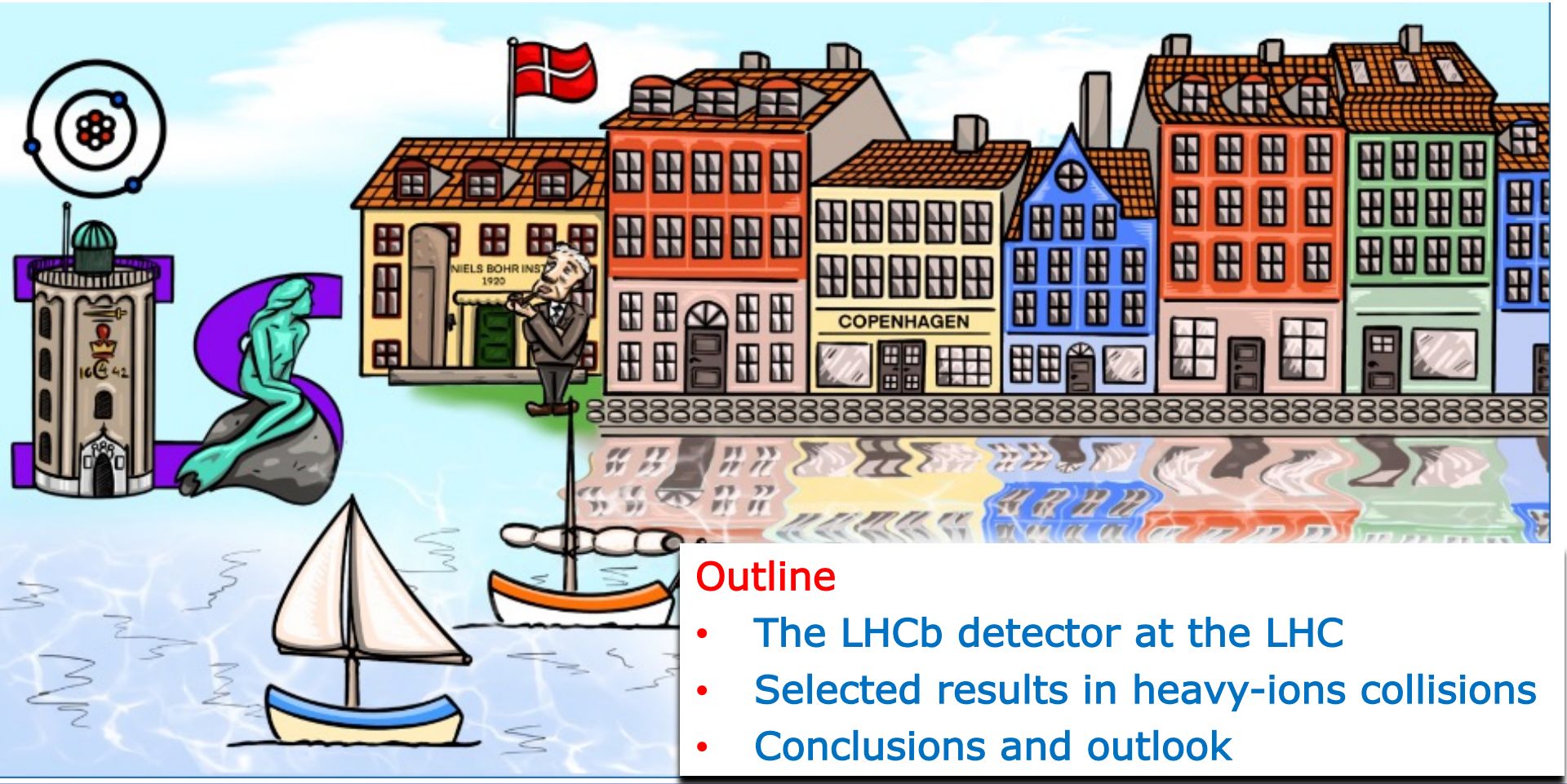
Heavy Ion and Fixed Target Results at LHCb

Giulia Manca,
Universita` degli studi di Cagliari (IT) & I.N.F.N.
on behalf of the LHCb collaboration



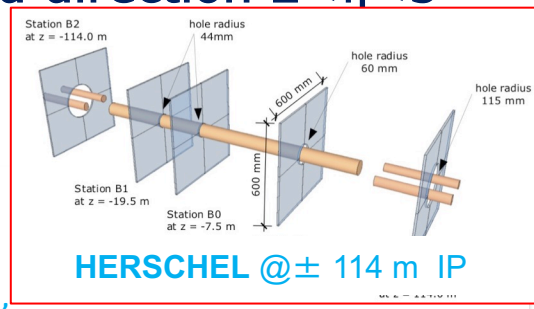
Outline

- The LHCb detector at the LHC
- Selected results in heavy-ions collisions
- Conclusions and outlook

LHCb Detector at the LHC

→ Single arm spectrometer fully instrumented in forward direction 2<η<5

- Designed for b-physics, becoming a General Purpose Detector
- Forward and backward coverage for asymmetric beams
- Precision in the forward region not achievable by others yet



HERSCHEL @± 114 m IP

[JINST 3 (2008) S08005]
[IJMPA 30 (2015) 1530022]

RICH detectors
K/π/p separation
ε(K→K) ~ 95 %,
mis-ID ε(π→K) ~ 5 %

Muon system
μ identification ε(μ→μ) ~ 97 %,
mis-ID ε(π→μ) ~ 1-3 %

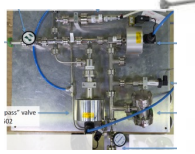
Vertex Detector(VELO)
reconstruct vertices
decay time resolution: 45 fs
IP resolution: 20 μm

~20 m

$\bar{b}$

10-300mrad

~12 m


SMOG

Dipole Magnet
bending power: 4 Tm

Tracking system
momentum resolution
$\Delta p/p$ = 0.4%–0.8%
(5 GeV/c – 100 GeV/c)

Calorimeters
energy measurement
e/γ identification
$\Delta E/E$ = 1 % ⊕10 %/√E (GeV)

Track reconstruction down to $p_T = 0$

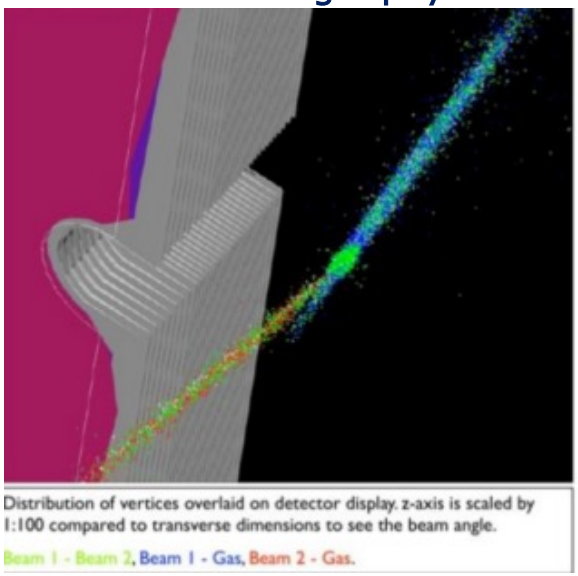
http://dx.doi.org/10.1142/S0217751X15300227

Fixed Target Physics with LHCb

SMOG : System for Measuring the Overlap with Gas

Poster of Camilla De Angelis

- injection of noble gas (He, Ne, Ar) into interaction region
- very simple robust system
- used for a precise luminosity determination
- used for fixed-target physics!



Distribution of vertices overlaid on detector display. z-axis is scaled by 1:100 compared to transverse dimensions to see the beam angle.
Beam 1 - Beam 2, Beam 1 - Gas, Beam 2 - Gas.

$p \sim 10^{-7}/10^{-6} mbar$

- precise vertexing to separate beam-beam and beam-gas strong acceptance effects as a function of the *z* position
- energy densities between those probed at the SPS and RHIC

Bridge between the SPS and LHC

→ Since 2022: SMOG2 !
- standalone gas storage cell at z~-500/-300 mm

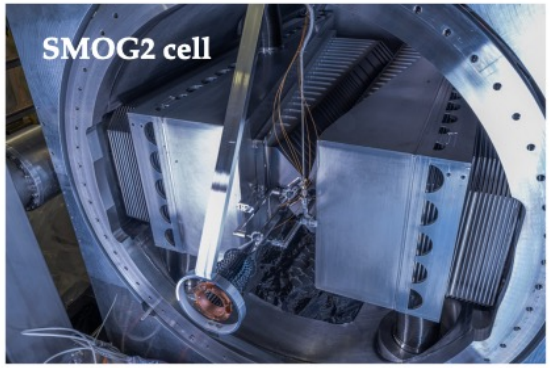
→ Up to x100 higher gas density with same gas flow of SMOG1

→ Precise measurement of the gas pressure => luminosity

→ Possibility to run in parallel with pp collisions, and inject not only noble gases

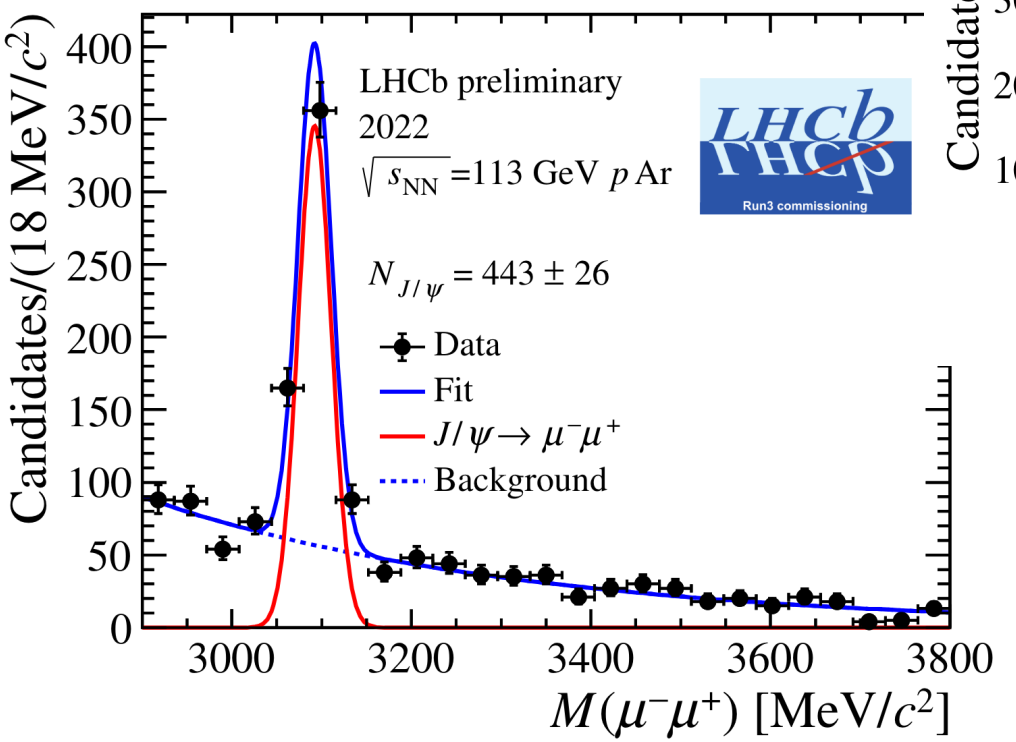
→ Projections for 1y pAr @ 115 GeV :

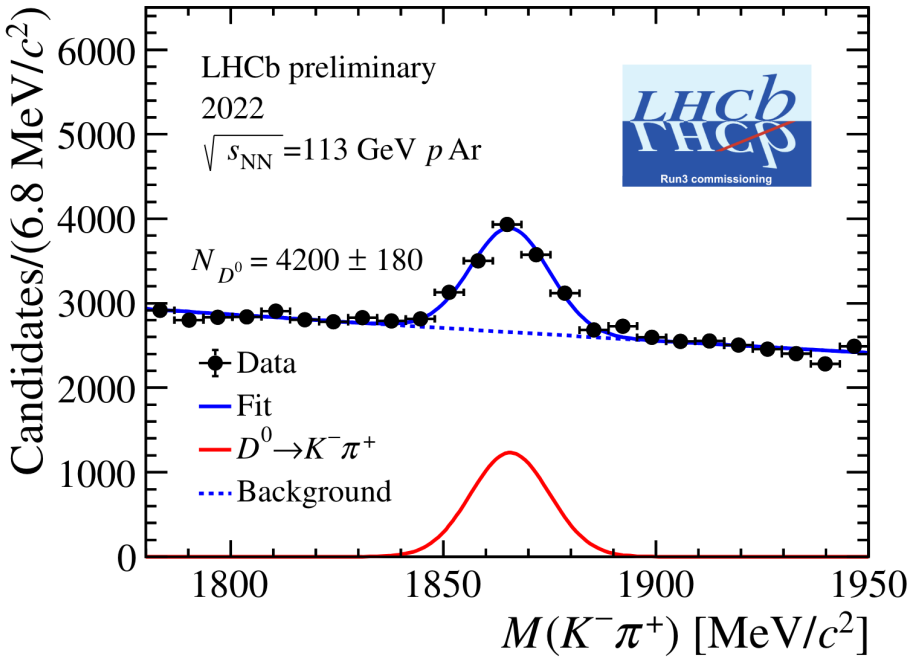
Int. Lumi.		80 pb^{-1}
Sys.error of J/Ψ	xsection	~3%
J/Ψ	yield	28 M
D^0	yield	280 M
Λ_c	yield	2.8 M
Ψ'	yield	280 k
$\Upsilon(1S)$	yield	24 k
$DY\ \mu^+\mu^-$	yield	24 k



SMOG2 RESULTS IN 2022 : pAr @ 113 GeV

Total time: 18 min



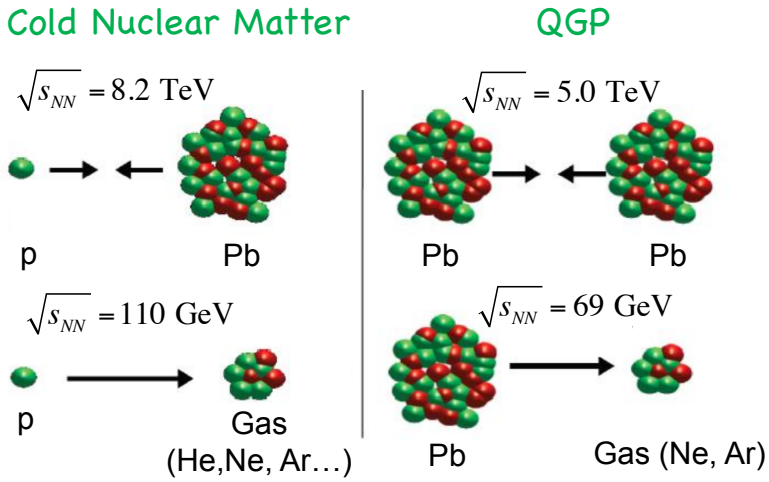


LHCb Experimental Set-up

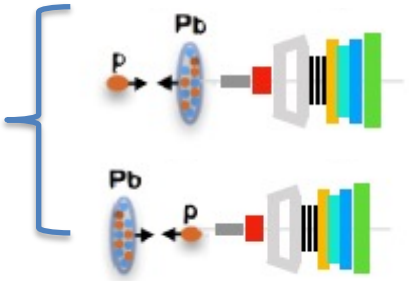
→ LHCb can make a valuable contribution to the study of nucleus-nucleus collisions in the forward region in different configurations

→ Experimental approach:

- Colliding beam mode
- Fixed target mode (SMOG)



- In colliding beam mode, the rapidity forward/backward region is covered
- For fixed target running the acceptance is central to backward.



p-Pb, forward, $1.5 < y^* < 4.5$

Pb-p, backward, $-5.5 < y^* < -2.5$

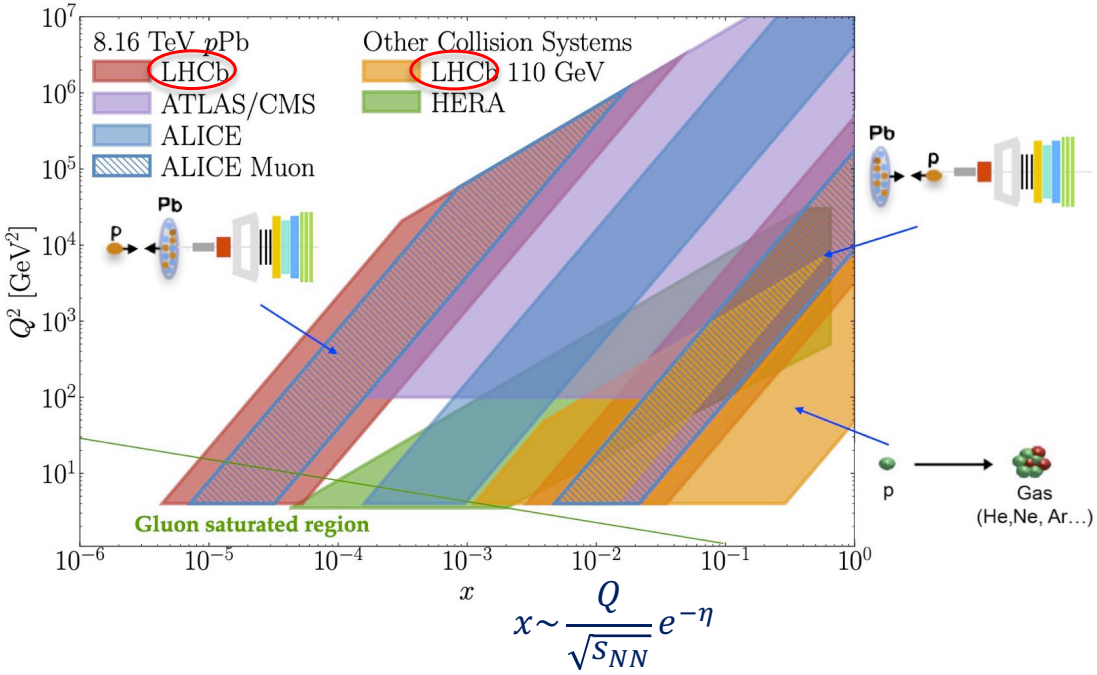
- Peripheral collisions at low pT can be precisely studied in PbPb => Partons largely unconstrained at LHC collisions energy in the forward region
- LHCb can explore the low-Bjorken x region with high precision, especially @low Q^2, down to 0 p_T

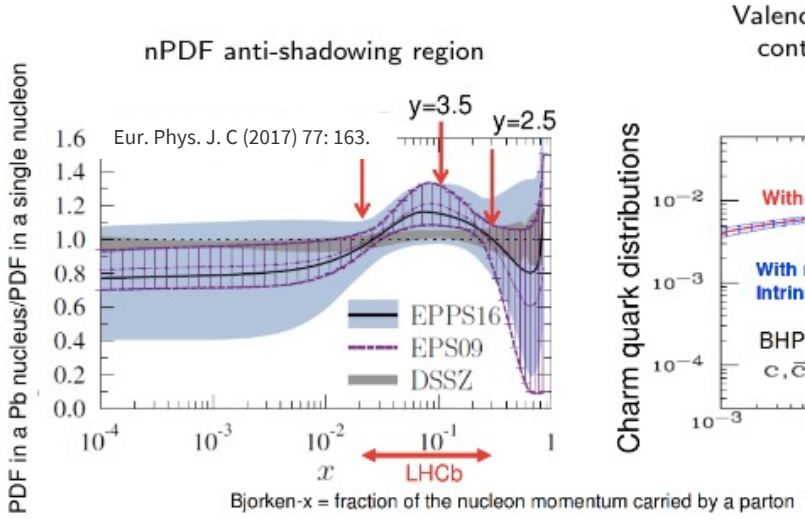
LHCb IN SMALL SYSTEMS

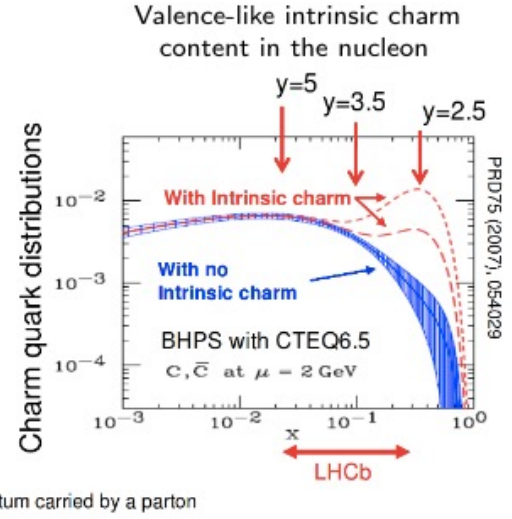
- Excellent for studying pp/Pb collisions
  - Constrain nPDFs at small and large Bjorken-x
  - Probe gluon saturation in low-x and low-Q^2 region
  - Test hadronisation mechanisms in the medium
  - Study final state effects in medium
  - Search for possible QGP droplet formation in small systems
- Unique opportunities with the fixed-target program
  - $\sqrt{s}$=69-110 GeV between SPS and RHIC
  - -3<y^*<0
  - Access nPDF in anti-shadowing region
  - Probe intrinsic charm content in the nucleon
  - Inputs to astrophysics

$Q^2 \sim m^2 + p_T^2$

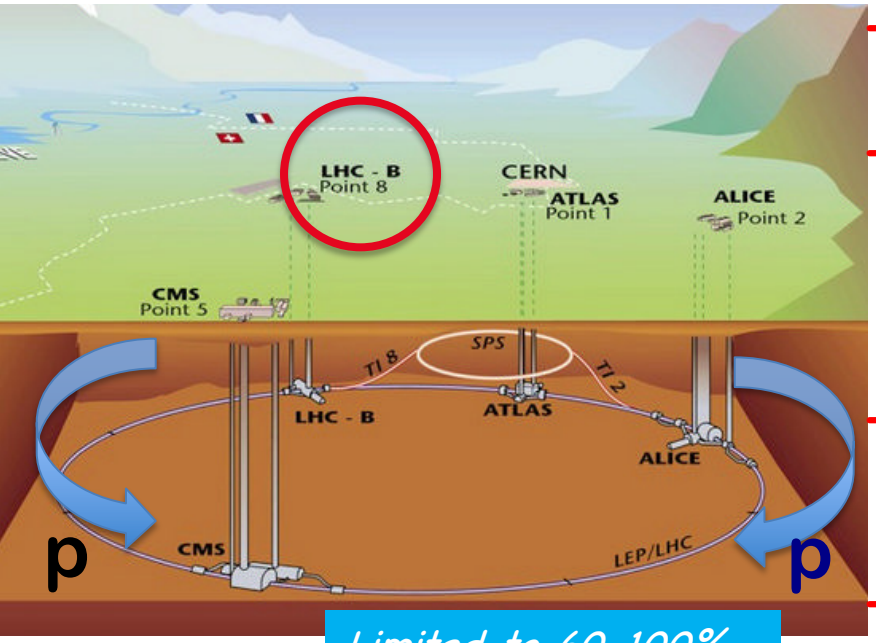
LHCb-PUB-2018-015





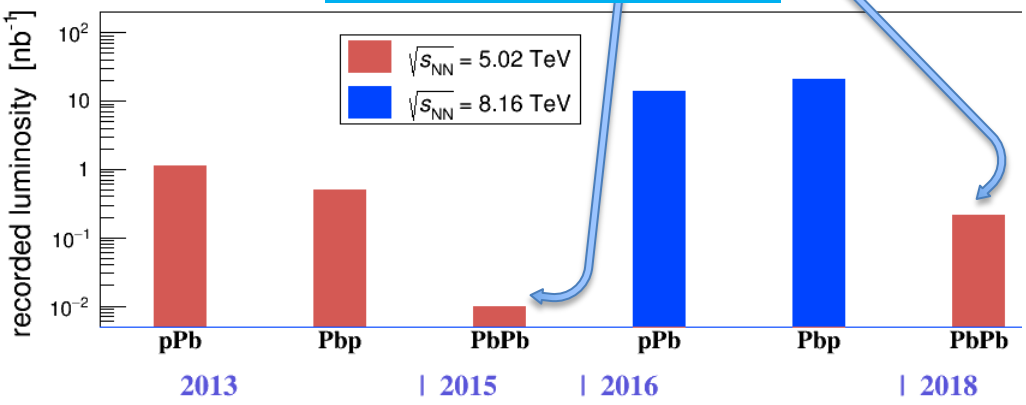


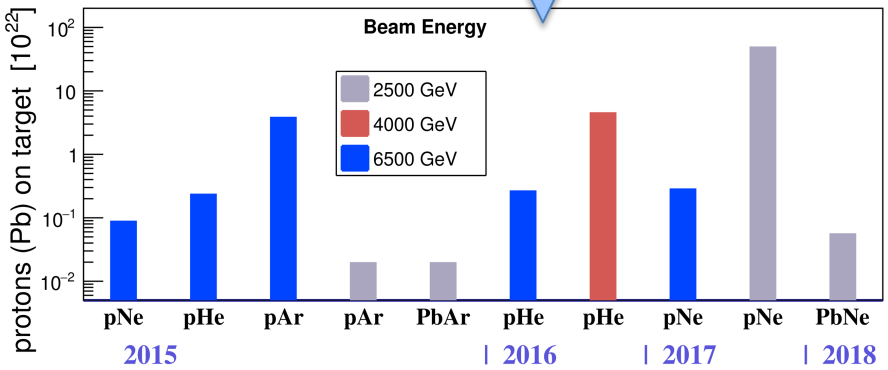
LHC and LHCb



- pp collider 2010-18@$\sqrt{s}$ = 2.76, 5, 7, 8, 13 TeV, L ≈ 9 fb^{-1}
- In 2013 & 2016 collected pPb/Pbp data @ $\sqrt{s_{NN}}$=5 and 8.16 TeV, L=1.6 & 34 nb^{-1}
  - 10^9 minimum bias collisions, ≈1M J/ψ's
- PbPb collisions @ $\sqrt{s}$=5TeV, L ≈ 10 μb^{-1} successfully collected at LHCb for the first time in 2015; already 20x in 2018 (!)
- LHCb also able to collect data in "fixed target" mode (SMOG)

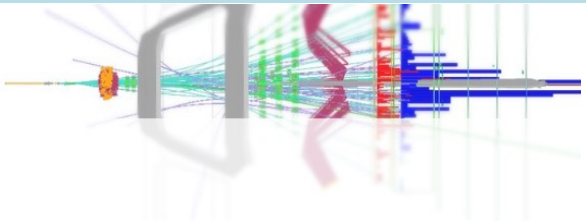
Limited to 60-100% in centrality due to detector saturation





Overview of LHCb Results

The LHCb Public results



Publications of the Ions and Fixed Target Working Group

[to restricted-access page]

ALL LHCB PUBLICATIONS

OTHER WORKING GROUPS

- B DECAYS TO CHARMONIUM
- B DECAYS TO OPEN CHARM
- CHARMLESS b-HADRON DECAYS
- b-HADRONS AND QUARKONIA
- CHARM PHYSICS
- FLAVOUR TAGGING
- LUMINOSITY
- QCD, ELECTROWEAK AND EXOTICA
- RARE DECAYS
- SEMILEPTONIC B DECAYS
- DETECTOR PERFORMANCE

List of papers (Total of 29 papers and 1319 citations)

TITLE	DOCUMENT NUMBER	JOURNAL	SUBMITTED ON	CITED
Measurement of Ξ_c^+ production in pPb collisions at $\sqrt{s_{NN}} = 8.16$ TeV at LHCb	PAPER-2022-041	PRL	11 May 2023	
J/ψ and D^0 production in $\sqrt{s_{NN}} = 68.5$ GeV PbNe collisions	PAPER-2022-011 arXiv:2211.11652 [PDF]	EPJC	21 Nov 2022	2
Charmonium production in pNe collisions at $\sqrt{s_{NN}} = 68.5$ GeV	PAPER-2022-014 arXiv:2211.11645 [PDF]	EPJC	21 Nov 2022	3
Open charm production and asymmetry in pNe collisions at $\sqrt{s_{NN}} = 68.5$ GeV	PAPER-2022-015 arXiv:2211.11633 [PDF]	EPJC	21 Nov 2022	2
Measurement of the Λ_c^+ to D^0 production cross-section ratio in peripheral PbPb collisions	PAPER-2021-046 arXiv:2210.06939 [PDF]	JHEP	13 Oct 2022	6
Study of coherent charmonium production in ultra-peripheral lead-lead collisions	PAPER-2022-012 arXiv:2206.08221 [PDF]	JHEP	16 Jun 2022	17
Measurement of the Z boson production cross-section in proton-lead collisions at $\sqrt{s_{NN}} = 8.16$TeV	PAPER-2022-009 arXiv:2205.10213 [PDF]	JHEP	20 May 2022	6
Measurement of antiproton production from antihyperon decays in pHe collisions at $\sqrt{s_{NN}} = 110$ GeV	PAPER-2022-006 arXiv:2205.09009 [PDF]	EPJC	18 May 2022	3
Measurement of the prompt D^0 nuclear modification factor in pPb collisions at $\sqrt{s_{NN}} = 8.16$ TeV	PAPER-2022-007 arXiv:2205.03936 [PDF]	PRL	08 May 2022	8
Evidence for modification of b quark hadronization in high-multiplicity pp collisions at $\sqrt{s} = 13$ TeV	PAPER-2022-001 arXiv:2204.13042 [PDF]	PRL	27 Apr 2022	11
Nuclear modification factor of neutral pions in the forward and backward regions in pPb collisions	PAPER-2021-053 arXiv:2204.10608 [PDF]	PRL	22 Apr 2022	6
Measurement of the Nuclear Modification Factor and Prompt Charged Particle Production in p – Pb and pp Collisions at $\sqrt{s_{NN}}$=5 TeV	PAPER-2021-015 arXiv:2108.13115 [PDF]	Phys. Rev. Lett. 128 (2022) 142004	30 Aug 2021	16
J/ψ photoproduction in Pb-Pb peripheral collisions at $\sqrt{s_{NN}} = 5$ TeV	PAPER-2020-043 arXiv:2108.02681 [PDF]	Phys. Rev. C105 (2022) L032201	05 Aug 2021	18
Study of coherent J/ψ production in lead-lead collisions at $\sqrt{s_{NN}} = 5$ TeV	PAPER-2021-013 arXiv:2107.03223 [PDF]	JHEP 07 (2022) 117	07 Jul 2021	25
Measurement of prompt-production cross-section ratio $\sigma(\chi_{c2})/\sigma(\chi_{c1})$ in pPb collisions at $\sqrt{s_{NN}} =$ 8.16 TeV	PAPER-2020-048 arXiv:2103.07349 [PDF]	Phys. Rev. C103 (2021) 064905	12 Mar 2021	6
Observation of multiplicity-dependent prompt $\chi_{c1}(3872)$ and $\psi(2S)$ production in pp collisions	PAPER-2020-023 arXiv:2009.06619 [PDF]	Phys. Rev. Lett. 126 (2021) 092001	14 Sep 2020	44
Observation of enhanced double parton scattering in proton-lead collisions at $\sqrt{s_{NN}} = 8.16$ TeV	PAPER-2020-010 arXiv:2007.06945 [PDF]	Phys. Rev. Lett. 125 (2020) 212001	14 Jul 2020	14
Measurement of B^+, B^0 and Λ_b^0 production in pPb collisions at $\sqrt{s_{NN}} = 8.16$ TeV	PAPER-2018-048 arXiv:1902.05599 [PDF]	Phys. Rev. D99 052011 (2019)	14 Feb 2019	48
First Measurement of Charm Production in its Fixed-Target Configuration at the LHC	PAPER-2018-023 arXiv:1810.07907 [PDF]	Phys. Rev. Lett. 122 (2019) 132002	18 Oct 2018	86
Study of Υ production in pPb collisions at $\sqrt{s_{NN}} = 8.16$ TeV	PAPER-2018-035 arXiv:1810.07655 [PDF]	JHEP 11 (2018) 194	17 Oct 2018	58
Prompt Λ_c^+ production in pPb collisions at $\sqrt{s_{NN}} = 5.02$ TeV	PAPER-2018-021 arXiv:1809.01404 [PDF]	JHEP 02 (2019) 102	05 Sep 2018	56

→ https://lhcbproject.web.cern.ch/Publications/LHCbProjectPublic/Summary_IFT.html

LHCb results at IS2023

PARALLEL TALKS

→ Wed 21 June 2023, 15:20

- Jianqiao Wang : Open heavy-flavour and quarkonia production at LHCb

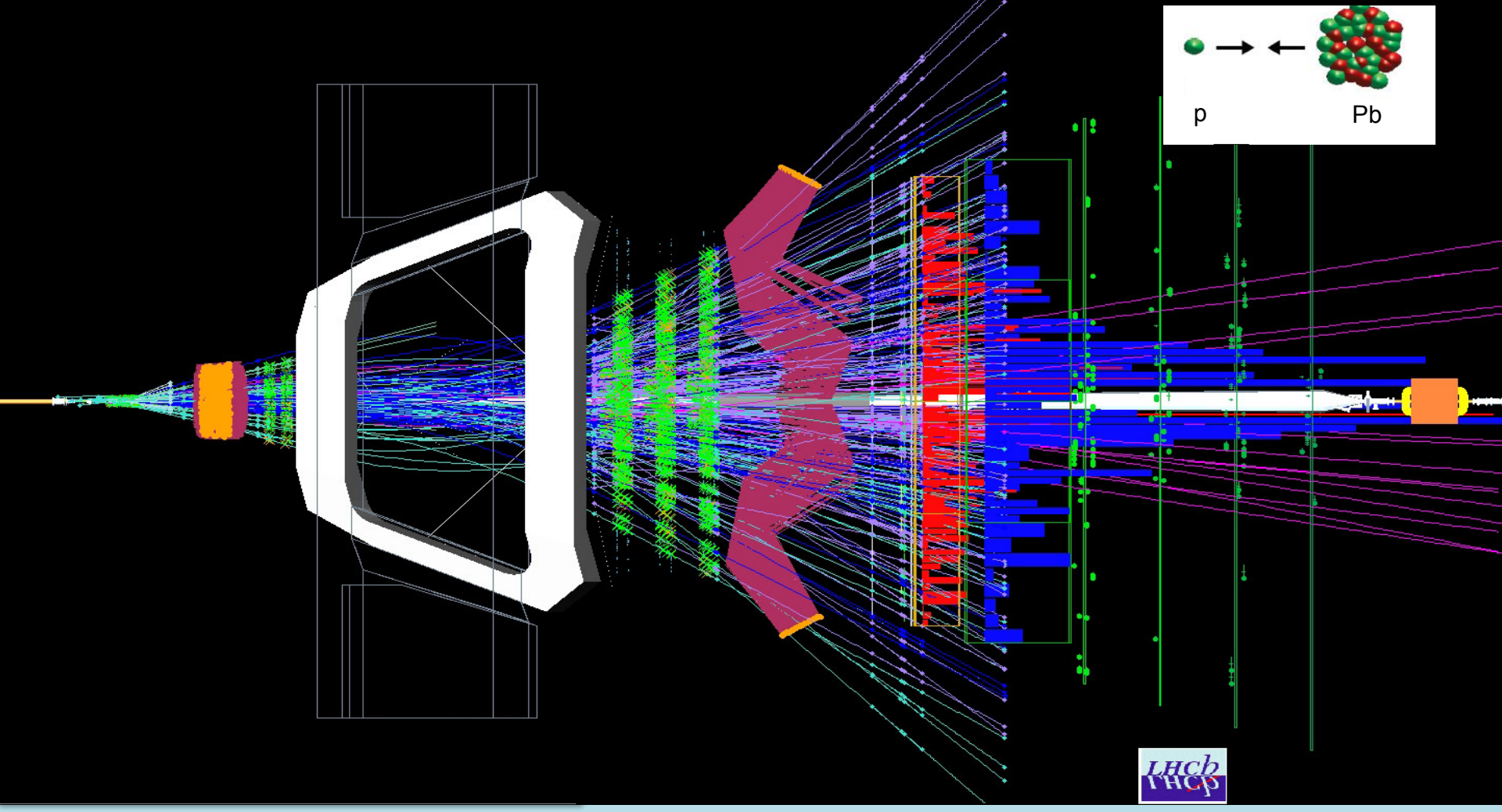
→ Wed 21 June 2023, 17:10

- Federica Fabiano: New constraints on nucleon structure from LHCb

POSTERS

→ Qiuchan Lu: New results from UPC collisions at LHCb

→ Camilla De Angelis : Probing nucleon structure with fixed-target collisions at LHCb

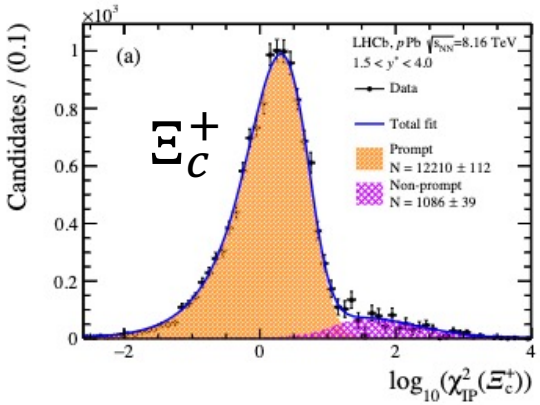


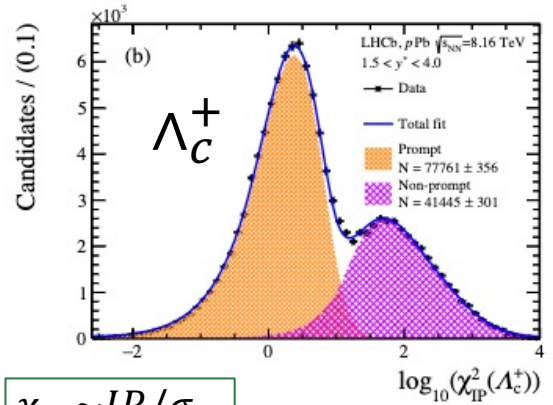
Proton-Lead

Prompt Ξ_c^+ production in pPb collisions at 8.16 TeV

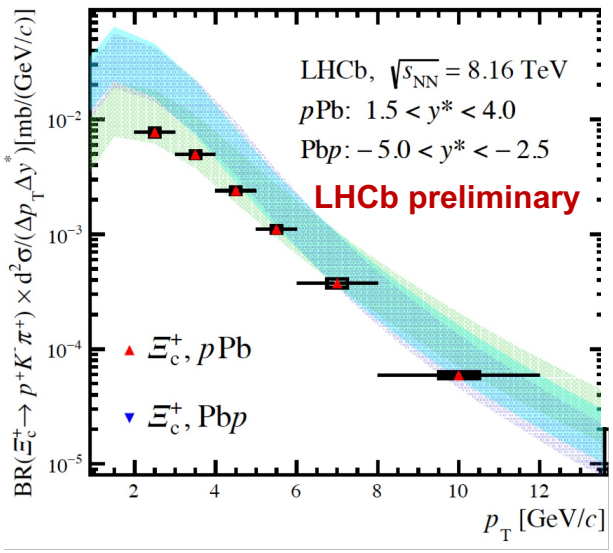
Arxiv:2305.06711, submitted to PRL

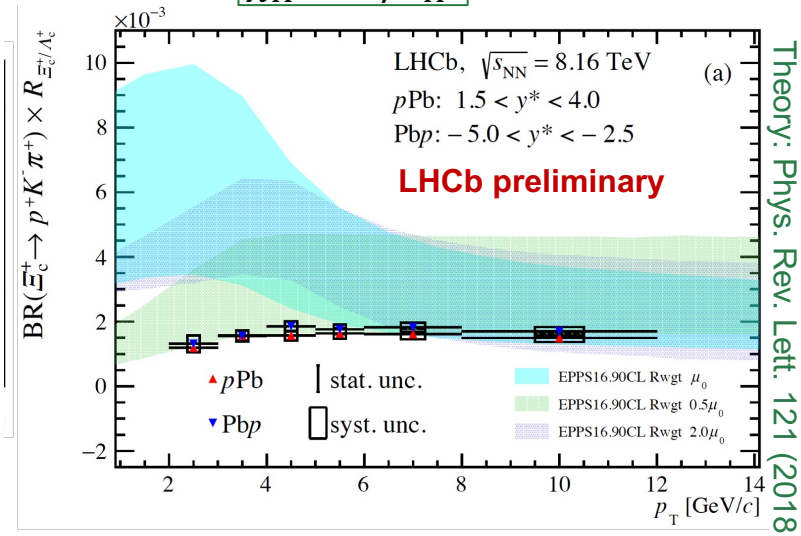
- First measurement of this meson in pPb/Pbp heavy ion collisions ($\mathcal{L} = 12.5$ & $17.4\ nb^{-1}$)
  - Decay $\Xi_c^+ \to p\, k^-\pi^+$
- Prompt Ξ_c^+ cross-section measured vs. p_T and y
- Ratio Ξ_c^+ / Λ_c^+ constant vs. p_T





$\chi_{IP} \sim IP/\sigma_{IP}$





Theory: Phys. Rev. Lett. 121 (2018) 052004

- Well described by models incorporating initial state effects due to gluon shadowing in nuclei (no clear sign of strangeness enhancement)
- Clear indications on the absolute scale of the theory

Talk of Jianqiao Wang, Wed 21st, 15:20

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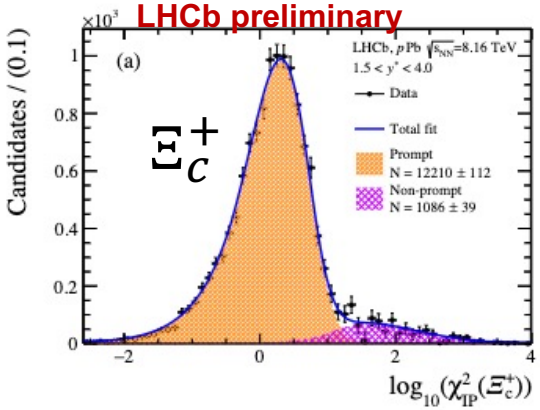

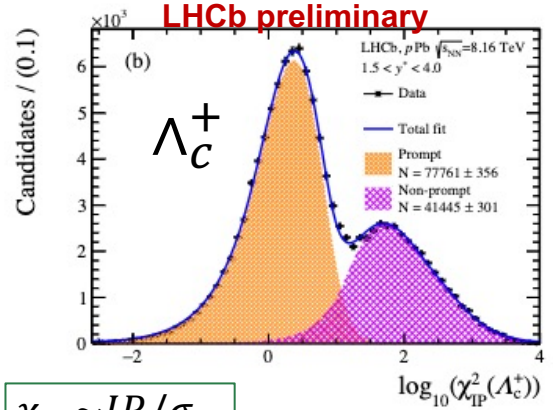

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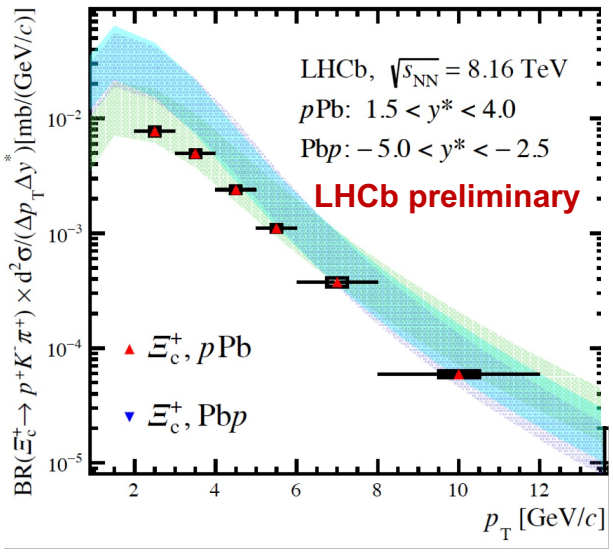

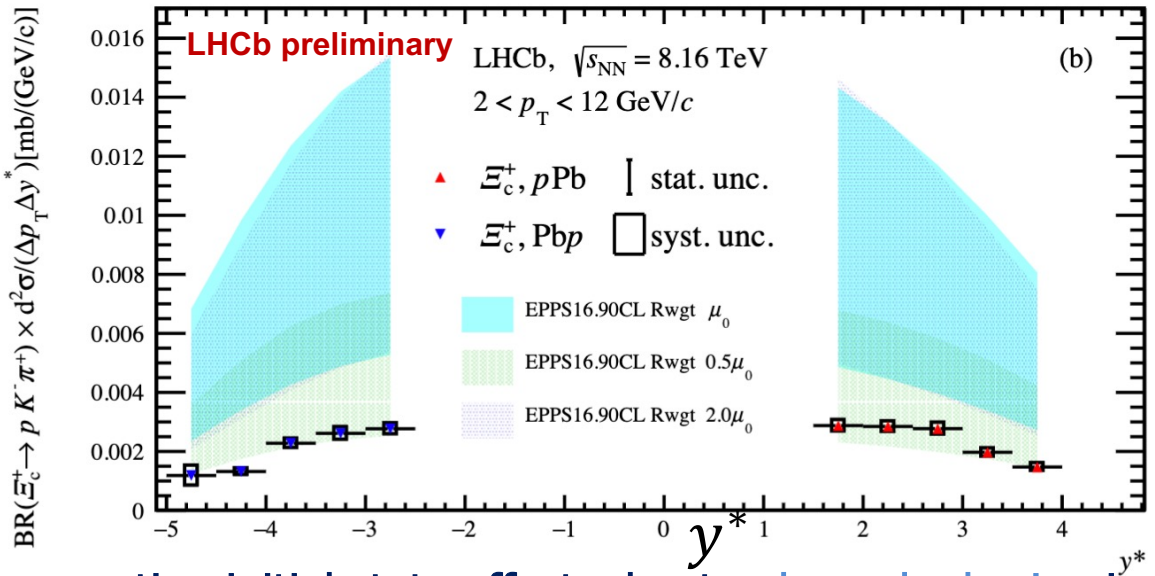

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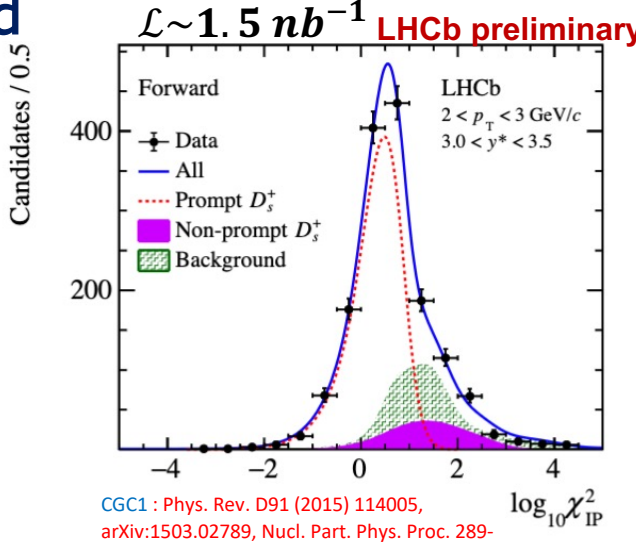
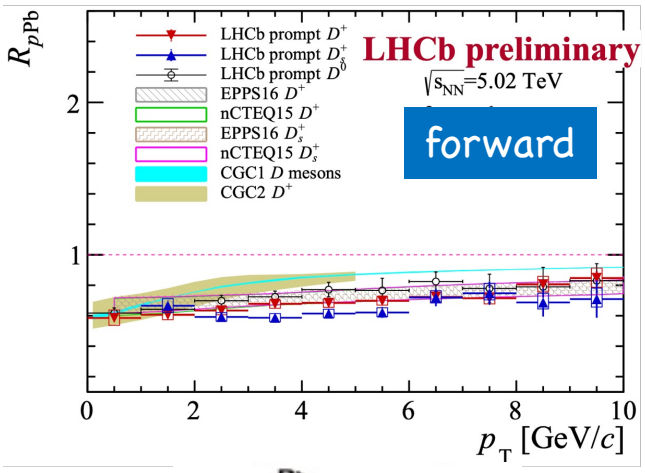
Prompt D^+, D_s^+ production in pPb collisions at 5.02 TeV

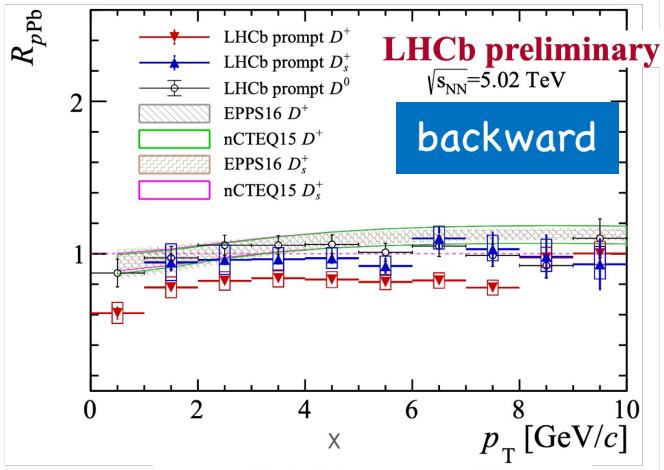
LHCb-PAPER-2023-006, in preparation

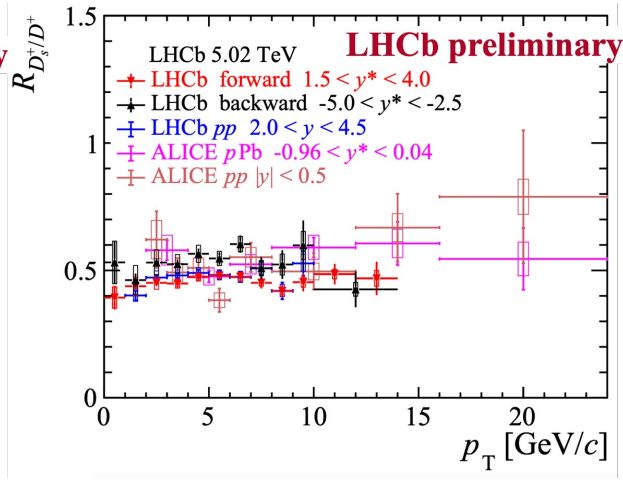
- First measurement of prompt D^+, D_s^+ @forward rapidity & 0p_T in heavy-ions collisions
- Forward :
  - Significant suppression consistent with nPDFs
  - Similar for D^+, D_s^+, D^0(JHEP 10 (2017) 090)
- Backward:
  - D_s^+ (and D^0) consistent with nPDFs
  - D_s^+/D^+ consistent with LHCb pp result and ALICE pp/pPb measurements at midrapidity→ little/no enhancement

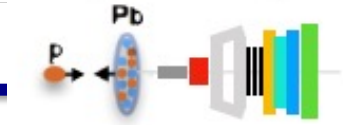


CGC1 : Phys. Rev. D91 (2015) 114005, arXiv:1503.02789, Nucl. Part. Phys. Proc. 289-290 (2017) 309, arXiv:1612.04585
CGC2: arXiv:1706.06728.
EPPS16: Eur. Phys. J. C 77 (2017)
CTEQ15: Phys. Rev. D 93 (2016) 085037









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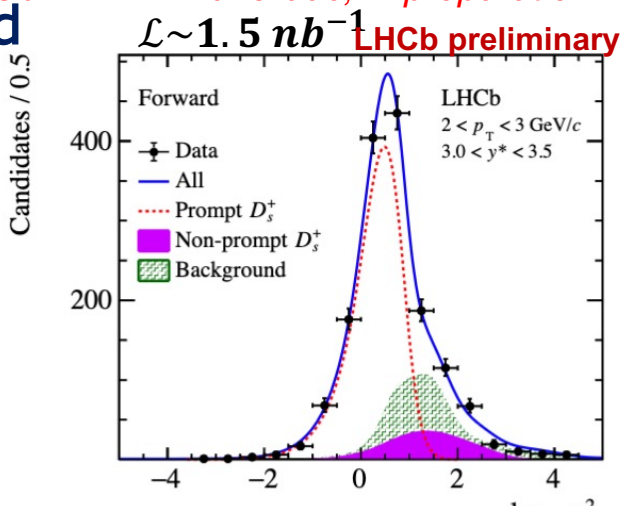

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CGC2: arXiv:1706.06728.
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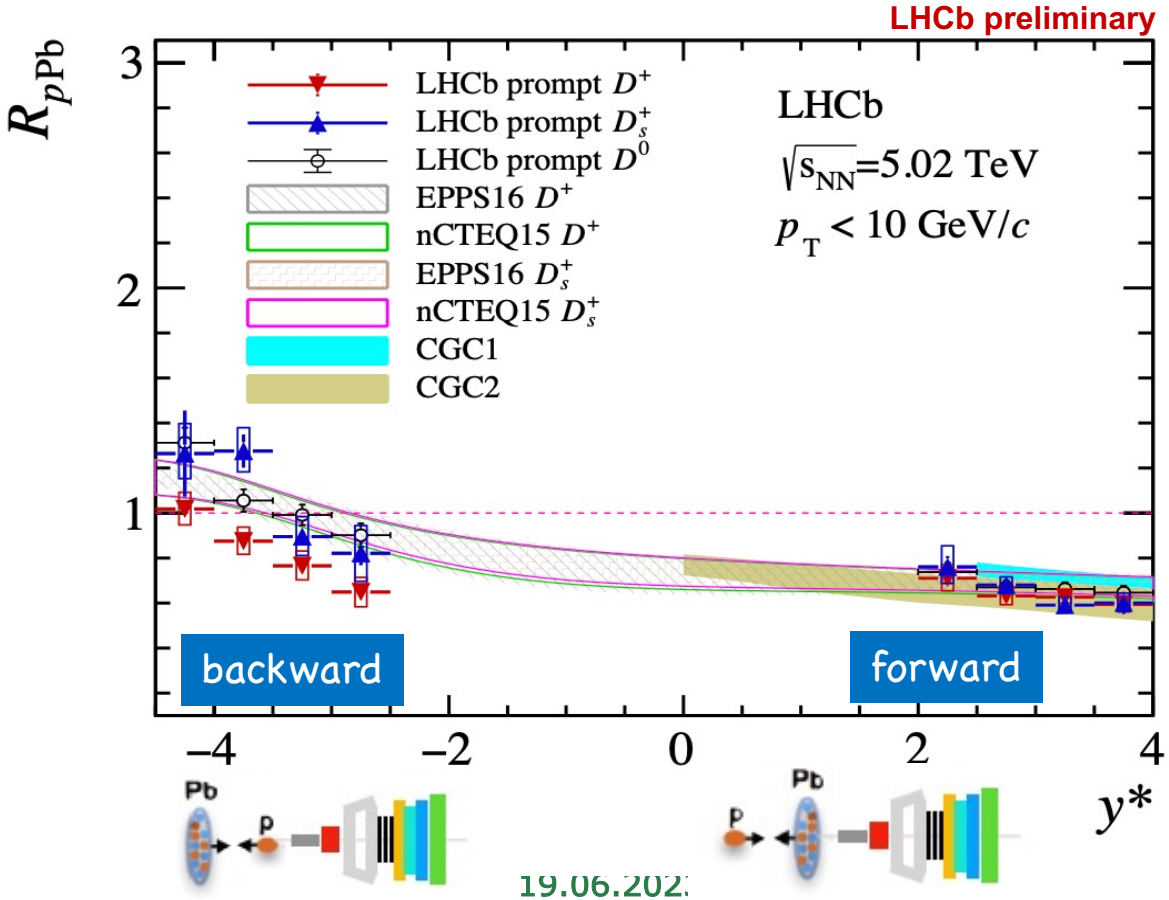
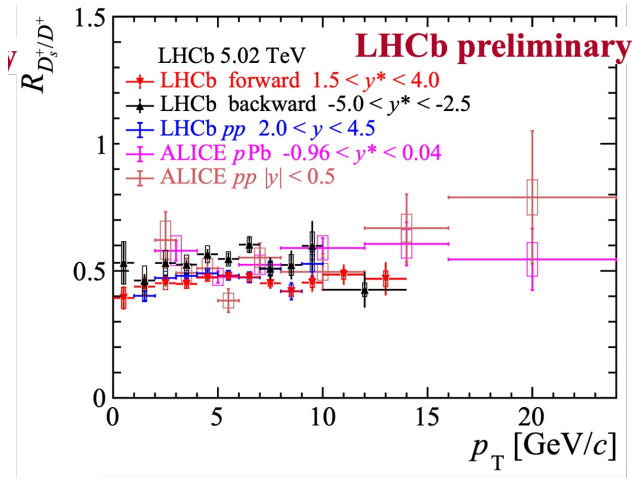
CTEQ15: Phys. Rev. D 93 (2016) 085037





Talk of Jianqiao Wang, Wed 21st, 15:20

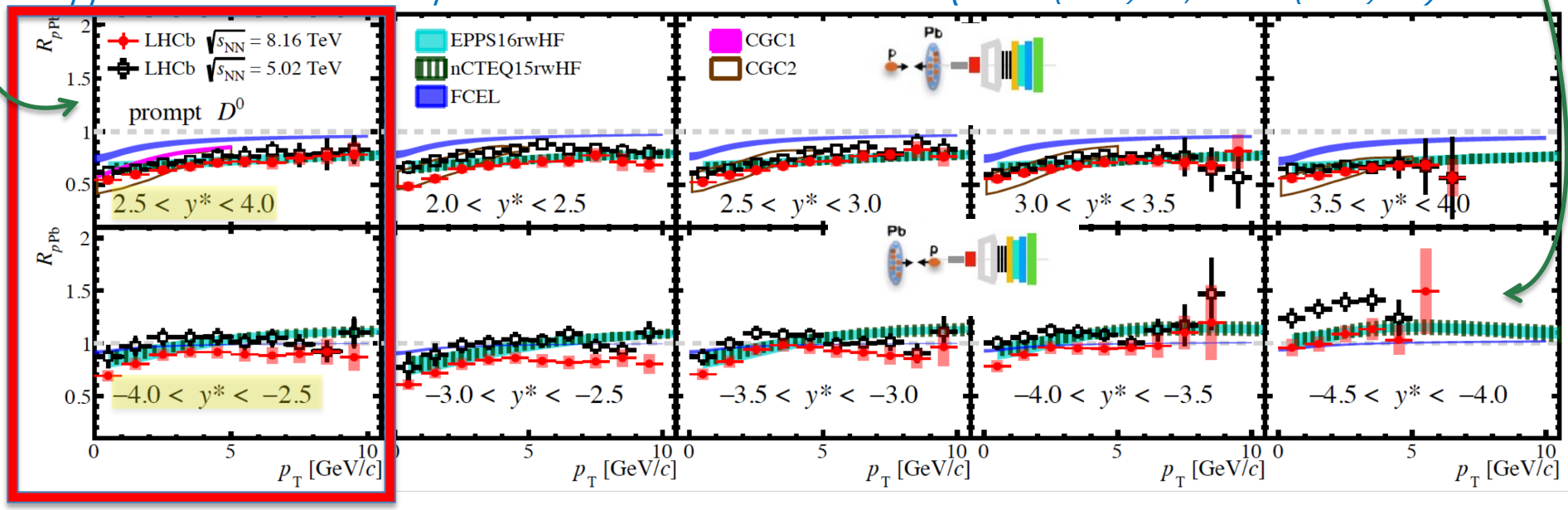
Prompt D^0 production in pPb collisions at 8.16 TeV

Arxiv:2205.03936, accepted by PRL

→ Flagship measurement to disentangle charmonia and open charm effects (at LHCb performed @ several $\sqrt{s}$'s)

- Forward :
  - Suppression observed consistent with 5 TeV result
  - In line with nPDF and CGC predictions
- Backward :
  - Data lower than nPDF at high pT
  - Room for additional effects at negative rapidities

pp reference from interpolation between 5&13 TeV data (JHEP06(2017)147; JHEP05(2017)074)



nPDF calculations do not describe simultaneously π^0 and D^0 in the backward

Talk of Jianqiao Wang, Wed 21st, 15:20

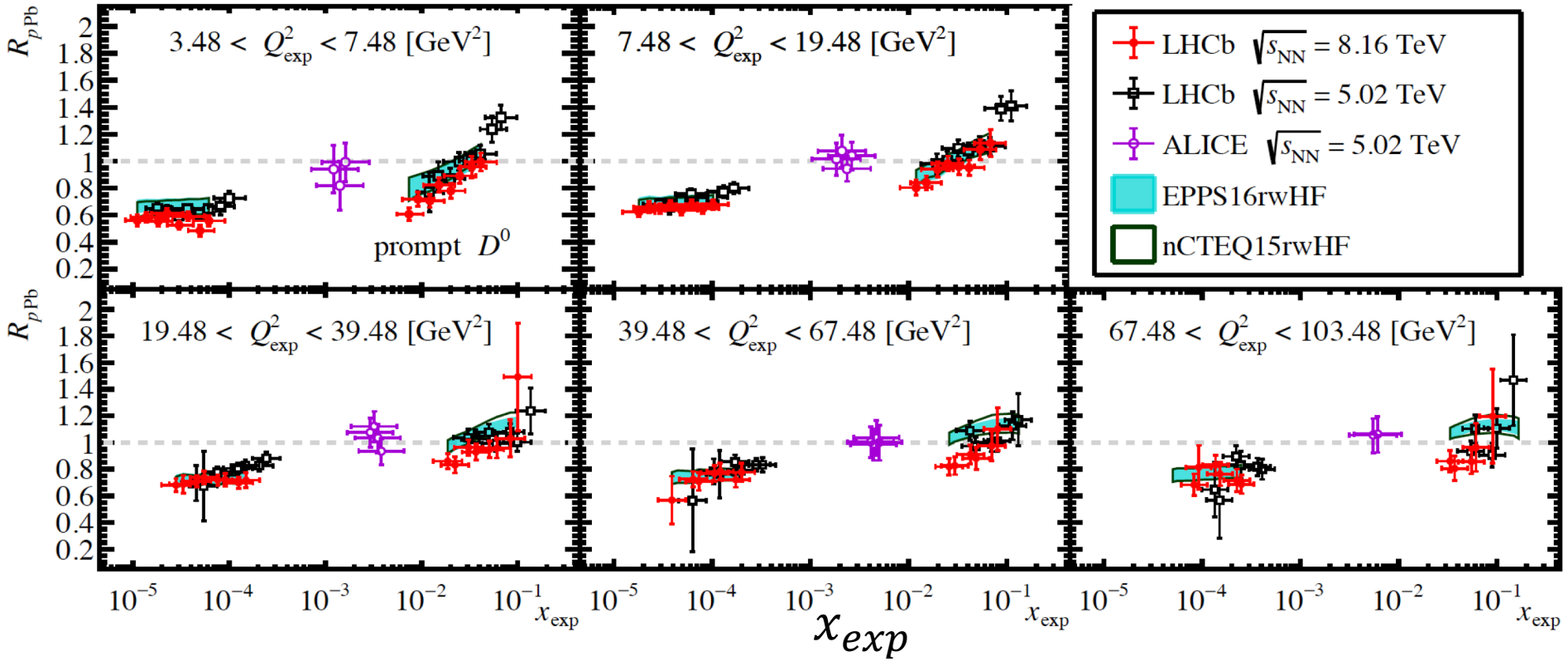
Prompt D^0 production in pPb collisions at 8.16 TeV

Arxiv:2205.03936, accepted by PRL

- → Use experimental proxies for x and Q^2
- → Data consistent at 5 and 8 TeV
- → Trend seems smooth over wide x range
- → nPDF undershoot the data at large x_{exp} and Q^2_{exp}

$$Q^2_{exp} \equiv m^2_{D^0} + p^2_T$$

$$x_{exp} \equiv 2\frac{Q_{exp}}{\sqrt{s_{NN}}}e^{-y^*}$$



pp reference from interpolation between 5&13 TeV data (JHEP06(2017)147; JHEP05(2017)074)

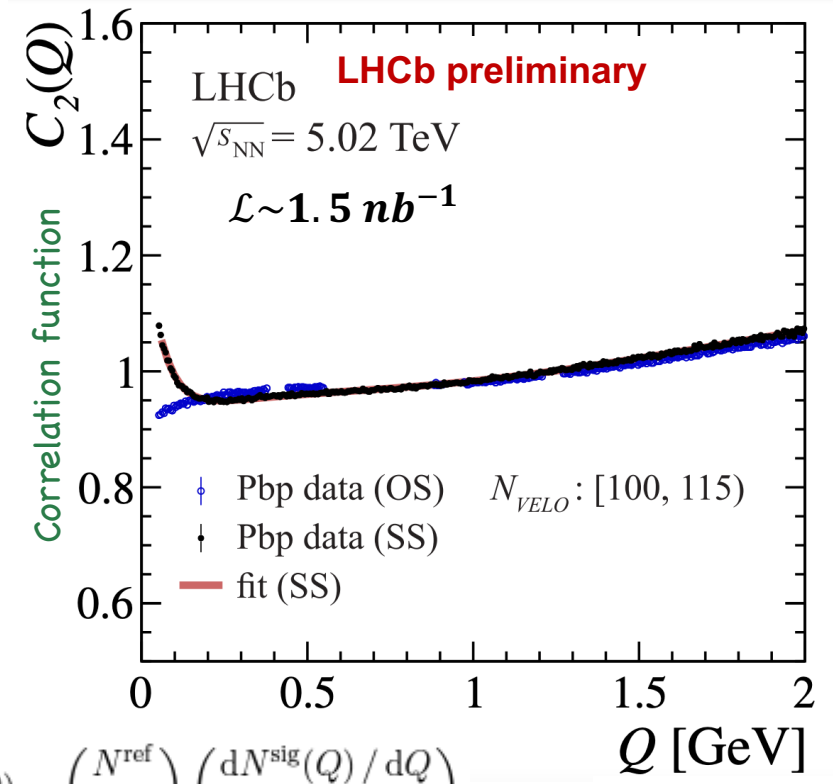
Talk of Jianqiao Wang, Wed 21st, 15:20

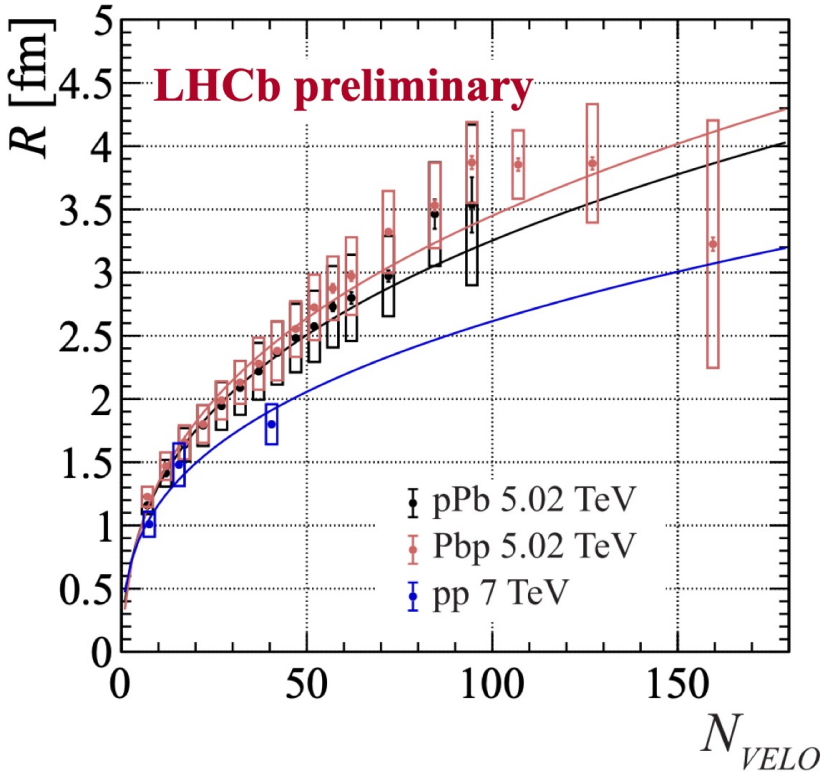
Bose-Einstein correlations in pPb@ 5.02TeV

- BEC: enhancement of prompt same-sign charged pions with small four-momentum difference squared
  - → Insight into the geometrical size of the particle emitting source
  - Measurement performed in each bin of Velo track multiplicity

LHCb-PAPER-2023-002, in preparation

→ First measurement quantum interference effects in forward region in pPb





$$C_2(Q) = \left(\frac{N^{\text{ref}}}{N^{\text{sig}}}\right)\left(\frac{dN^{\text{sig}}(Q)/dQ}{dN^{\text{ref}}(Q)/dQ}\right)$$

$$Q \equiv \sqrt{-(q_1 - q_2)^2} = \sqrt{M^2 - 4m^2}\,,$$

→ Correlation radii scale with cube root of the reconstructed charged-particle multiplicity, comparable with hydrodynamics models [Phys.Rev.C83(2011)044915, Phys.Lett.B720(2013)250]

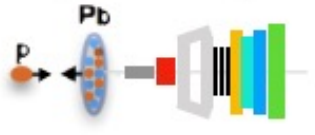
π^0 production in pPb collisions at 8.16 TeV

Arxiv:2205.10608, accepted by PRL

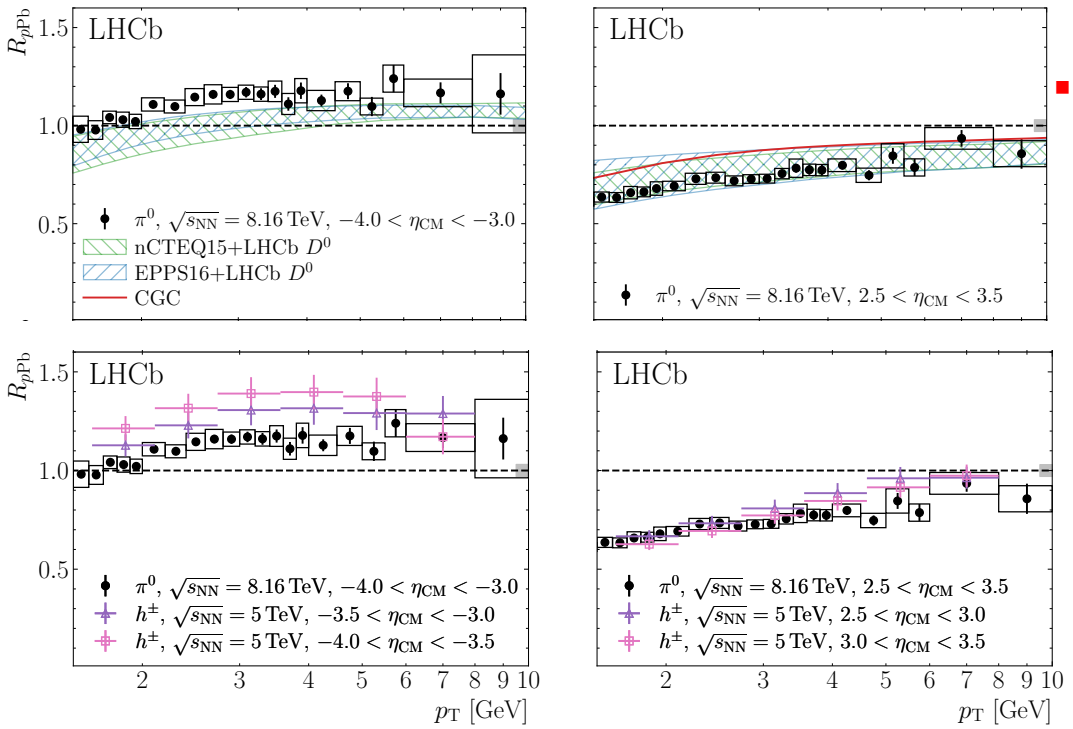
→ First measurement in forward rapidity at LHC

$\pi^0 \to \gamma\gamma$

backward



forward



- **Backward:**
  - Enhancement above nPDFs
  - Lower than charged hadrons => mass ordering effect ?

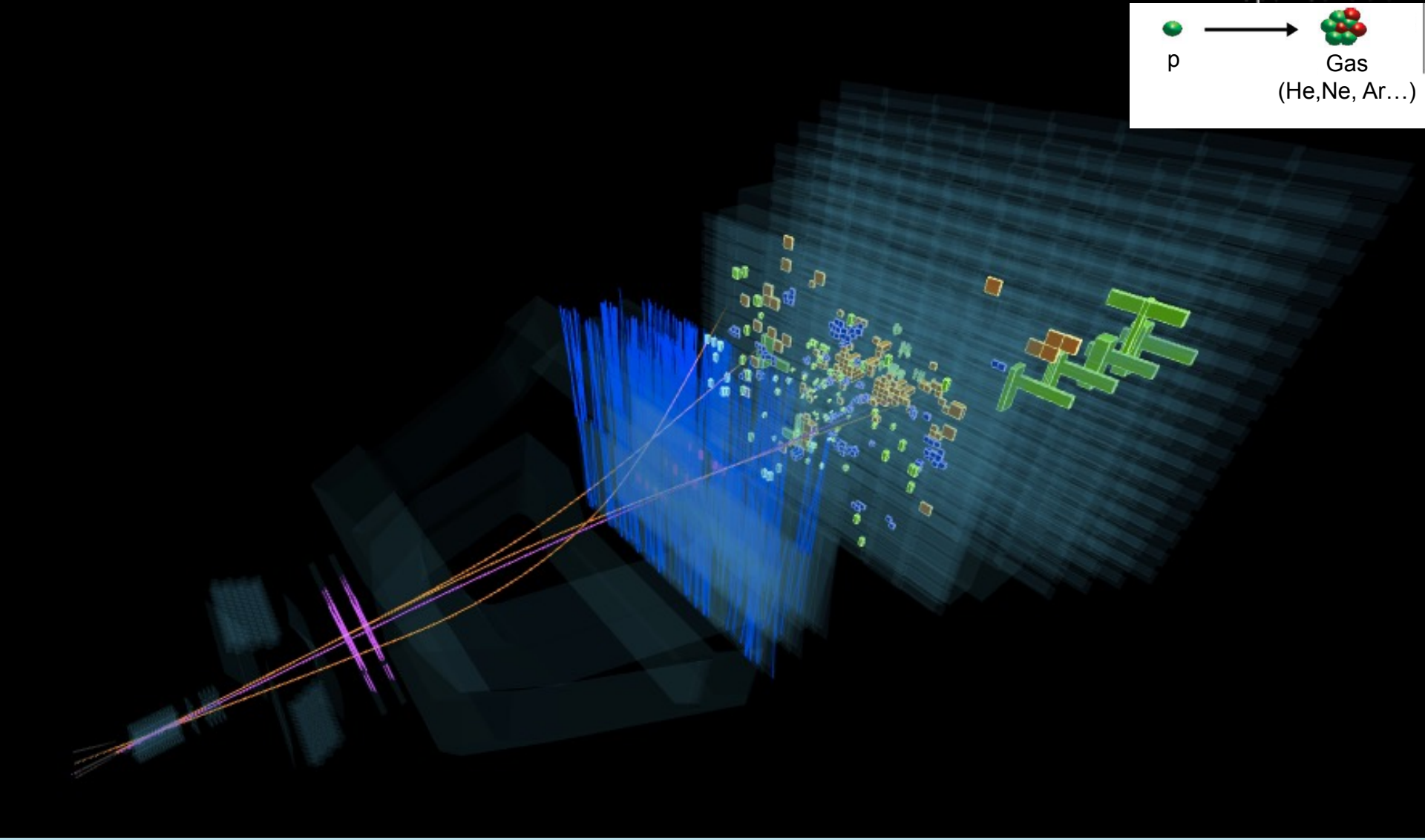
- **Forward :**
  - Measurement more precise than nPDFs predictions!
  - Consistent with result in charged hadrons

→ Open the route to direct photon production measurements

$$R_{pPb} = \frac{\sigma_{pPb}}{208 \times \sigma_{pp}}$$

pp reference from interpolation between 5&13 TeV data

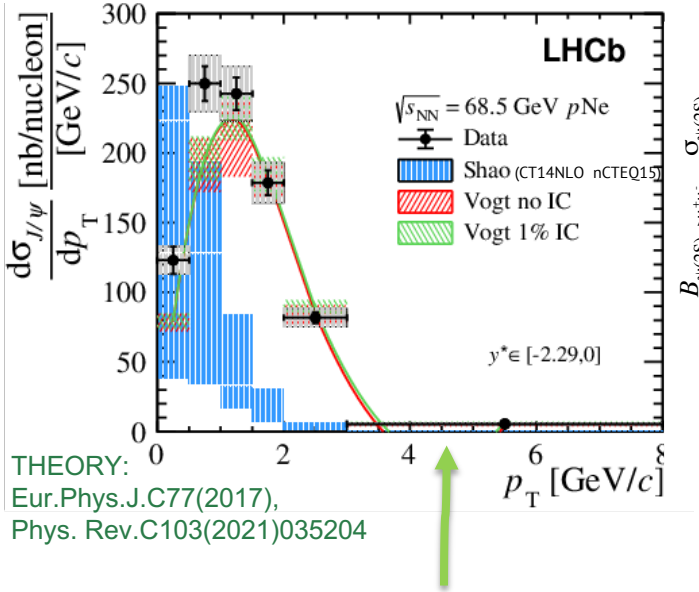
Talk of Federica Fabiano, Wed 21st , 17:10



Fixed target

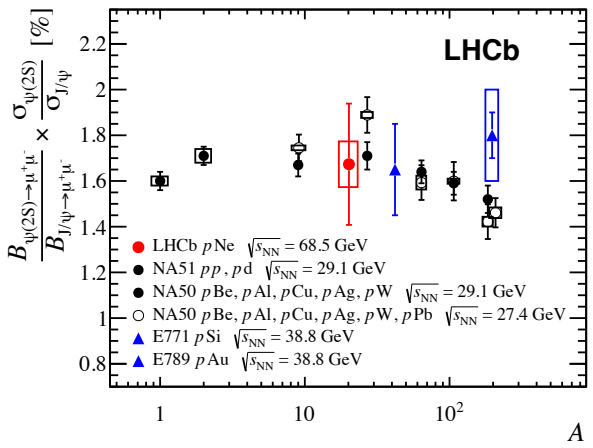
Charm Production in pNe collisions at 68.5 GeV

arxiv:2211.11633,arxiv: 2211.11645 (submitted to EPJC)



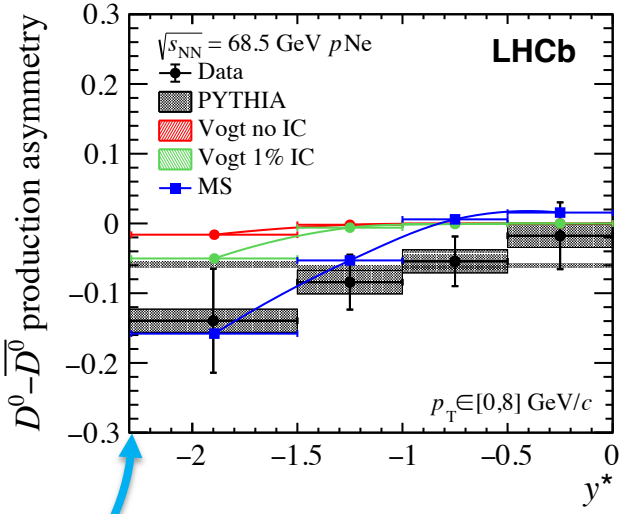
THEORY:
Eur.Phys.J.C77(2017),
Phys. Rev.C103(2021)035204

→ J/ψ cross section measured vs. p_T and y; in agreement with NLO pQCD models. Not sensitive to intrinsic charm contributions

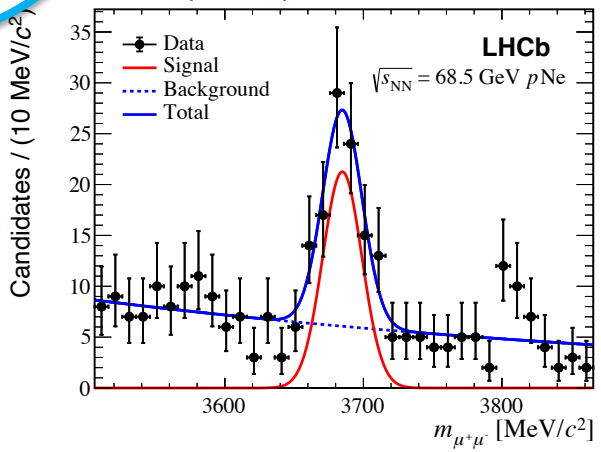


→ J/ψ to $\psi(2S)$ ratio agrees with other measurements in pA for small A (of the target)

$\mathcal{L}\sim 22\ nb^{-1}$



$N(J/\psi)$=4542±71
$N(\psi(2S))$ =76±12



→ Largest D^0 asymmetry of about 15% for y^*~2.3, consistent with the MS model

- MS = 1% Intrinsic charm + 10% Recombination
  Phys. Lett.B835(2022)137530

$$\sigma_{D^0}^{y^*\in[-2.29,0]} = 48.2 \pm 0.3\,(\text{stat.}) \pm 4.5\,(\text{syst.})\ \mu\text{b/nucleon}$$

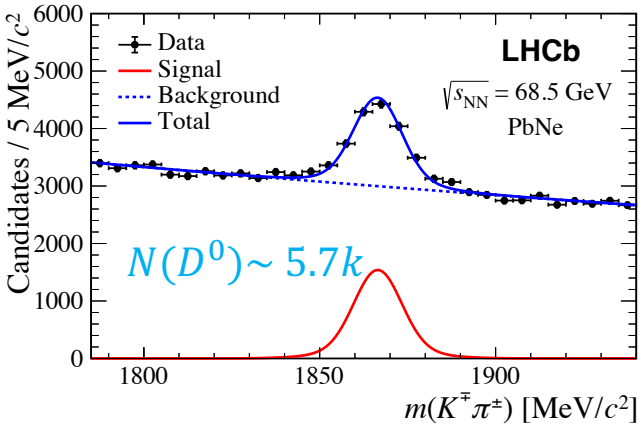
Poster of Camilla De Angelis

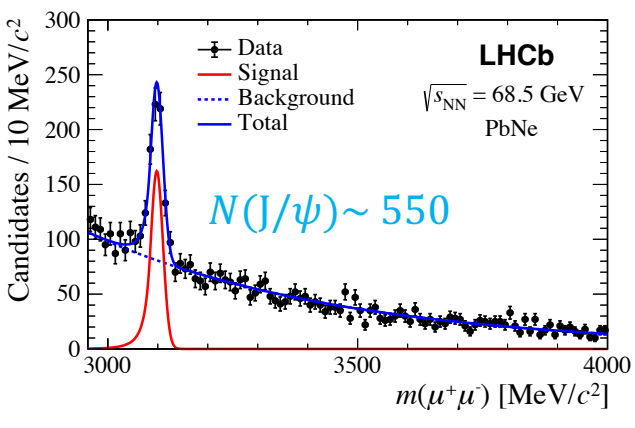
→ First measurement of $\psi(2S)$ with SMOG.

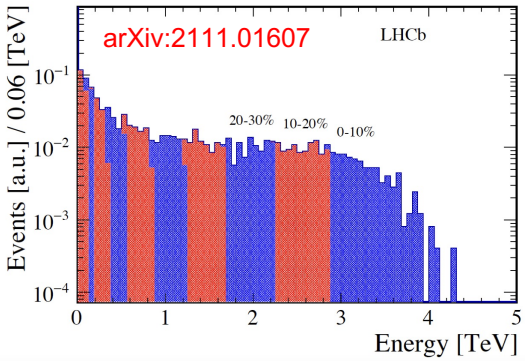
J/ψ AND D^0 PRODUCTION IN PbNe COLLISIONS AT 68.5 GeV

arxiv: 2211.11652 (submitted to EPJC)

→ First measurement in fixed-target nucleus-nucleus collisions at the LHC → Milestone for SMOG and LHCb!!!





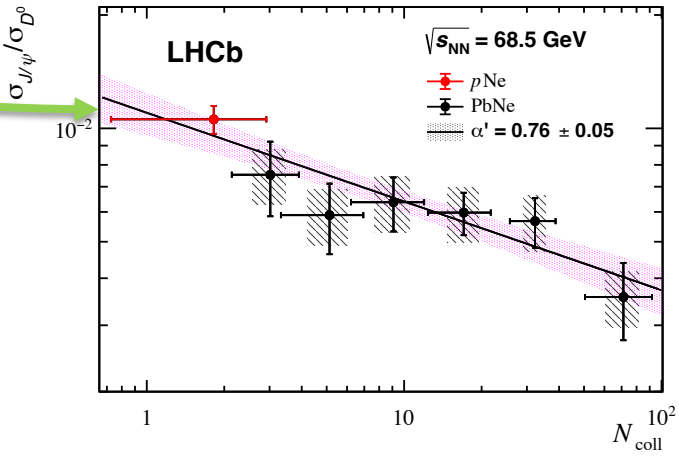


→ Potential to observe Quark Gluon Plasma ☺

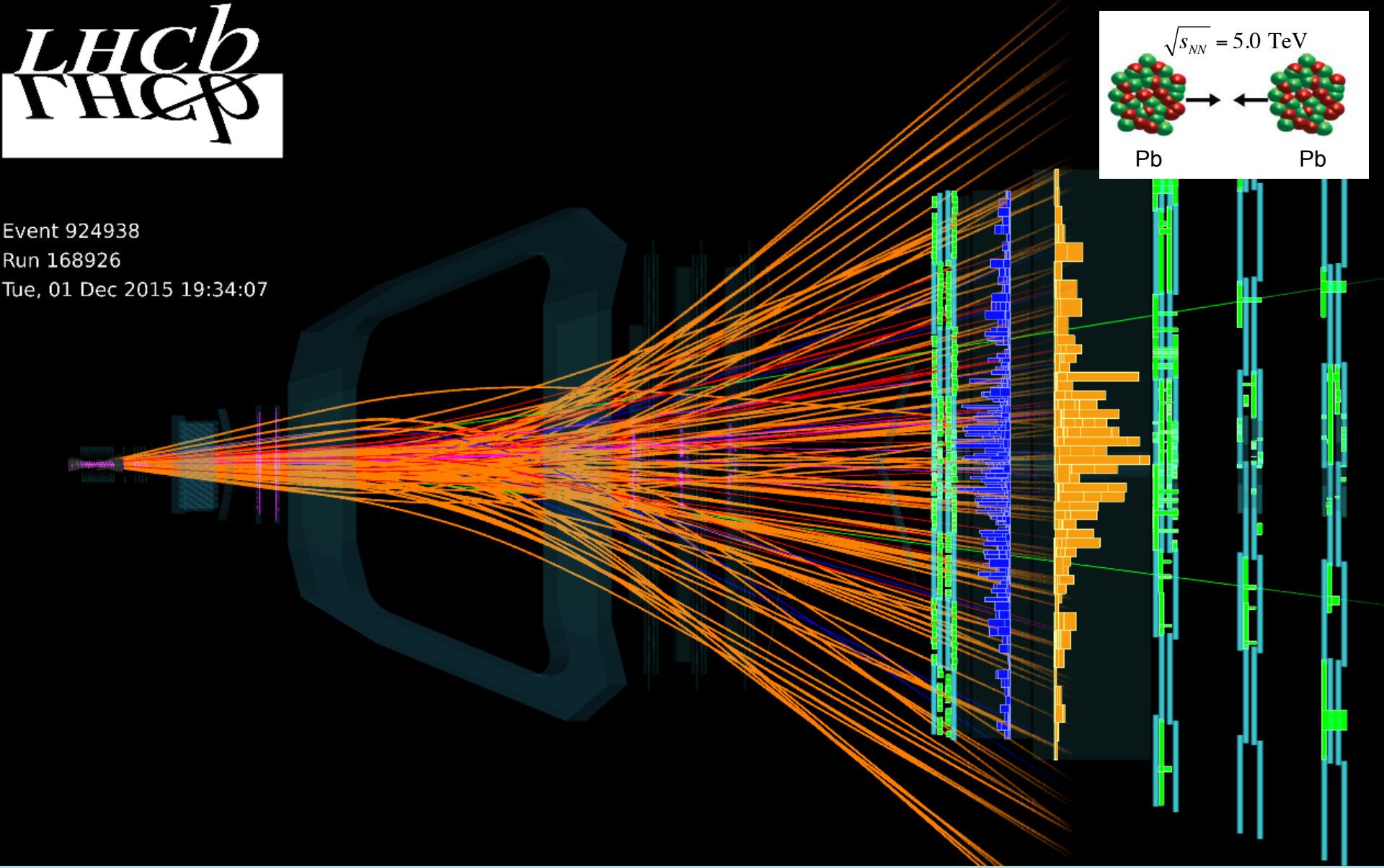
→ J/ψ further suppressed compared to D^0 in most central collisions

- BUT: No anomalous J/ψ suppression is observed which could indicate QGP formation

→ Measurement of ratio $J/\psi/D^0$ vs. N_{coll} agrees in shape with pA results from NA50
(Phys. Lett. B 410 (1997) 337)



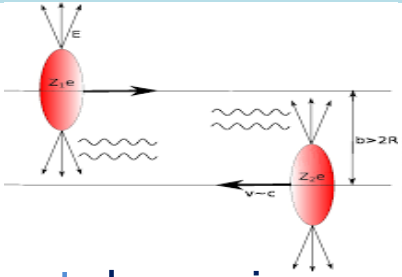
Poster of Camilla De Angelis


LHCb
Event 924938
Run 168926
Tue, 01 Dec 2015 19:34:07
$\sqrt{s_{NN}}$ = 5.0 TeV
Pb
Pb

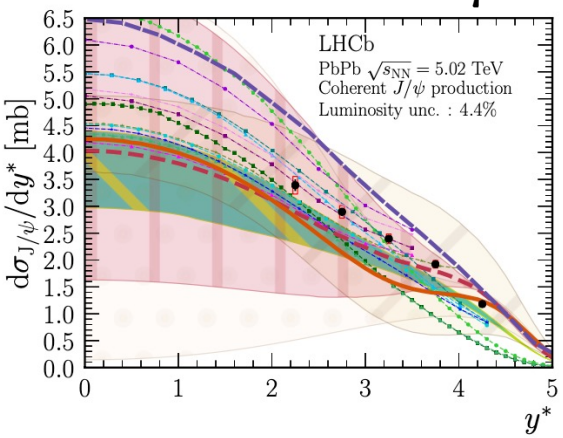
Lead-Lead

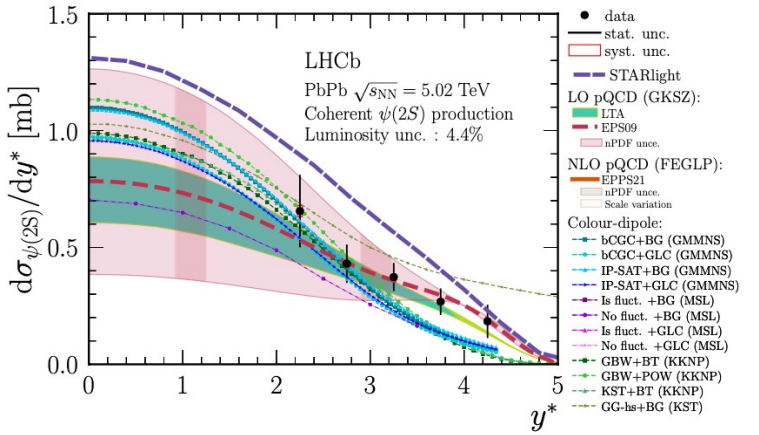
Charmonium in UPC PbPb collisions @5TeV

arXiv:2206.08221, accepted by HEP

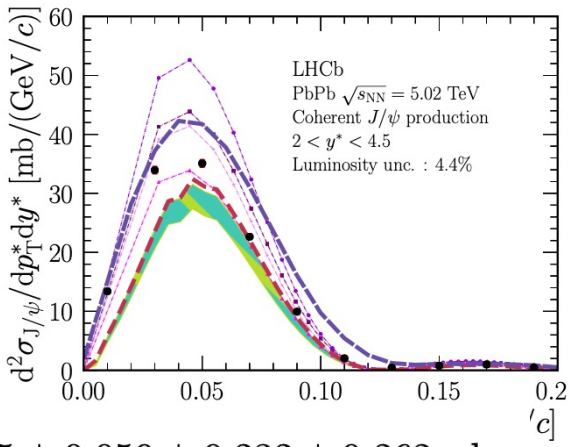


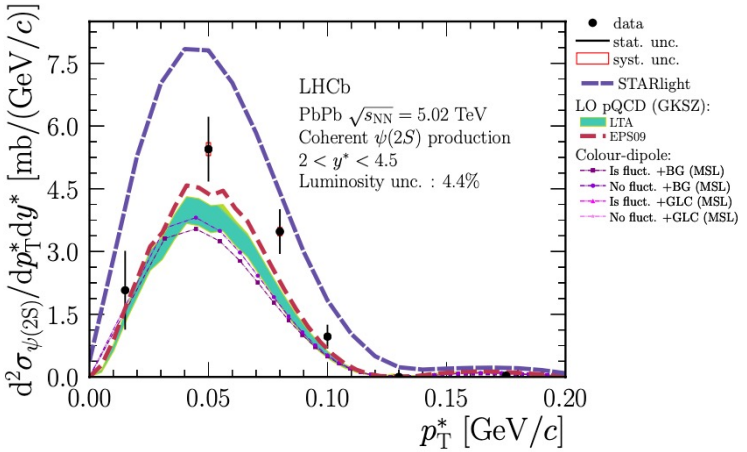
$\mathcal{L}\sim 220\ \mu b^{-1}$





- Coherent charmonia produced by interaction between photon and pomeron
- Probe of the nuclear gluon distribution functions at a scale $Q^2\sim\frac{m^2}{4}$
- First coherent $\psi(2S)$measurement in at forward rapidities at the LHC
- Precise measurement of coherent J/ψ cross section vs. p_T in UPC PbPb collisions





$$\sigma^{\rm coh}_{J/\psi} = 5.965 \pm 0.059 \pm 0.232 \pm 0.262\,{\rm mb}\,,$$

$$\sigma^{\rm coh}_{\psi(2S)} = 0.923 \pm 0.086 \pm 0.028 \pm 0.040\,{\rm mb}\,,$$

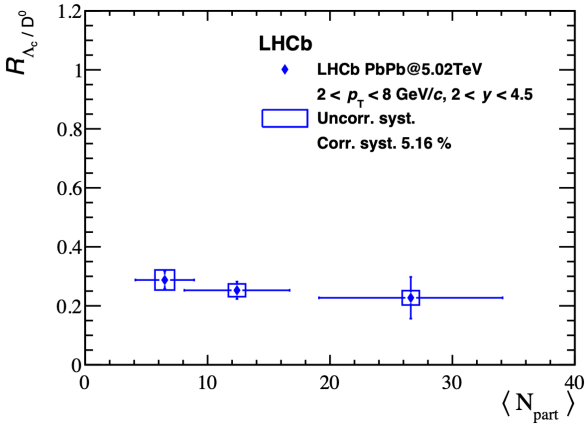
- Reasonable description of data by models based on nPDF/CGC
- J/ψ uncertainty much smaller than the spread of theoretical curves

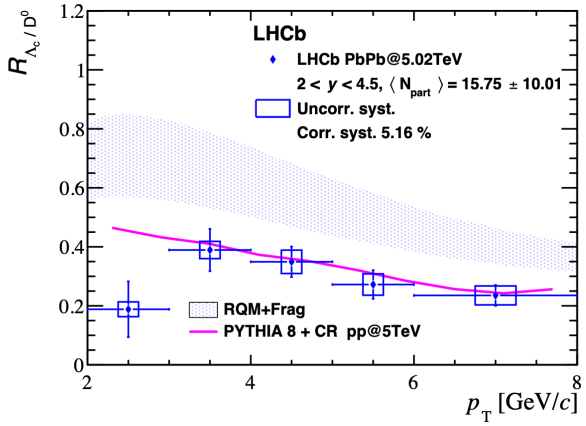
Λ_c^+ AND D^0 IN PERIPHERAL PbPb COLLISIONS

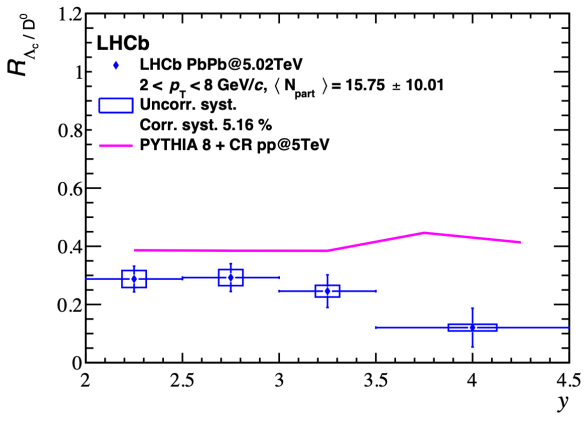
Arxiv:2210.06939, accepted by JHEP

➜ First measurement of the ratio Λ_c^+ / D^0 in PbPb in the forward

- In agreement with Pythia8 with colour reconnection within 3σ of the data; tension with the Statistical Hadronization Model







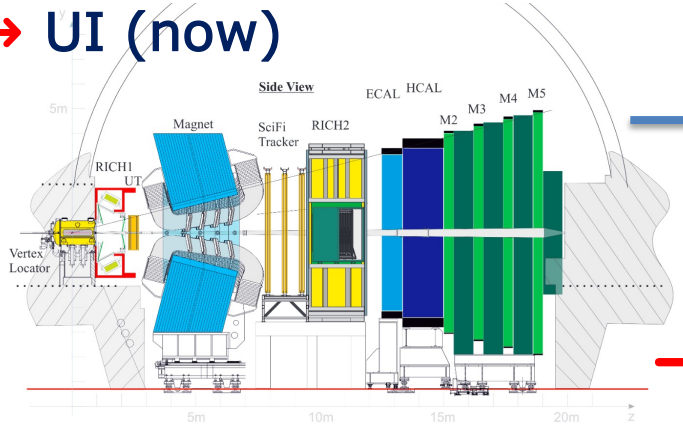
- Flat dependence vs. $\langle N_{part} \rangle$
- Decreases at low-pt
- Compatible with flat dependence vs. rapidity

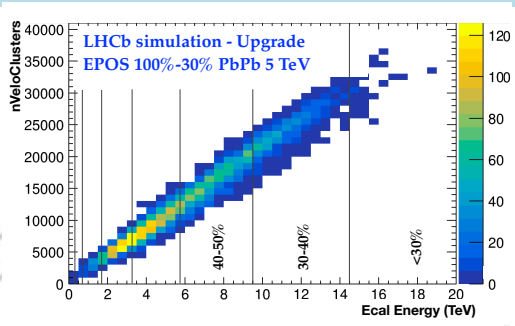
➜ Needs more data to understand charm hadronisation mechanism

- Will profit from larger dataset in the fall!

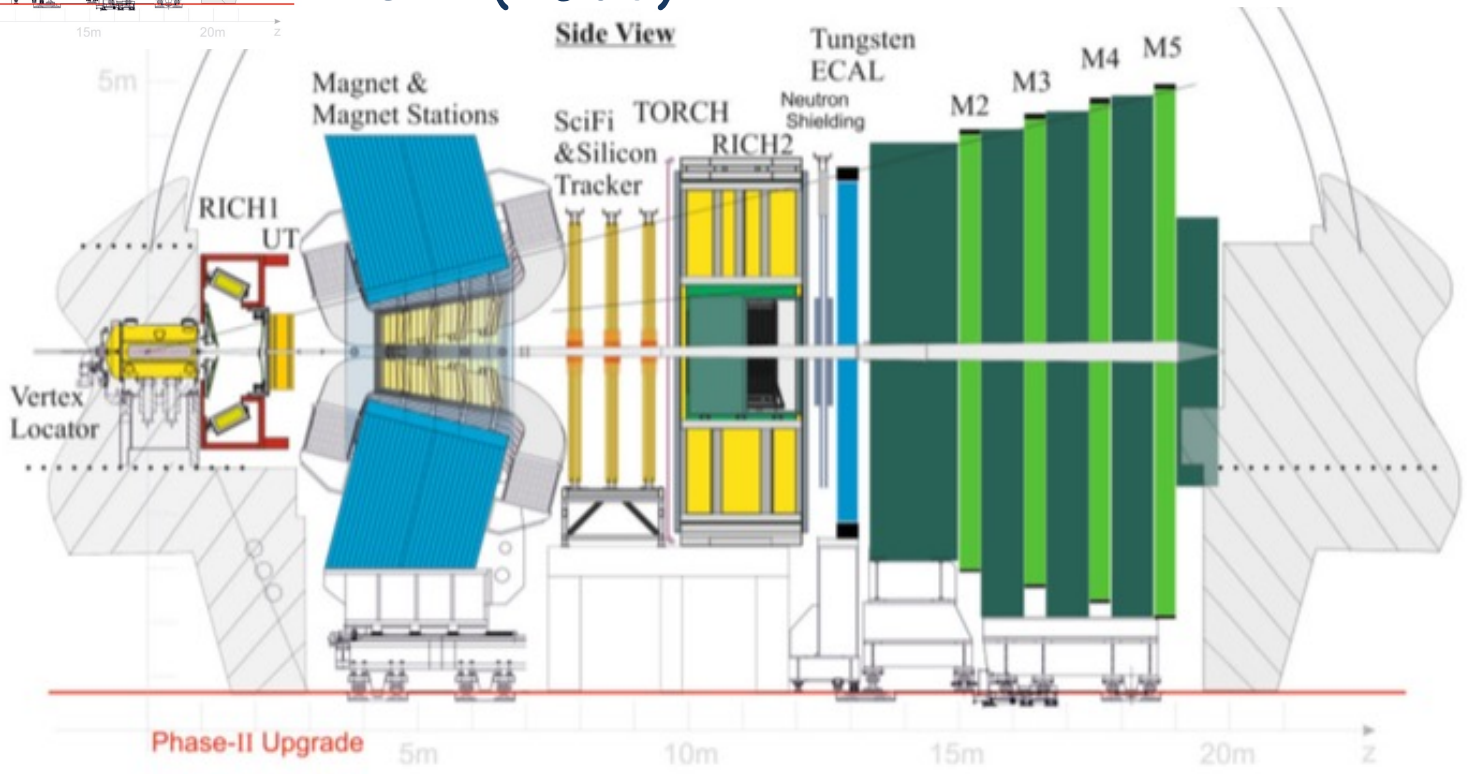
LHCb Detector(s)

→ UI (now)



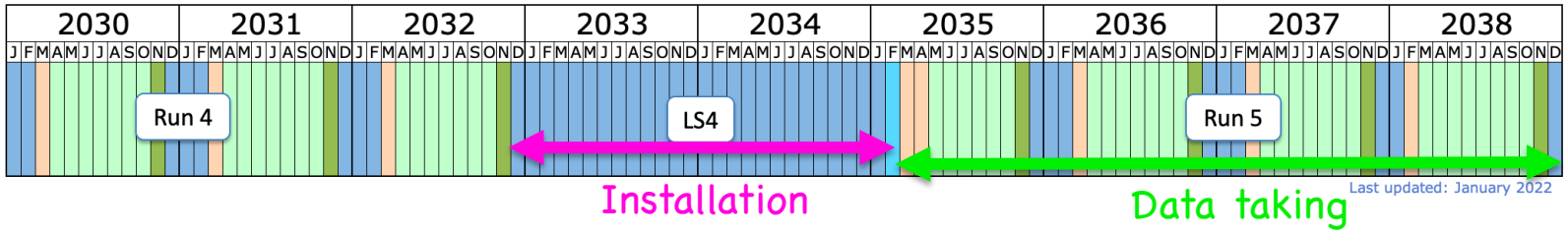


→ UII (2035) CERN-LHCC-2021-012 ; LHCB-TDR-023



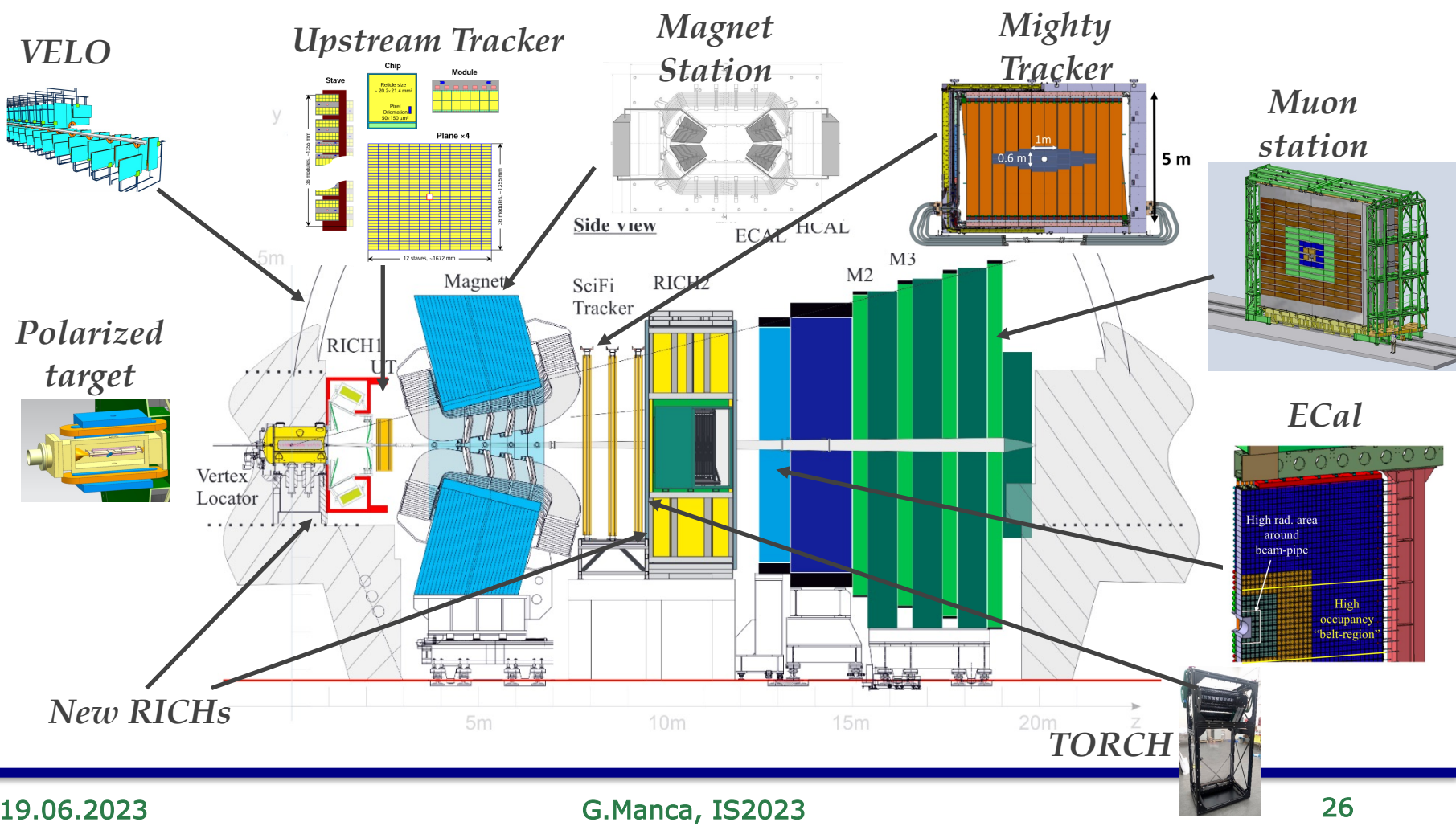
Phase II in a nutshell

CERN-LHCC-2021-012 ; LHCB-TDR-023

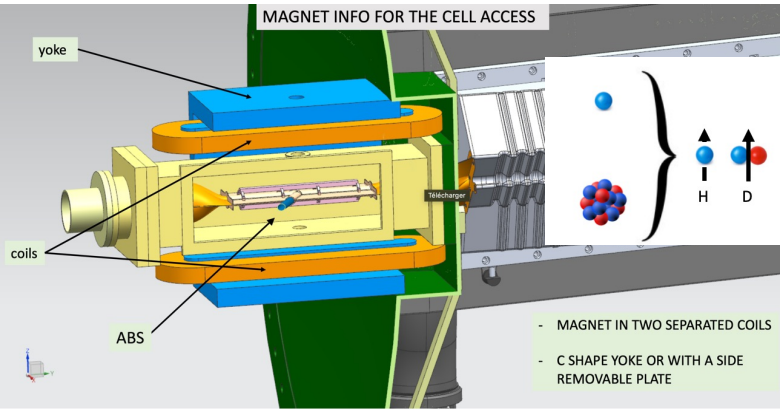


Upgrade II:

- 1.5×10^{34} cm^{-2} s^{-1}
- 50/fb/year (tot ≈ 300/fb)
- Pile-up ≈ 42 in pp



The Polarised Gas Target: LHCspin

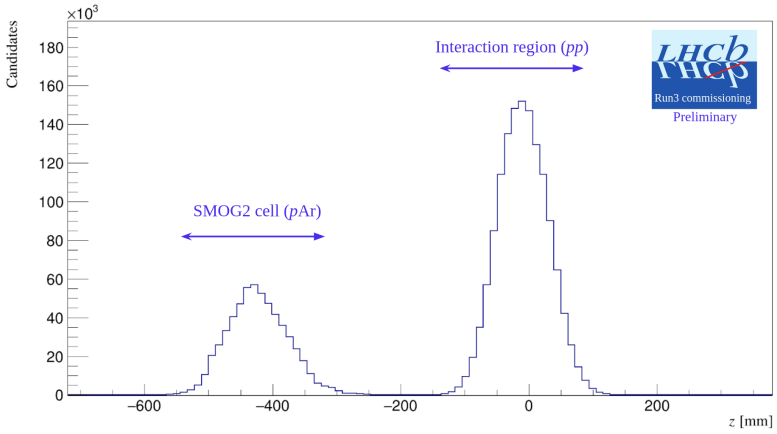


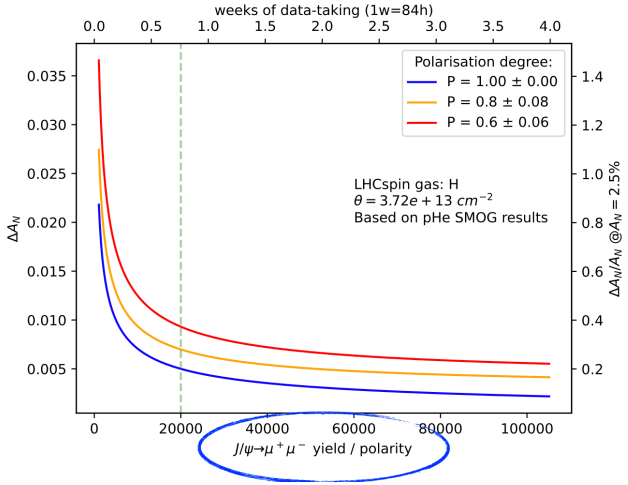
R&D has started!

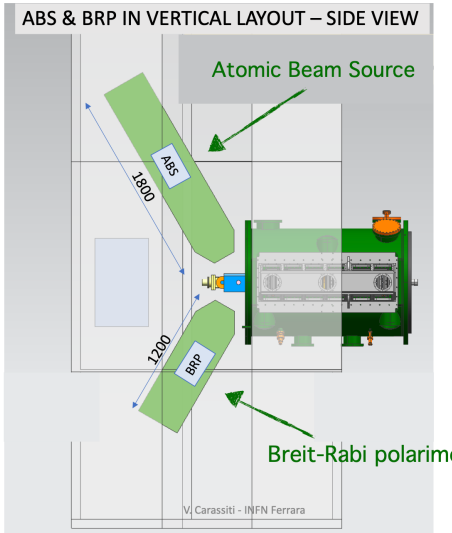
- Compact dipole magnet static → transverse field.
- Superconductive coils + iron yoke configuration fits in the space constraints.
- B = 300 mT, ΔB/B ≃ 10 %, with polarity inversion.

Achievable Luminosity (HL-LHC): $\sim 8 \times 10^{32}\ \mathrm{cm}^{-2}\ \mathrm{s}^{-1}$

- Route open by the fixed target system SMOG2 already in operation.



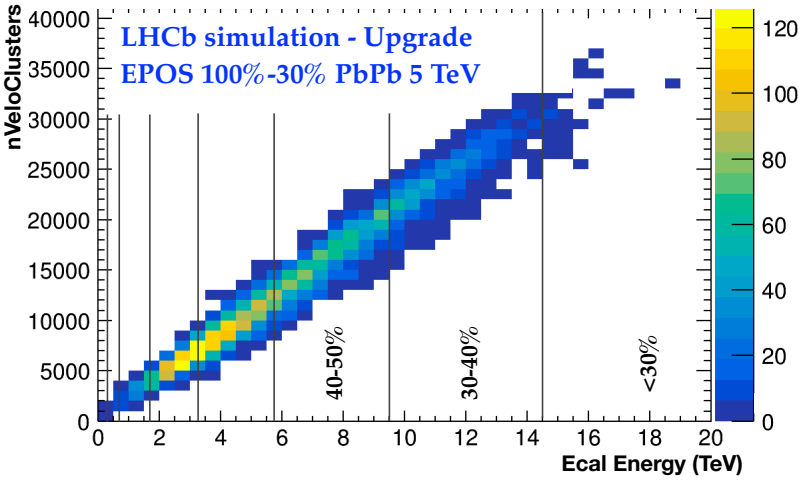


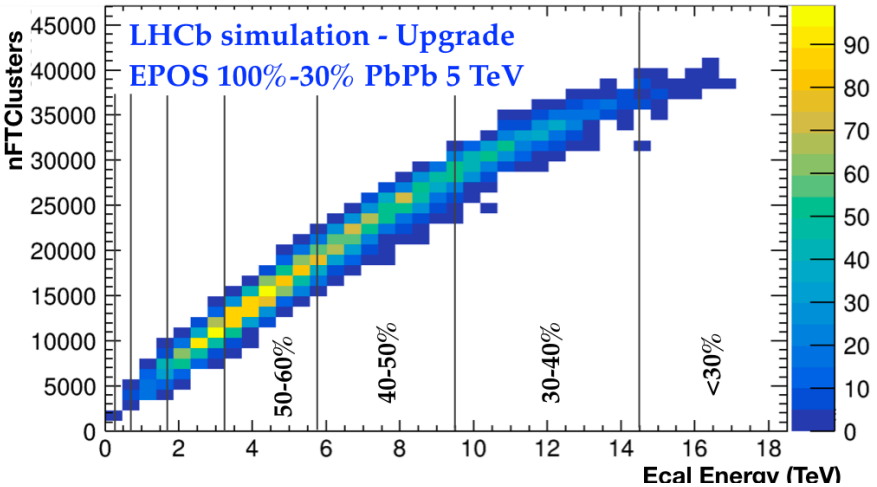


- LHC beams cannot be polarised => only way to open to this frontier physics
- Complementary to new EIC machine in US

Summary and Outlook

- ➜ LHCb successfully participated in heavy ion data-taking in 2015,2016 & 2018
  - Collected good statistics → great measurements !
  - Ready for the upcoming exciting results in Run3 (PbPb around the corner)!!
- ➜ More new results soon with Run3 data
- ➜ Many results also studied in view of the new detector in Run4/5
  - Upgraded II detector designed with improvements crucial for heavy ions
  - All centralities could be explored!
  - Yellow report on the way *LHCB-TDR-12 – 17; CERN-LHCC-2018-026; LHCB-TDR-019*





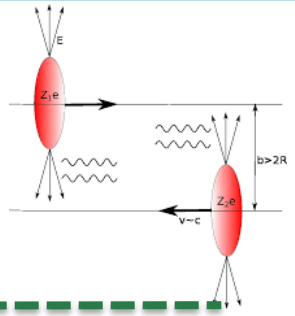
LHCB-FIGURE-2019-021

BACK-UP

Charmonium in (Ultra) Peripheral PbPb Collisions

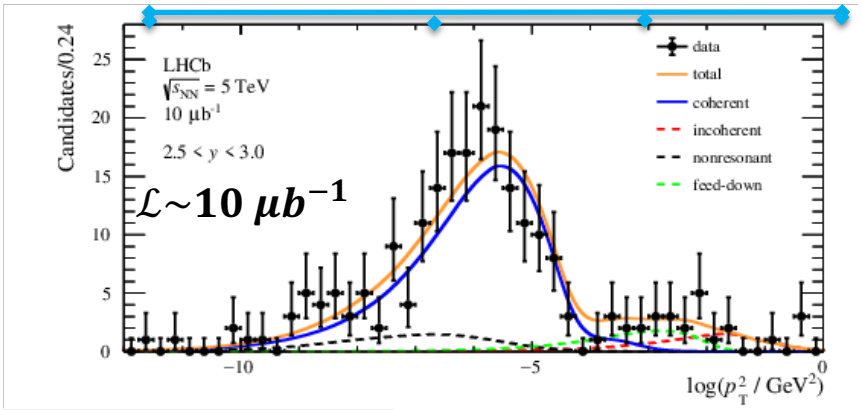
[Arxiv:2107.03223, 2108.02681]

- Two nuclei collide with each-other with impact parameter larger or barely smaller than the sum of their radii
- Photon induced interactions enhanced by strong EM field of nucleus.
  - Coherent: γ interacts with nucleus as a whole
  - Incoherent: γ interacts with the nucleons in the nucleus

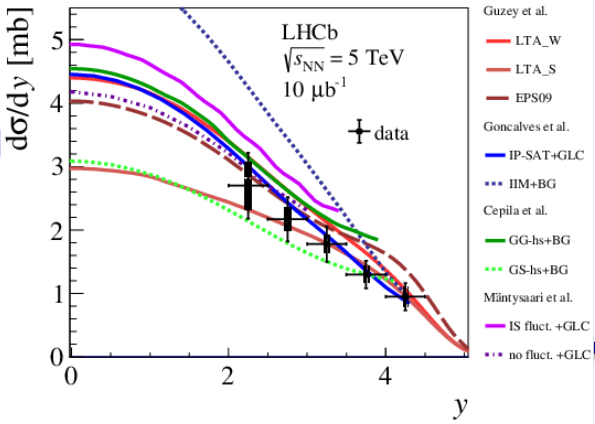


Measurement of coherent $\sigma(J/\psi)$ in UPC

2.5. 18 135. 606. (MeV/c)

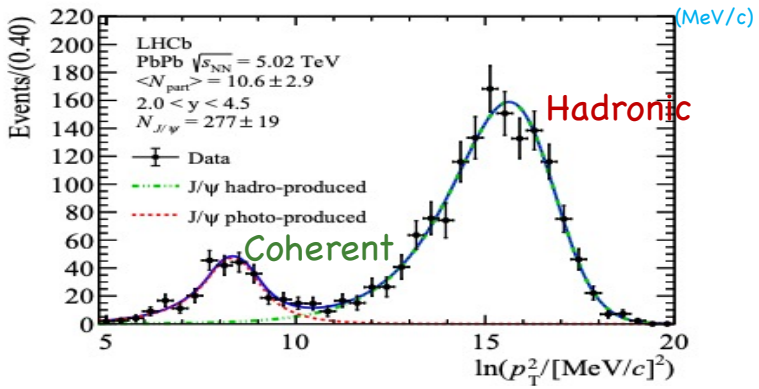


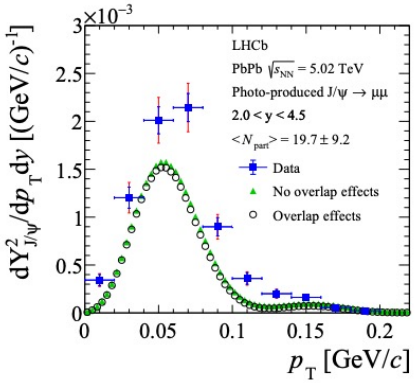
- pQCD calculation [PRC 93 (2016) 055206]
- Color dipole models [PRD 96 (2017) 094027] [PRC 97 (2018) 024901] [PLB 772 (2017) 832]

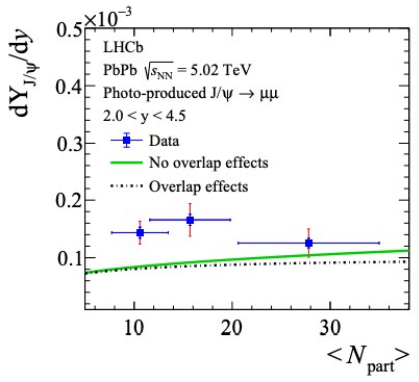


Measurement of yield in PC

12. 150 1800 22x10^3 (MeV/c)

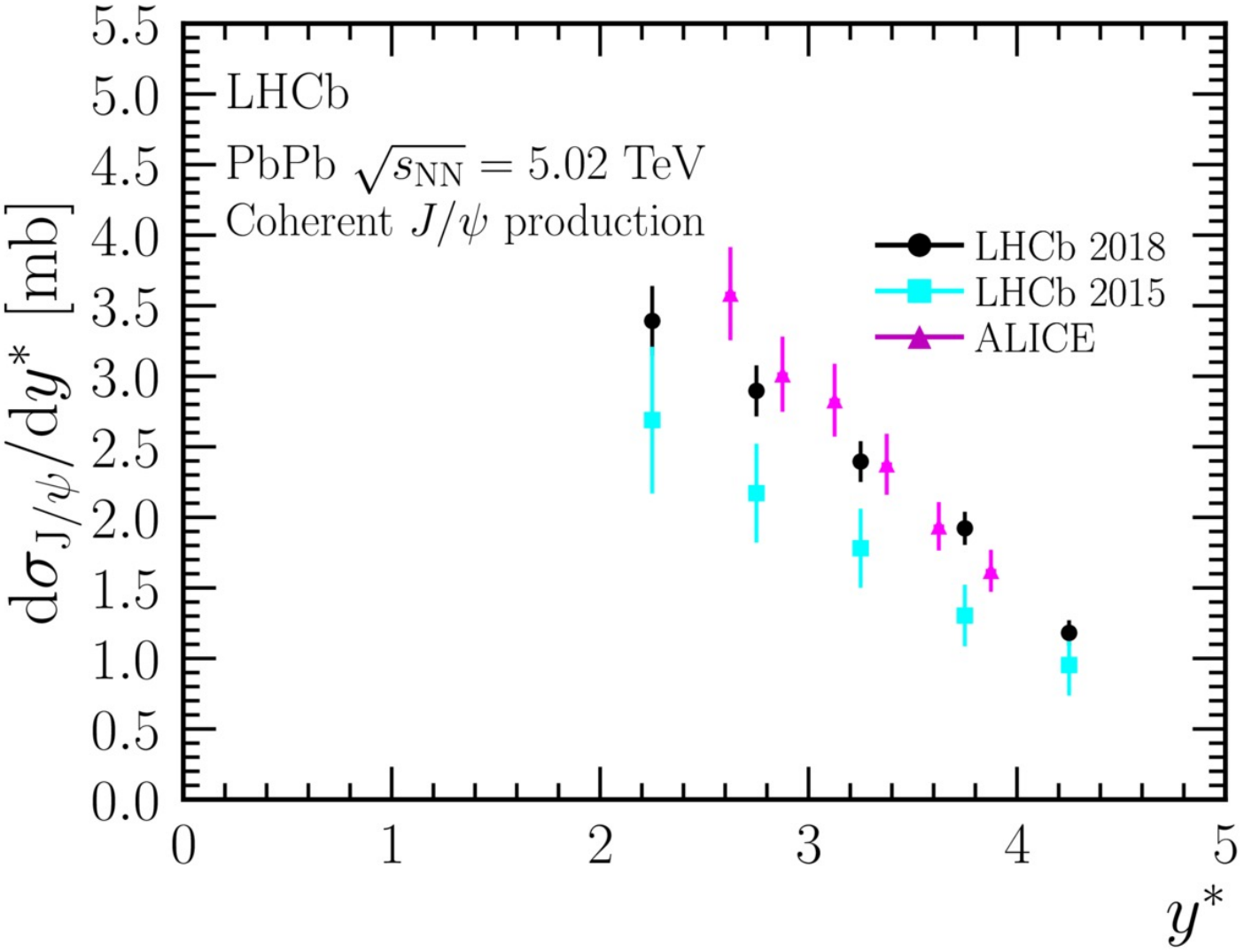






[W. Zha et al. Phys. Rev. C97 (2018) 044910 / Phy. Rev. C99, 06901(R)]

→ Comparisons



Prompt D^+, D_s^+ production in pPb collisions at 5.02 TeV

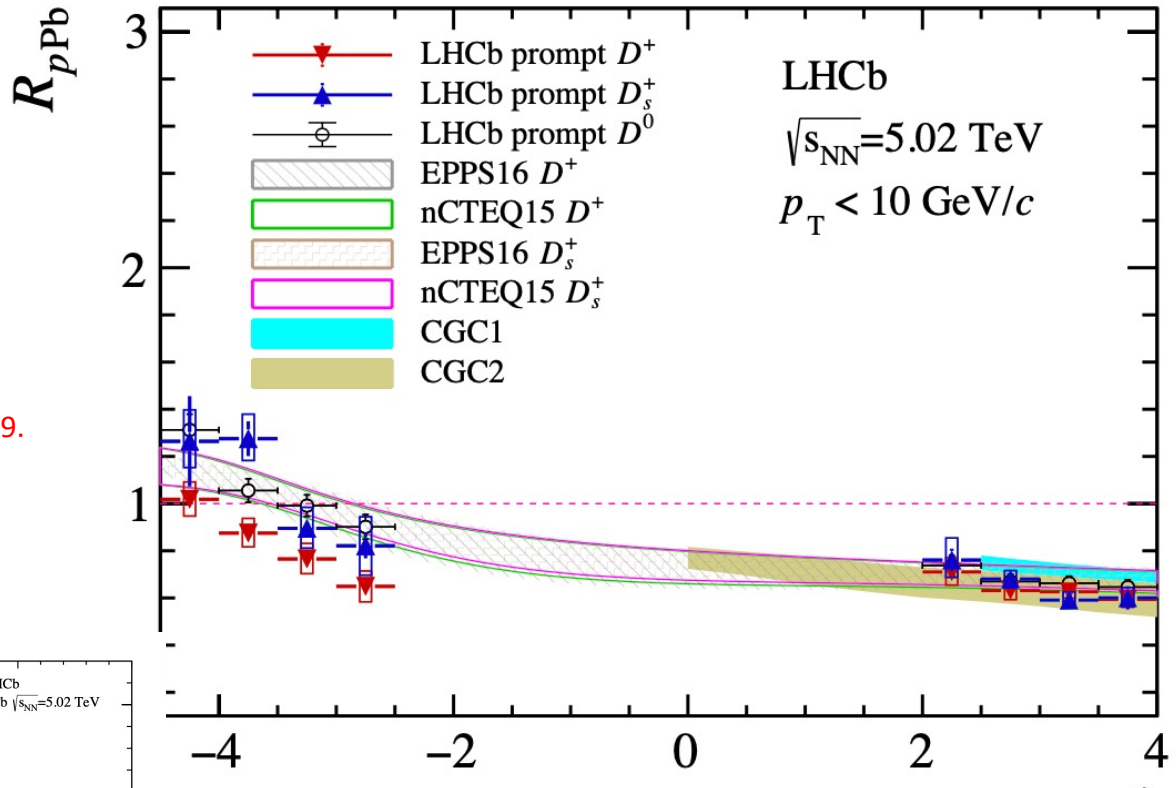
LHCb-PAPER-2023-006, in preparation

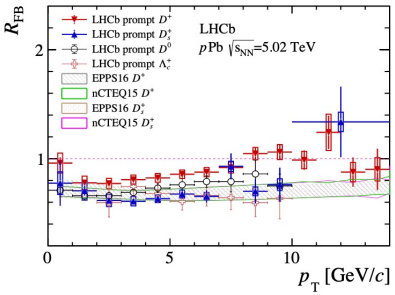
→ First measurement of prompt D^+, D_s^+ mesons in forward rapidity in heavy ion collisions

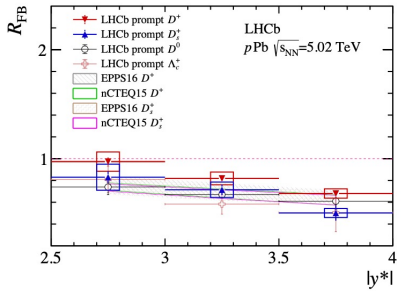
Talk of Jianqiao Wang, Wed 21st, 15:20

CGC1 [75,76], the cross-section of the D mesons is obtained with the optical Glauber mechanism correlates the initial state of the nucleon with that of the proton

CGC2 [77], it is derived by convolving the charm-quark fragmentation function in a transverse momentum-dependent factorization framework







[75] Phys. Rev. D91 (2015) 114005, arXiv:1503.02789.
[76] Nucl. Part. Phys. Proc. 289-290 (2017) 309, arXiv:1612.04585
[77]arXiv:1706.06728.
EPPS16: Eur. Phys. J. C 77 (2017)
CTEQ15: Phys. Rev. D 93 (2016) 085037