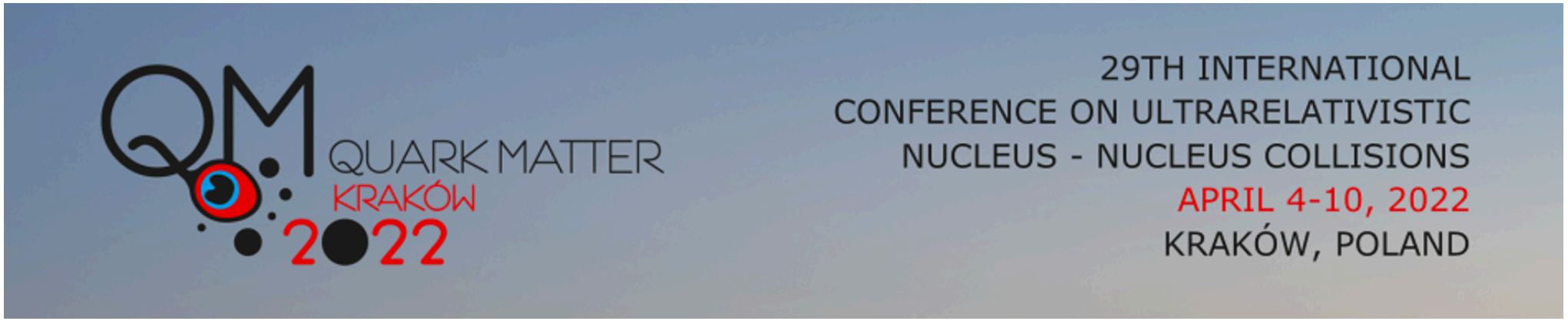
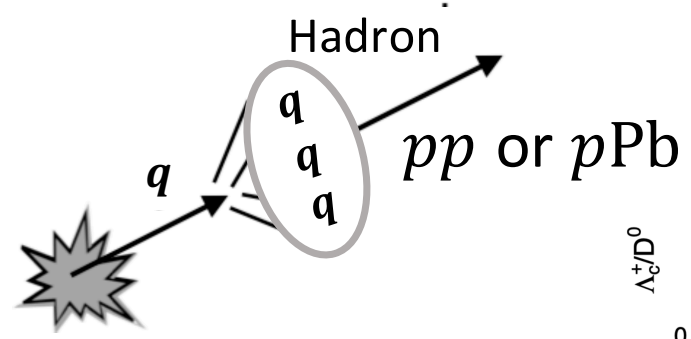
Prompt Λ_c^+/D^0 ratio in peripheral $\mathrm{Pb}-\mathrm{Pb}$ collisions in LHCb

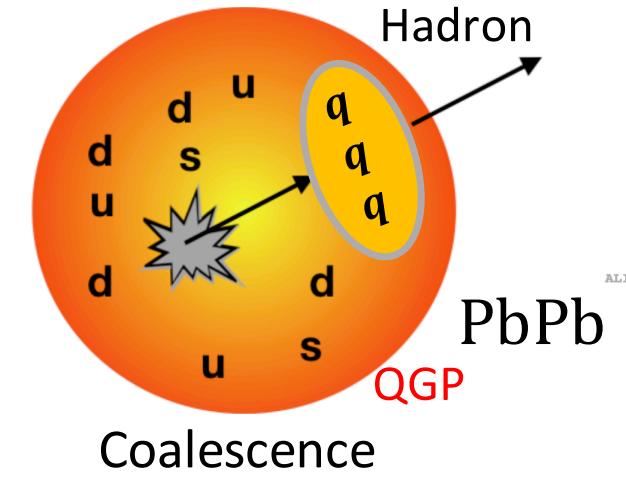
Di Yang, Tsinghua University

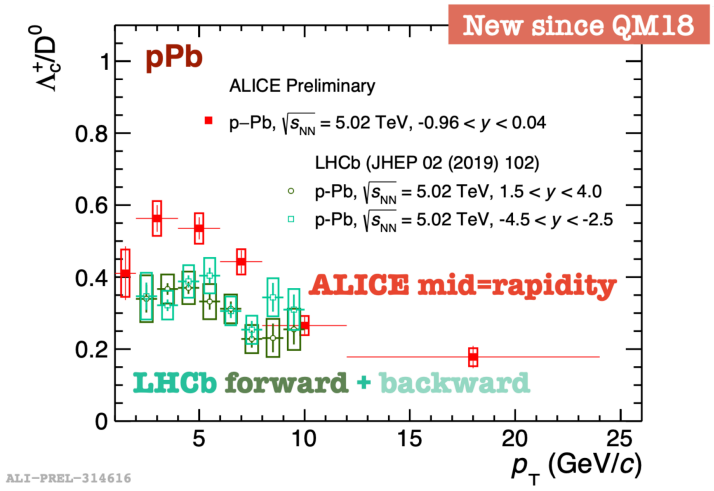
On behalf of LHCb Collaboration

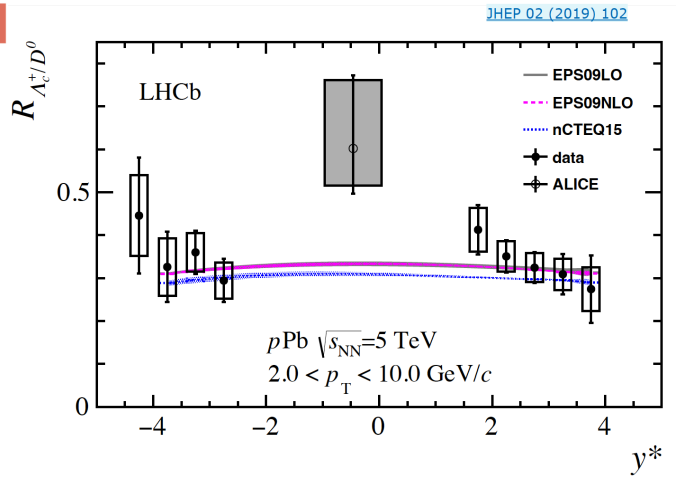


Physics motivation









- R_{Λ_c/D^0} is sensitive to hadronization (fragmentation or coalescence).
- Coalescence hadronization in QGP are supposed to occur in PbPb collisions.
- Coalescence enhance R_{Λ_c/D^0} at intermediate p_{T}.
- R_{Λ_c/D^0}(ALICE) > R_{Λ_c/D^0}(LHCb) in pPb: Tension or feature? More measurement of R_{Λ_c/D^0} are needed.

PRL. 90 (2003) 202302 PRL. 90 (2003) 202303

The LHCb detector

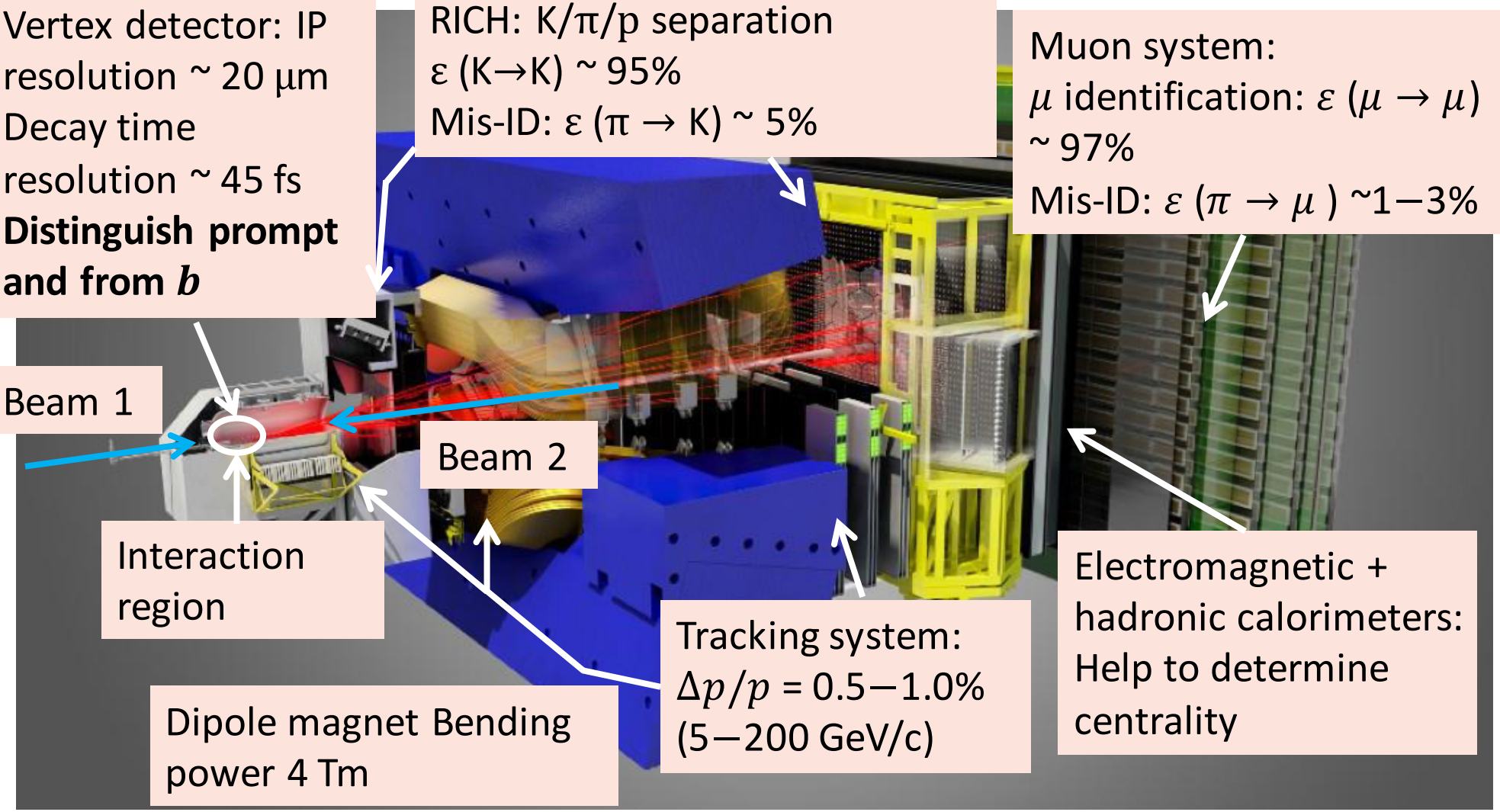
A single-arm **general purpose detector** at **forward** rapidity !

pseudorapidity acceptance $2 < \eta < 5$, p_T down *to 0*

Vertex detector: IP resolution ~ 20 μm
Decay time resolution ~ 45 fs
Distinguish prompt and from *b*

RICH: K/π/p separation
ε (K→K) ~ 95%
Mis-ID: ε (π → K) ~ 5%

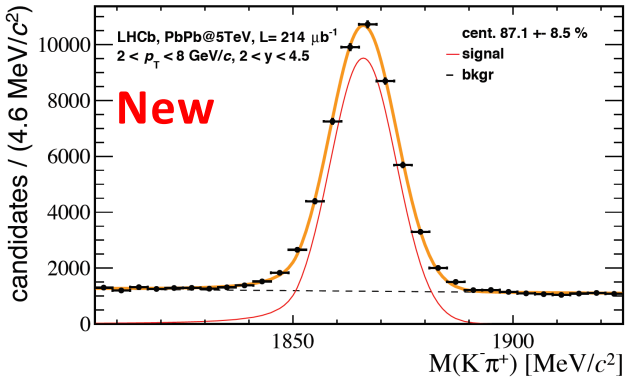
Muon system:
μ identification: ε ($\mu \rightarrow \mu$) ~ 97%
Mis-ID: ε ($\pi \rightarrow \mu$) ~1−3%

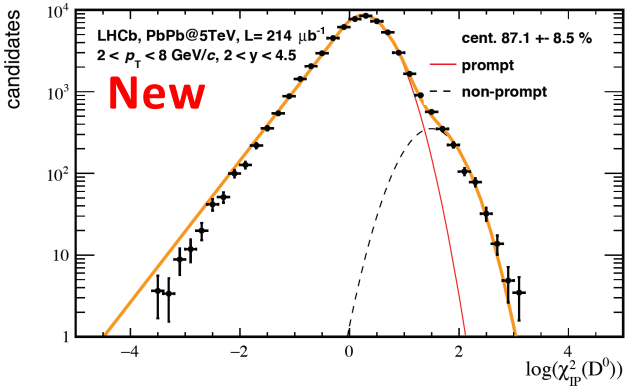


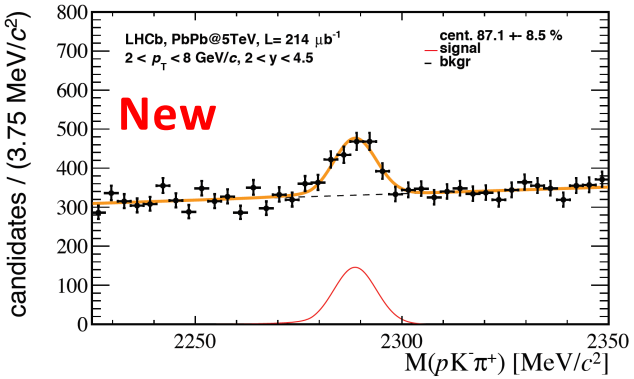
LHCb. IJMPA 30 (2015) 1530022

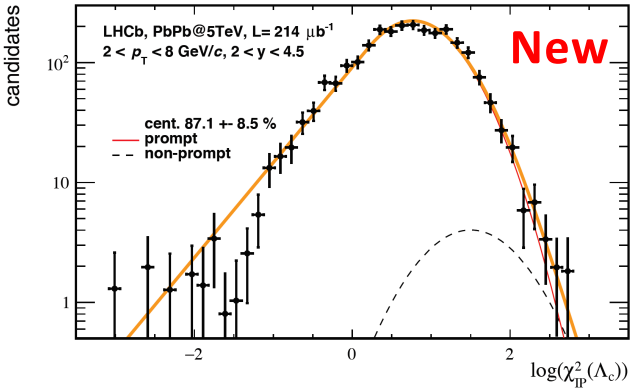
Prompt R_{Λ_c/D^0} in peripheral PbPb at 5.02 TeV

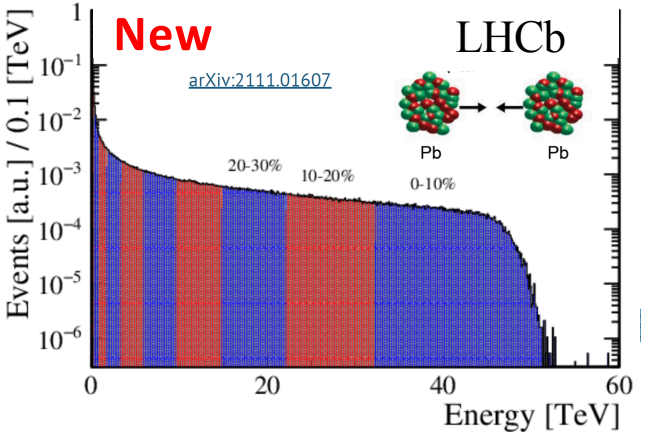
LHCB-PAPER-2021-046-001







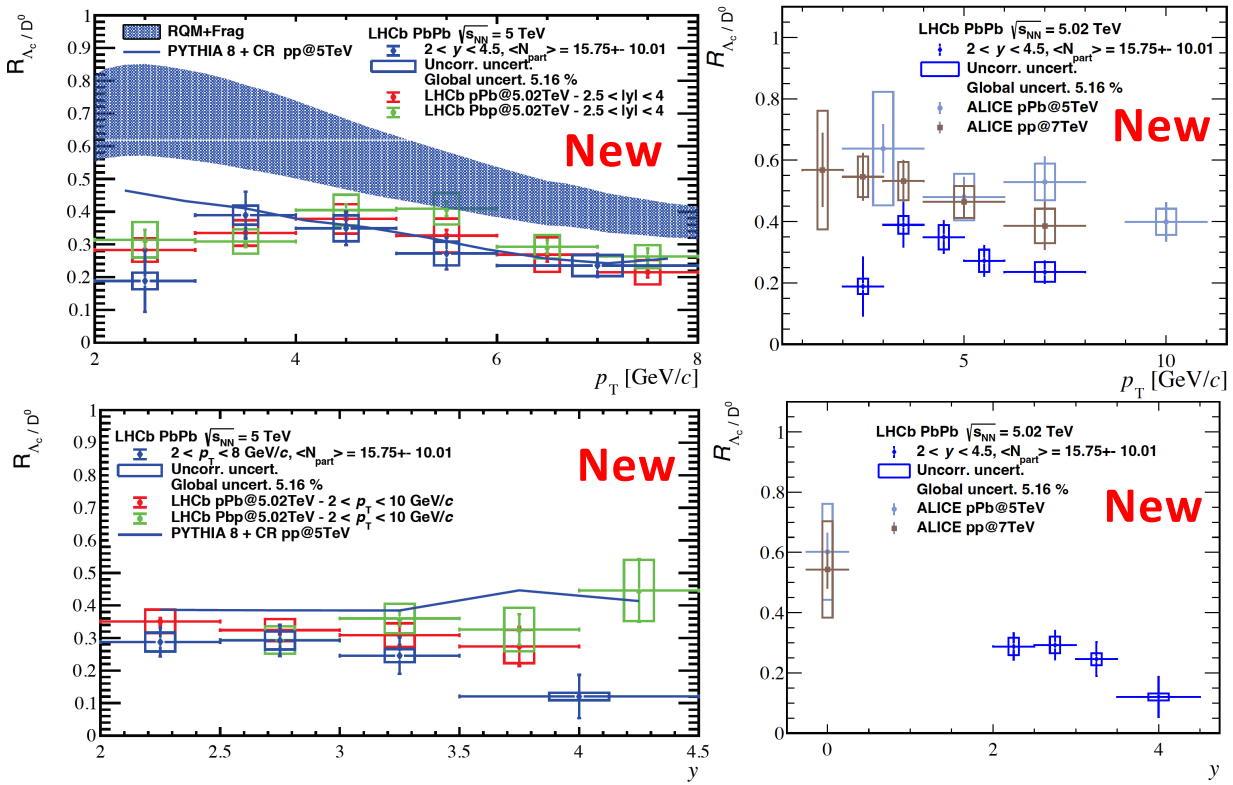




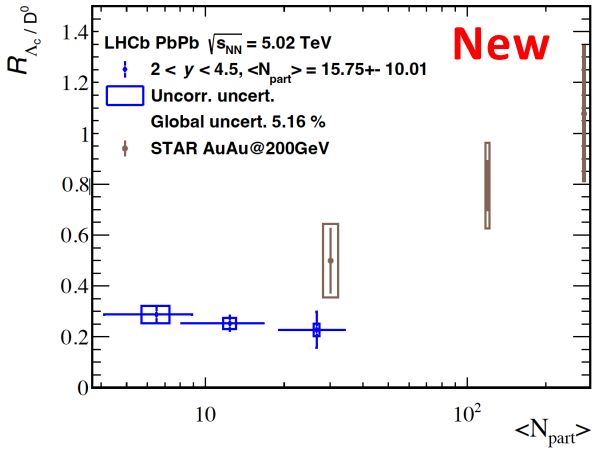
- $R_{\Lambda_c/D^0} = \frac{\mathcal{B}^{D^0} Y^{\Lambda_c}(p_T, y \text{ or } \langle N_{part} \rangle)}{\mathcal{B}^{\Lambda_c} Y^{D^0}(p_T, y \text{ or } \langle N_{part} \rangle)}$; $Y = \frac{N(p_T, y \text{ or } \langle N_{part} \rangle) \cdot f_{prompt}(p_T, y \text{ or } \langle N_{part} \rangle)}{\varepsilon_{tot}(p_T, y \text{ or } \langle N_{part} \rangle)}$
- N and f_{prompt} are determined through mass and $\log \chi^2_{IP}$ fit.
- Up to 60% centrality reached in hadron collisions.

Prompt R_{Λ_c/D^0} in peripheral PbPb at 5.02 TeV

LHCB-PAPER-2021-046-001



R_{Λ_c/D^0} in peripheral PbPb at $\sqrt{s_{\mathrm{NN}}} = 5.02$ TeV



- p_{T} dependence compatible with a relative enhancement at intermediate p_{T}.
- Compatible with flat rapidity dependence and flat $\langle N_{\mathrm{part}} \rangle$ dependence.
- R_{Λ_c/D^0} in pPb and PbPb are compatible with each other, lower than that in ALICE.
- Tension is due to different rapidity range?

Work in progress: prompt Λ_c^+ production in pPb collisions at 8.16TeV

- Λ_c^+ production and R_{Λ_c/D^0} in pPb at $\sqrt{s_{NN}} = 8.16$ TeV, are ongoing.
- Nearly 20 times larger statistics → much more precise measurement than the 5TeV pPb results
- $$\frac{\mathrm{d}^2\sigma^{\Lambda c}}{\mathrm{d}p_\mathrm{T}\mathrm{d}y^*} = \frac{N^{\Lambda c}(p_\mathrm{T},y^*)\cdot f_\mathrm{prompt}(p_\mathrm{T},y^*)}{\mathcal{L}\mathcal{B}\varepsilon_\mathrm{tot}(p_\mathrm{T},y^*)}$$
- N^{Λ_c} and f_prompt are determined through mass and $\log\chi^2_\mathrm{IP}$ fit and ε_tot are estimated with MC samples.