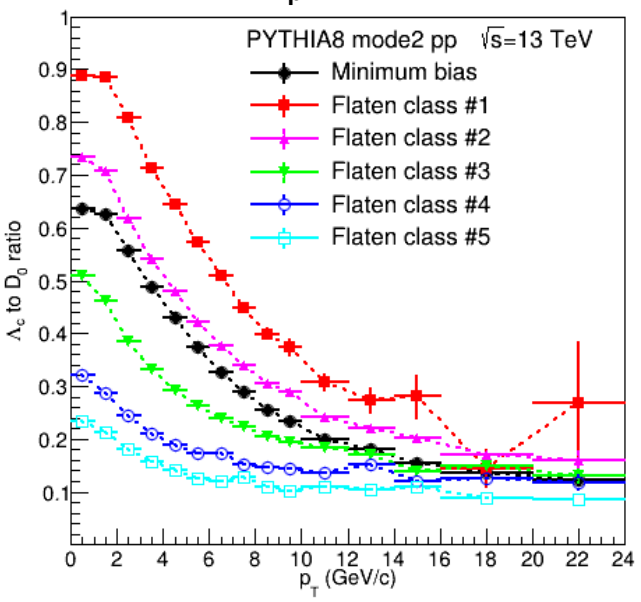


$$S_0 = \frac{\pi^2}{4} \times \min_{\hat{n}=(n_x,n_y,0)} \left(\frac{\Sigma_i \, |\vec{p}_{T_i} \times \hat{n}|}{\Sigma_i \, \vec{p}_{T_i}} \right)^2$$



<u>Flatenicity</u>: A. Ortiz, G. Paic, arXiv:2204.13733

$\rho = \sigma_{pT}^{cell} / \langle p_T^{cell} \rangle$



- The Λ_C/D^0 enhancement depends on the MPI in the lower p_T region.
- Spherocity allows decribing the enhancement in events without a leading trigger hadron.
- **<u>Flatenicity</u> pulls apart the distributions much more than spherocity.**

Λ_c/D^0 enhancement in jetty and isotropic events

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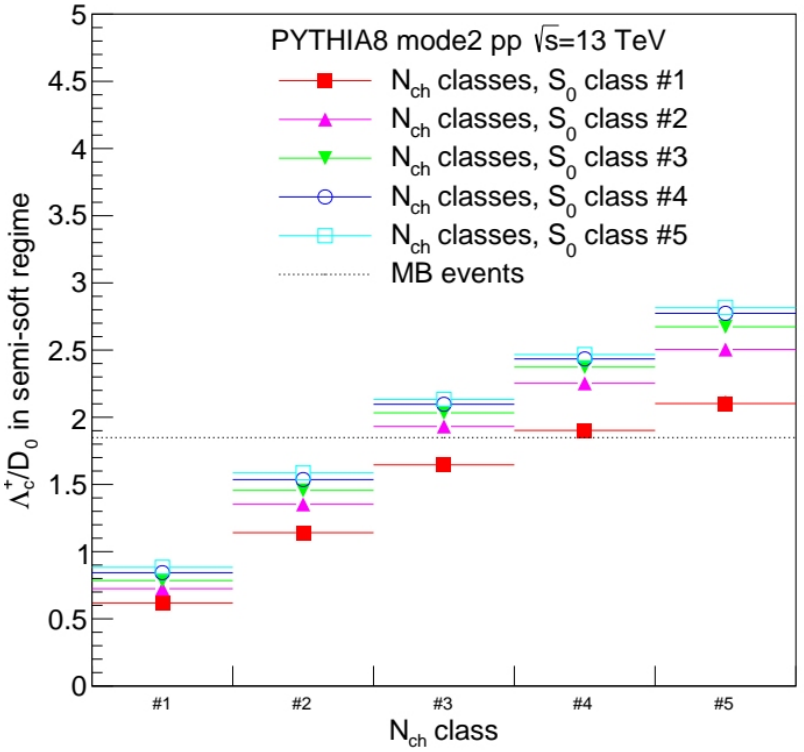
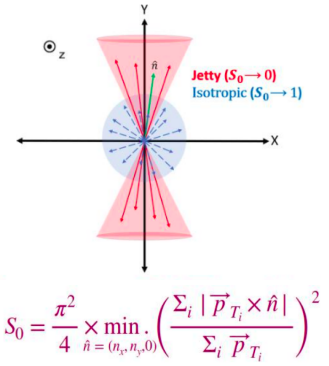
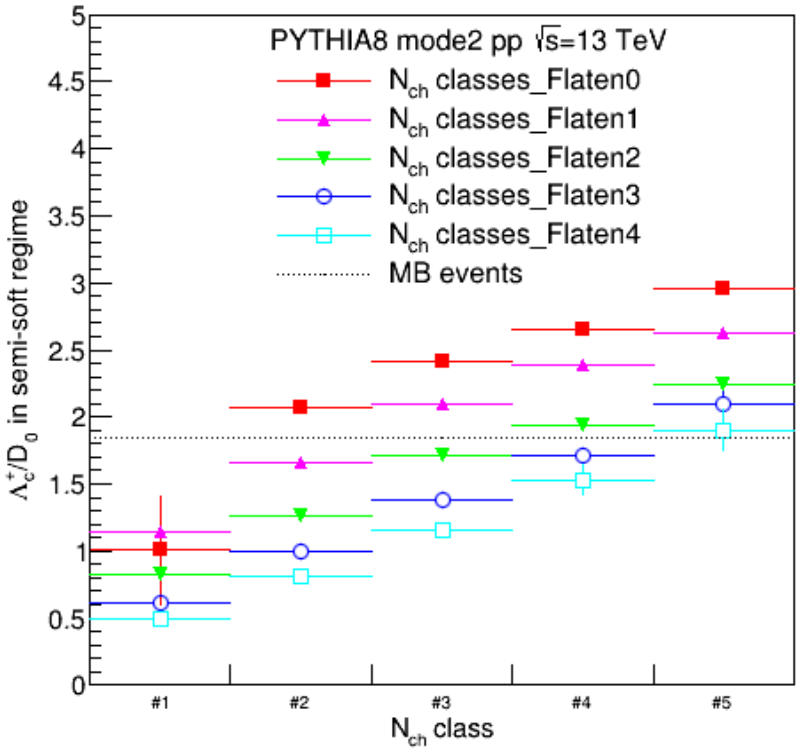




$\rho = \sigma_{pT}^{cell} / \langle p_T^{cell} \rangle$



- **Spherocity S_0** in **minimum-bias events**:
  - Λ_c/D^0 enhancement is more prominent in spherical (UE-dominated) than jetty events

- **Flatenicity ρ** in **minimum-bias events**:
  - Λ_c/D^0 enhancement decreases with flatenicity, and **contrary to spherocity** the enhancement is sensitive to it in every N_{ch} classes

- **CR-BLC model links the enhancement to the UE:**
  - discrimination power in data from the upcoming LHC Run3.
- **Flatenicity could be a better quantity to describe the MPI and the enhancement!**