



# ALICE Overview

**Alessandro Grelli**

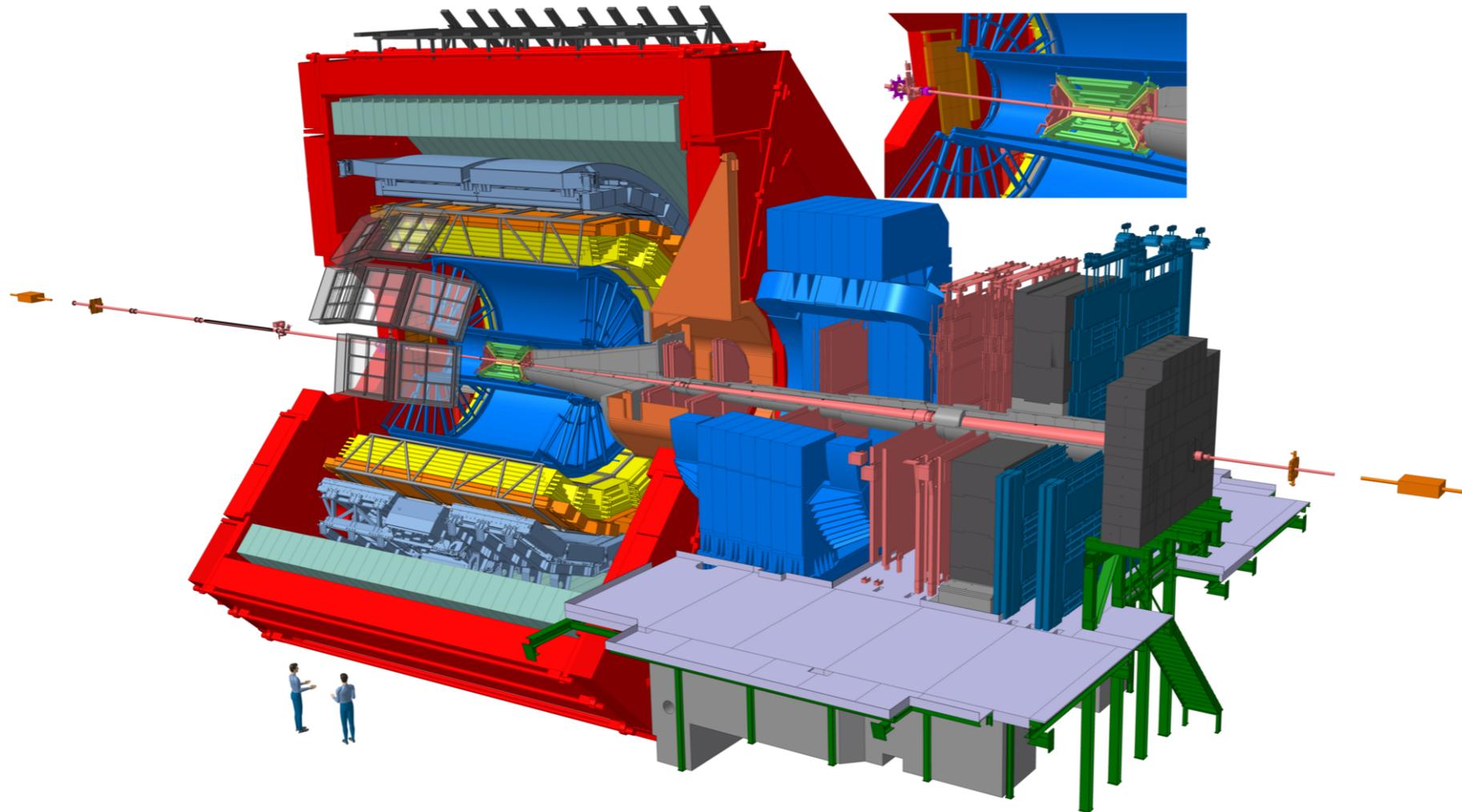
*Utrecht University*

**for the ALICE Collaboration**



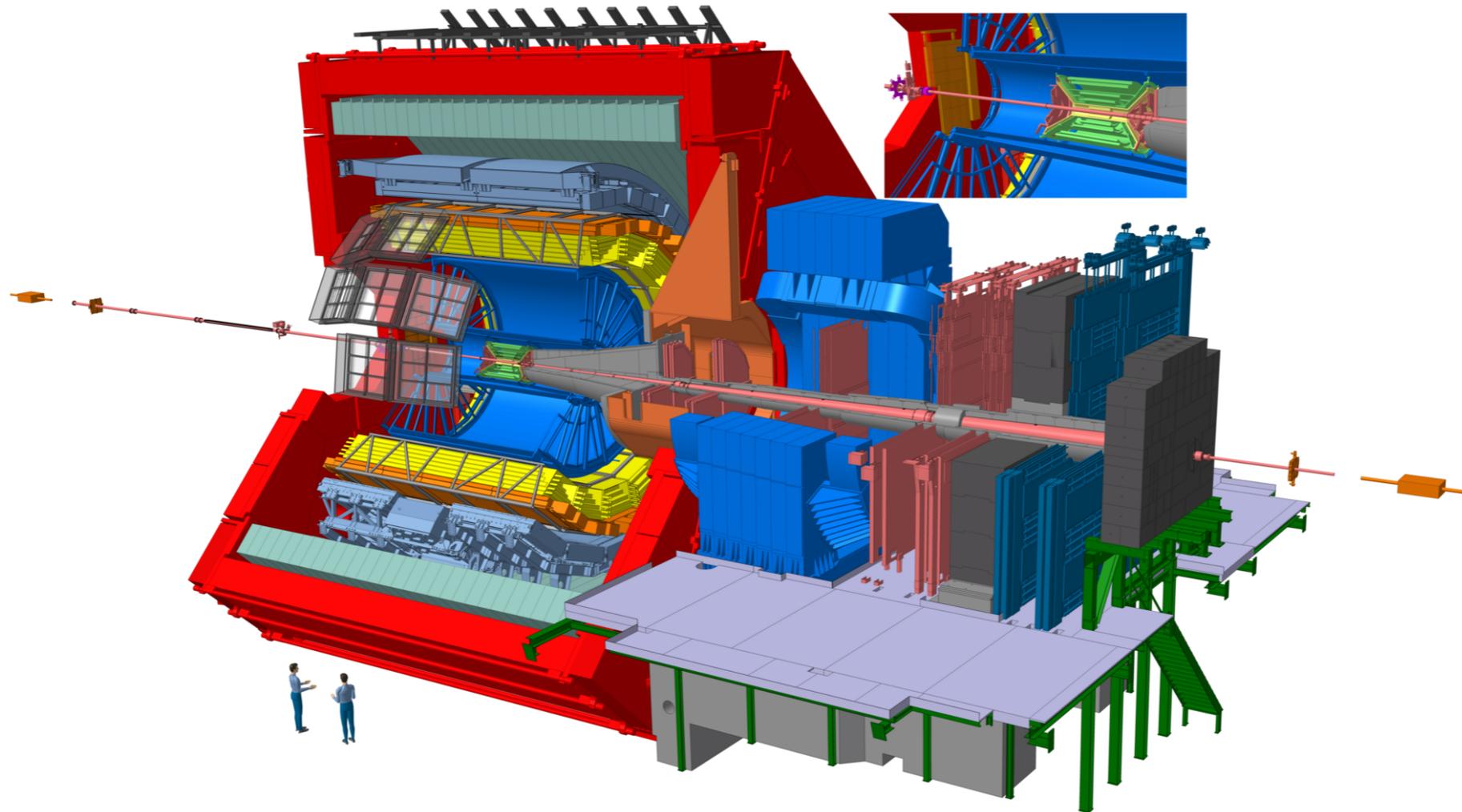
***19 talks + 11 posters at this conference***

# ALICE datasets



| Run 1 (2009-13)                 | Run 2 (2015 - now)           |
|---------------------------------|------------------------------|
| <b>Pb-Pb @ 2.76 TeV</b>         | <b>Pb-Pb @ 5.02 TeV</b>      |
| <b>p-Pb @ 5.02 TeV</b>          | <b>p-Pb @ 5.02, 8.16 TeV</b> |
| <b>pp @ 0.9, 2.76, 7, 8 TeV</b> | <b>pp @ 5, 13 TeV</b>        |

# ALICE datasets

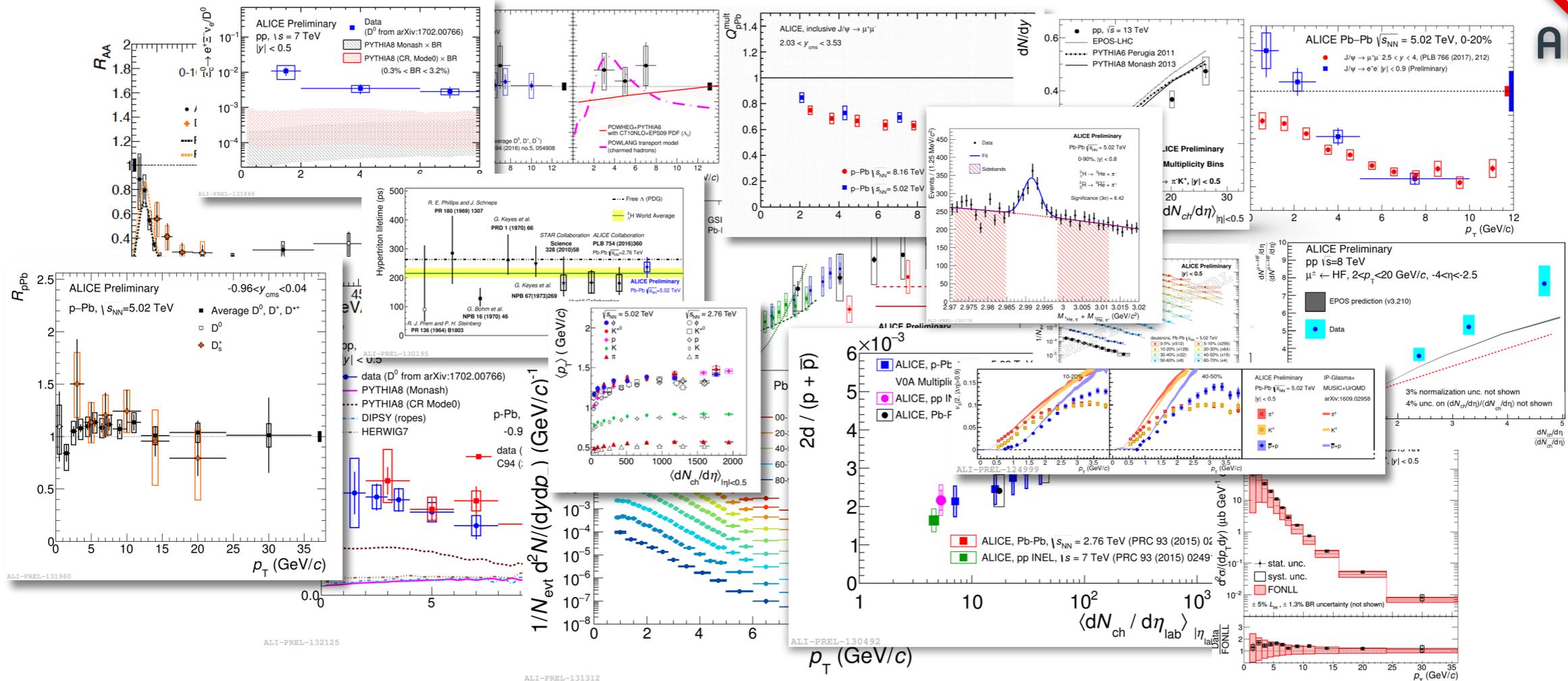


| Run 1 (2009-13)          |  | Run 2 (2015 - now)    |   |
|--------------------------|--|-----------------------|---|
| Pb-Pb @ 2.76 TeV         | <b>~70 <math>\mu\text{b}^{-1}</math></b> | Pb-Pb @ 5.02 TeV      | <b>~250 <math>\mu\text{b}^{-1}</math></b> |
| p-Pb @ 5.02 TeV          |  | p-Pb @ 5.02, 8.16 TeV |   |
| pp @ 0.9, 2.76, 7, 8 TeV |  | pp @ 5, 13 TeV        |   |

# ALICE datasets



ALICE



|                                 |
|---------------------------------|
| <b>Run 1 (2009-13)</b>          |
| <b>Pb-Pb @ 2.76 TeV</b>         |
| <b>p-Pb @ 5.02 TeV</b>          |
| <b>pp @ 0.9, 2.76, 7, 8 TeV</b> |

|                              |
|------------------------------|
| <b>Run 2 (2015 - now)</b>    |
| <b>Pb-Pb @ 5.02 TeV</b>      |
| <b>p-Pb @ 5.02, 8.16 TeV</b> |
| <b>pp @ 5, 13 TeV</b>        |

**New results!**





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# Highlights on Heavy-flavour production



# Pb-Pb: D mesons $R_{AA}$ in run II



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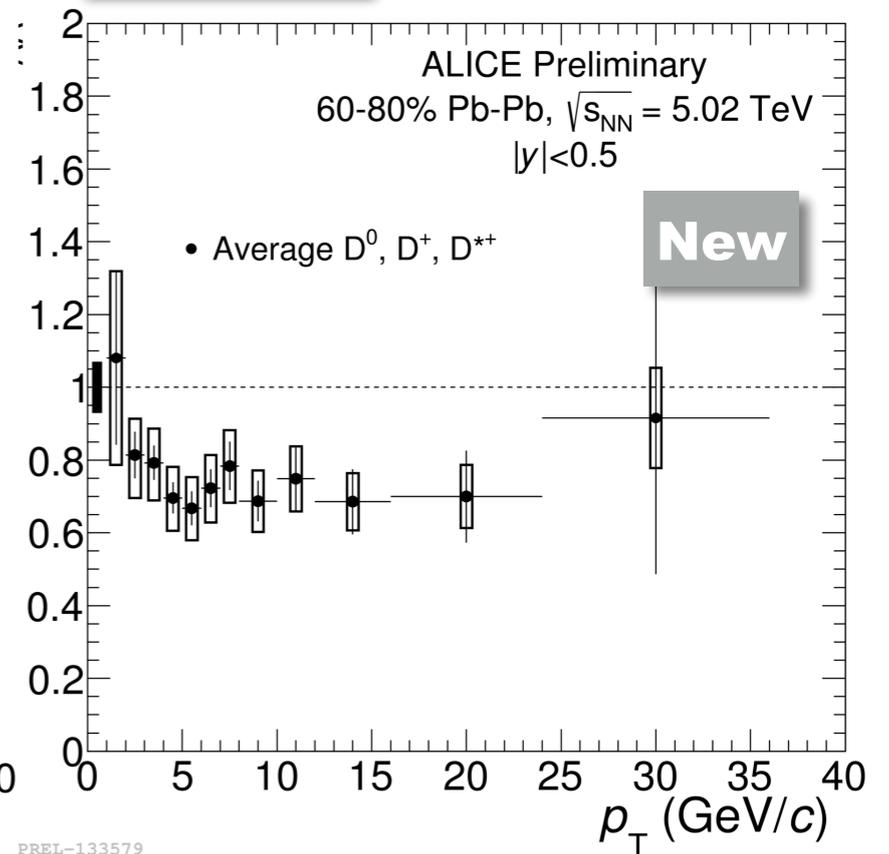
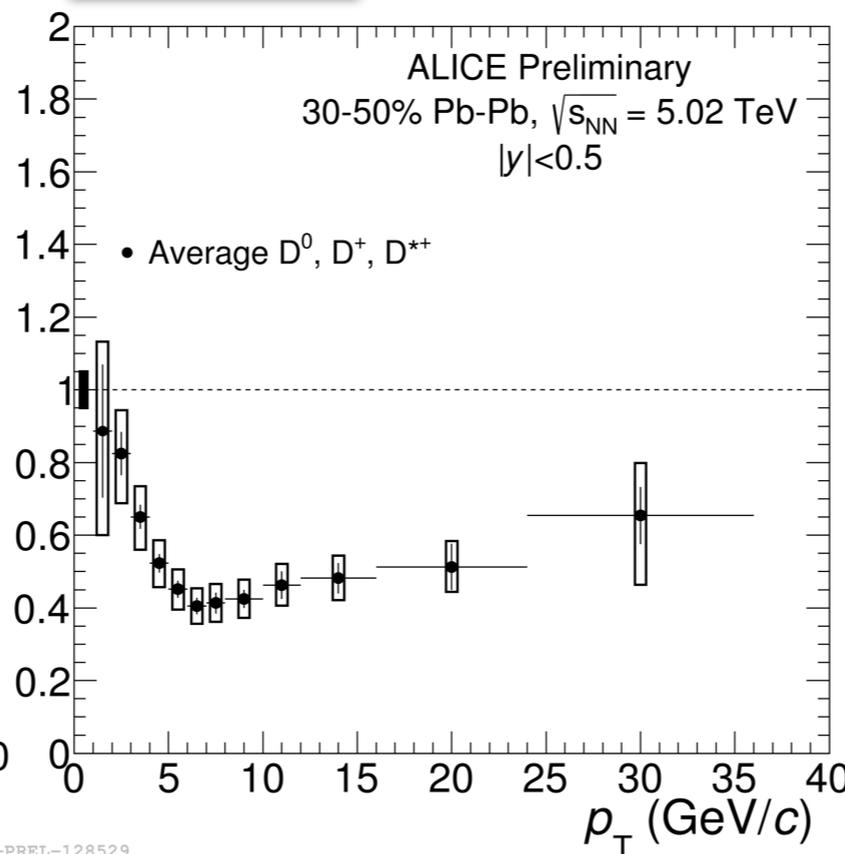
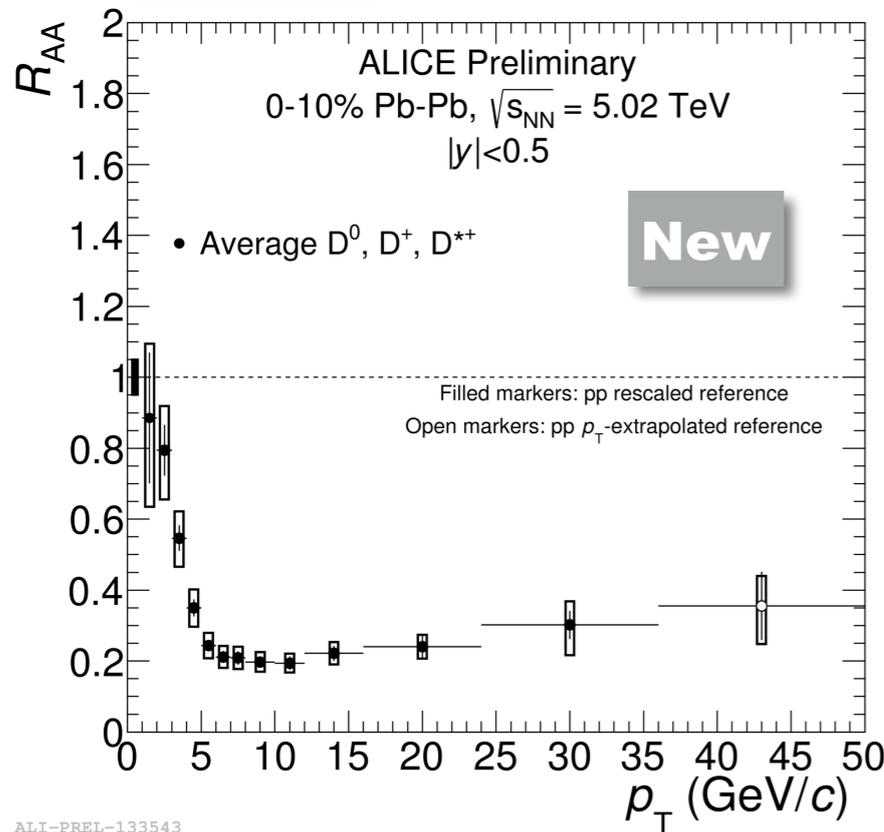
0-10%



30-50%



60-80%



ALICE-PUBLIC-2017-003

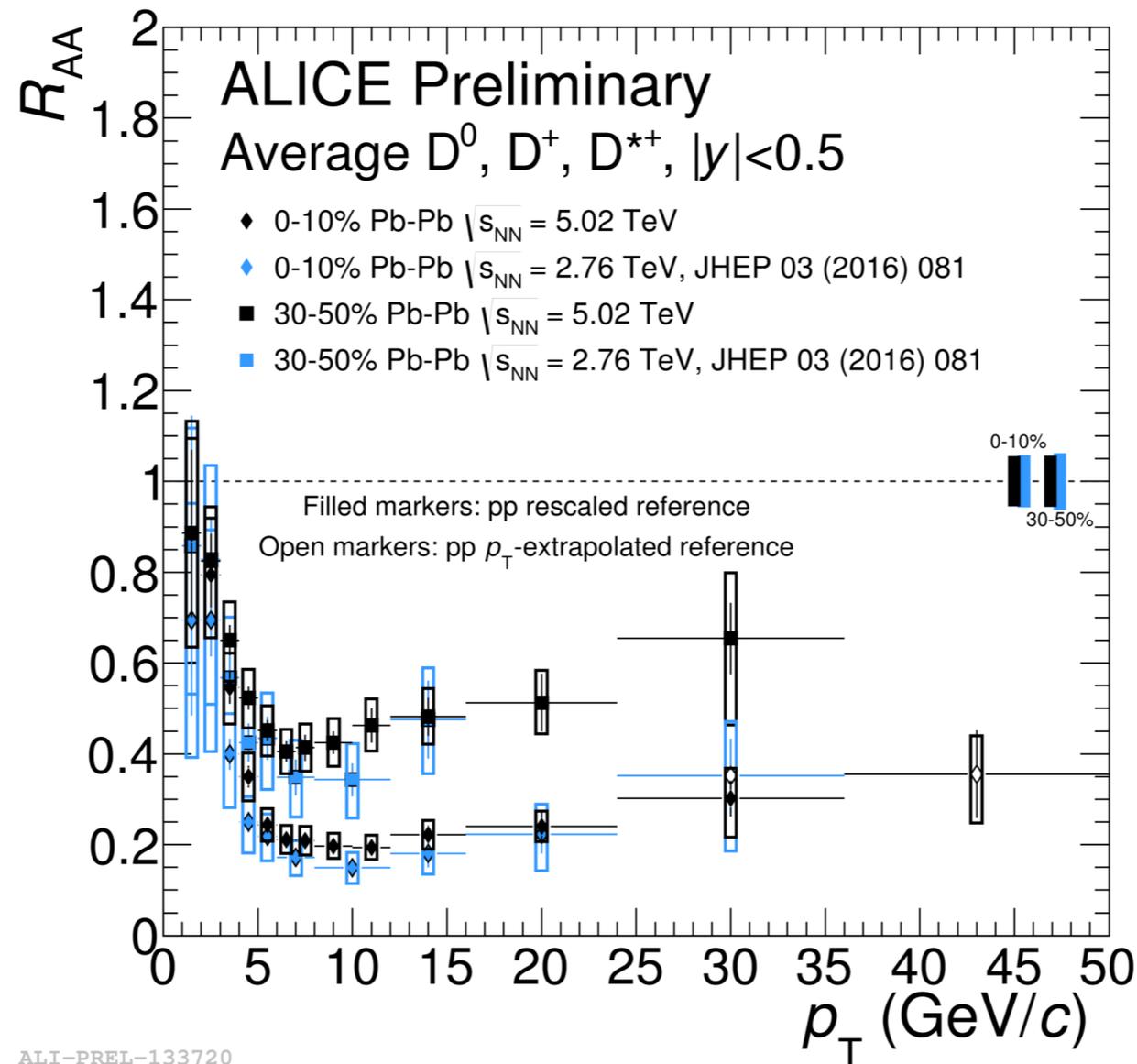
Average non-strange D meson  $p_T$ -differential  $R_{AA}$  in 0-10%, 30-50% and 60-80% centrality

• Transverse momentum reach  $1 < p_T < 50$  GeV/c (in central 0-10%)



Fabrizio Grosa, Thu 11.30 AM

# Pb-Pb: D mesons; run II vs run I



Good agreement  
with run I result

✓ Average non-strange D meson  $p_T$ -differential  $R_{AA}$  in 0-10%, 30-50% and 60-80% centrality

📌 Transverse momentum reach  $1 < p_T < 50$  GeV/c (in central 0-10%)

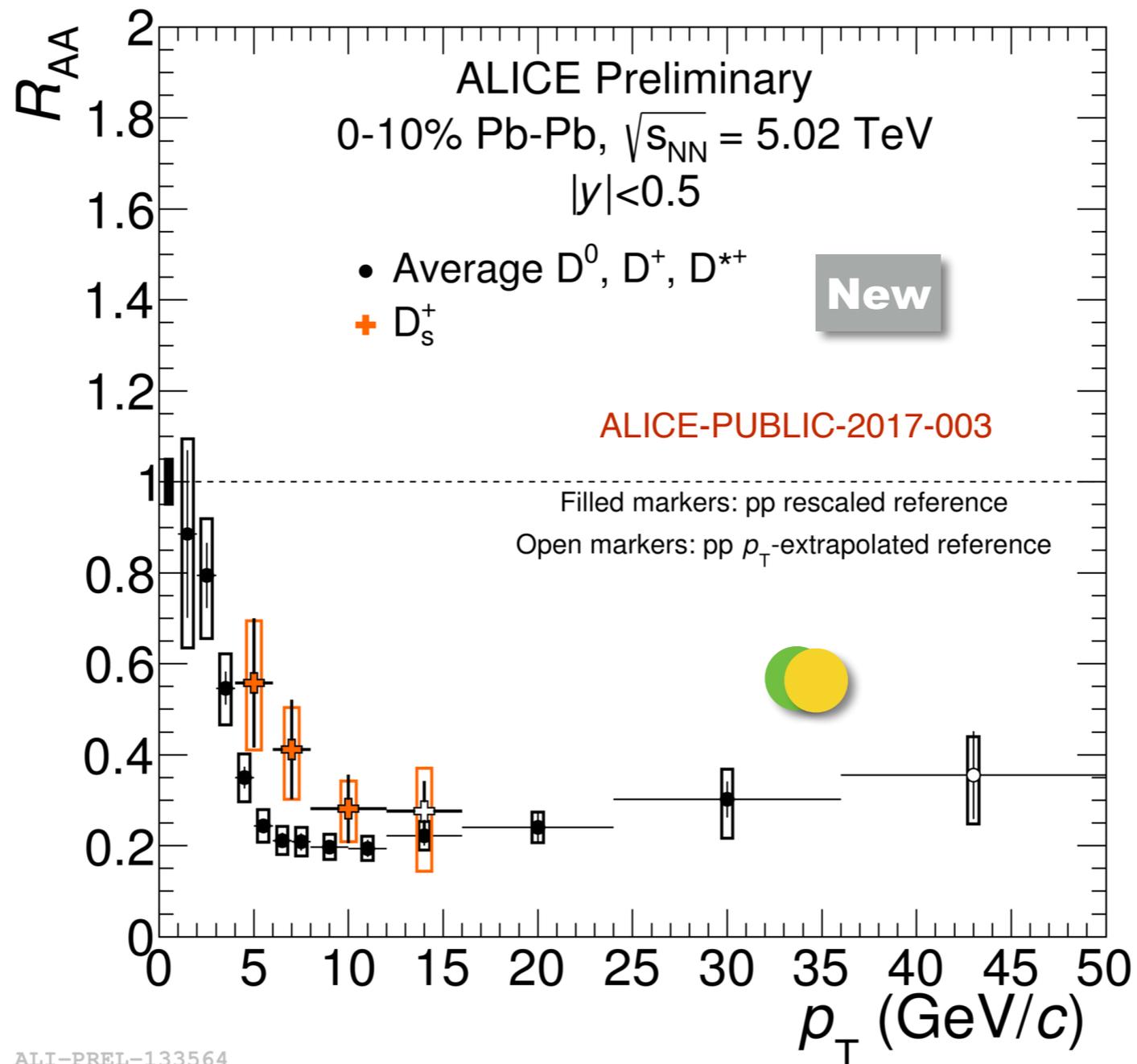
📌 Compatible with run I measurement, improved precision and  $p_T$  reach

Fabrizio Grosa, Thu 11.30 AM

# Pb-Pb: strange D mesons



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0-10%

ALI-PREL-133564

☑ Comparison of  $D_s^+$  with non-strange D mesons hints a lower  $D_s^+$  suppression

📌 Coalescence + strangeness enhancement?

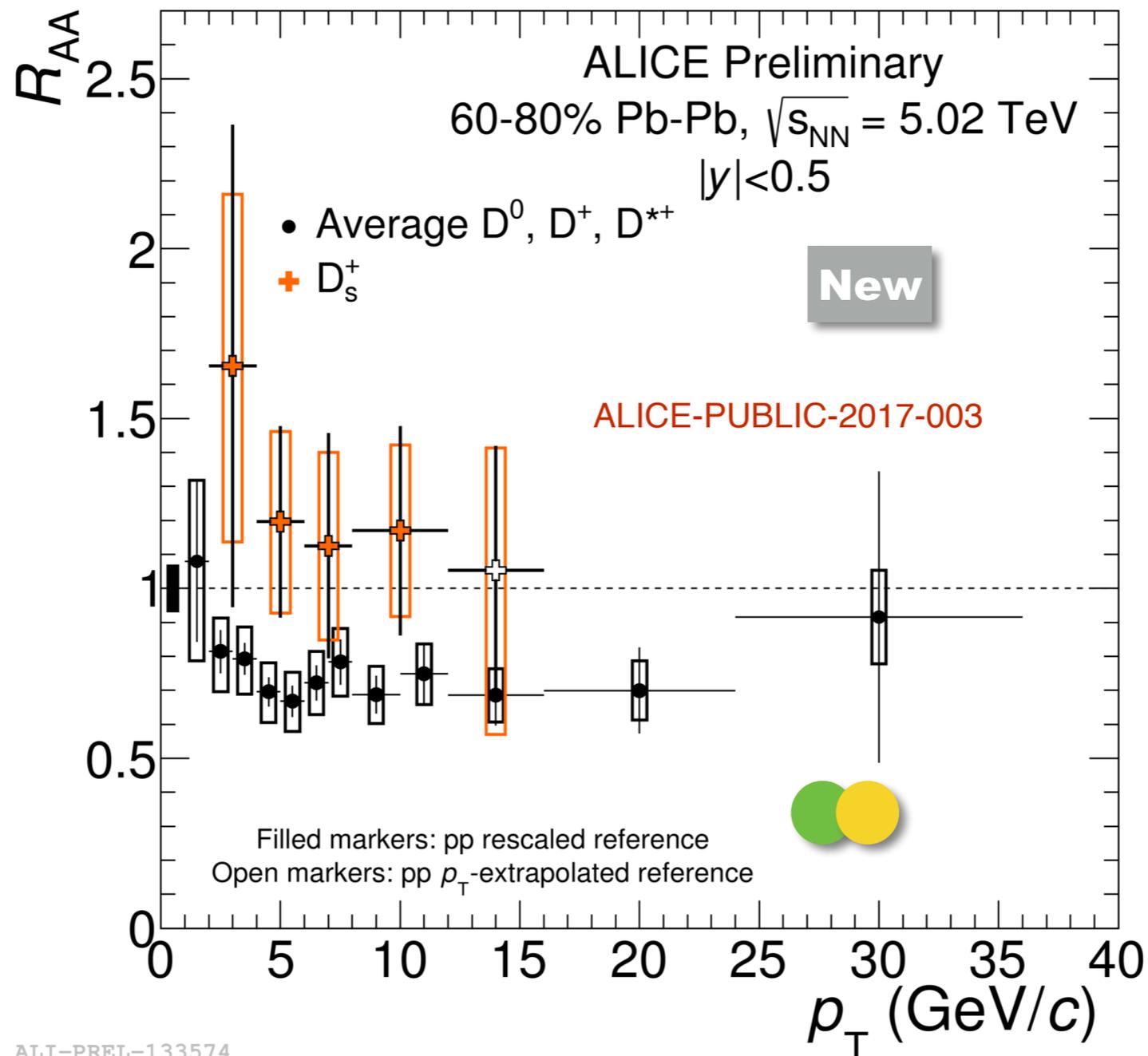
📌 Need more data to conclude

Fabrizio Grosa, Thu 11.30 AM

# Pb-Pb: strange D mesons



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60-80%

ALI-PREL-133574  
☑ Comparison of  $D_s^+$  with non-strange D mesons hints a lower  $D_s^+$  suppression

📌 Coalescence + strangeness enhancement?

📌 Need more data to conclude

Fabrizio Grosa, Thu 11.30 AM

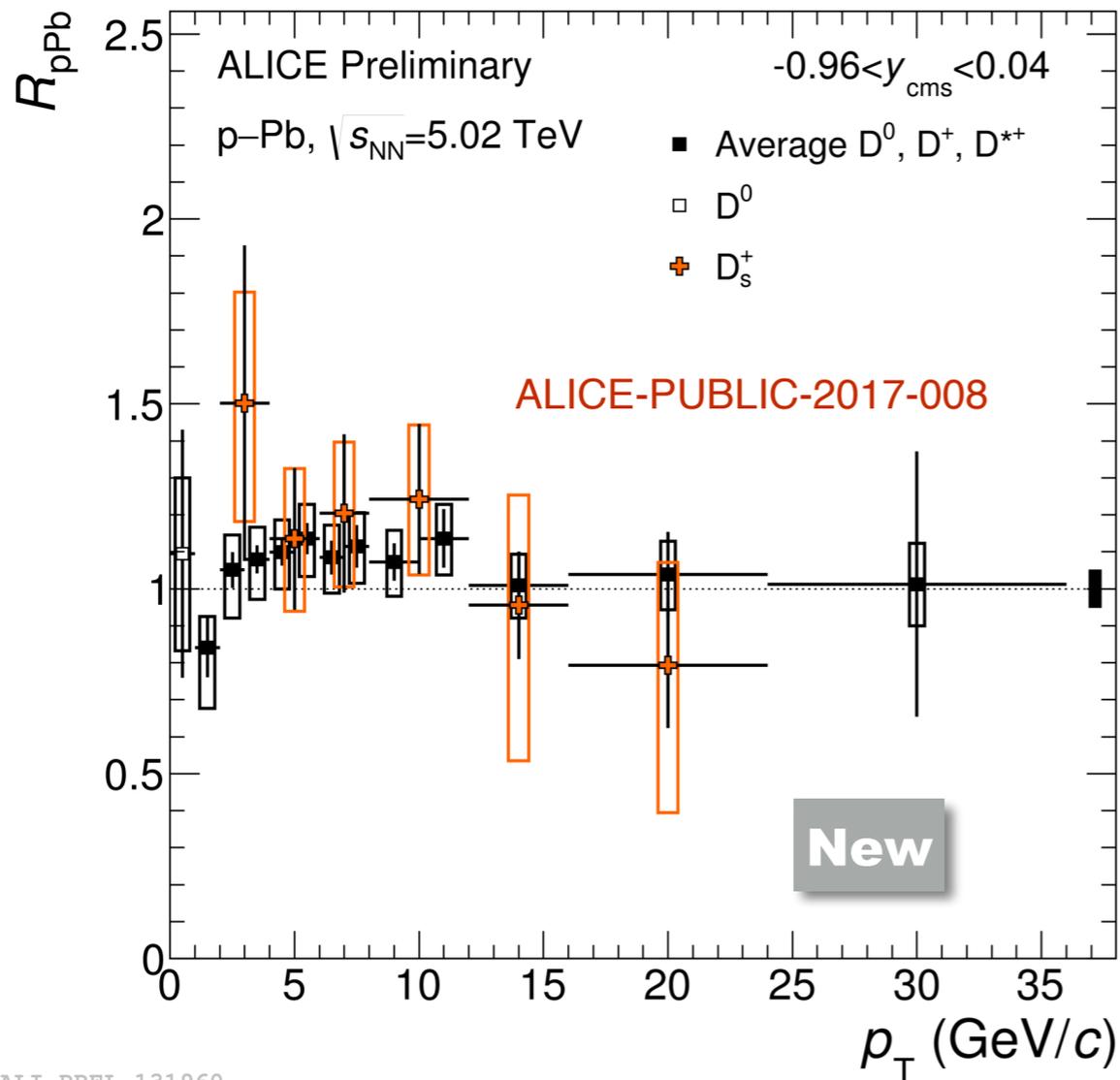
# p-Pb: D meson $R_{pPb}$ and $Q_{CP}$



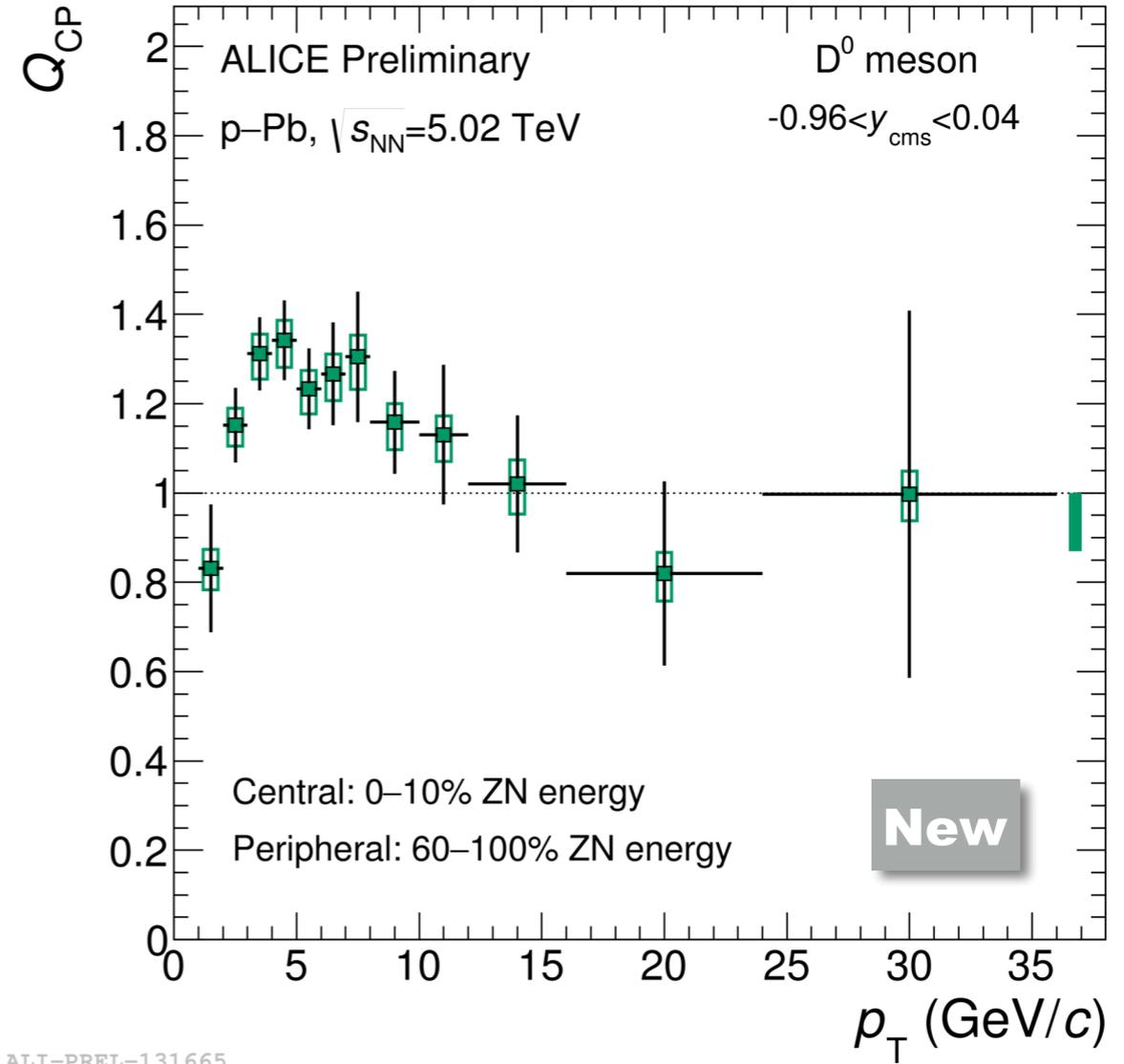
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Fabrizio Grosa, Thu 11.30 AM

Jaime Norman, Fri 2.55 PM



ALI-PREL-131960



ALI-PREL-131665

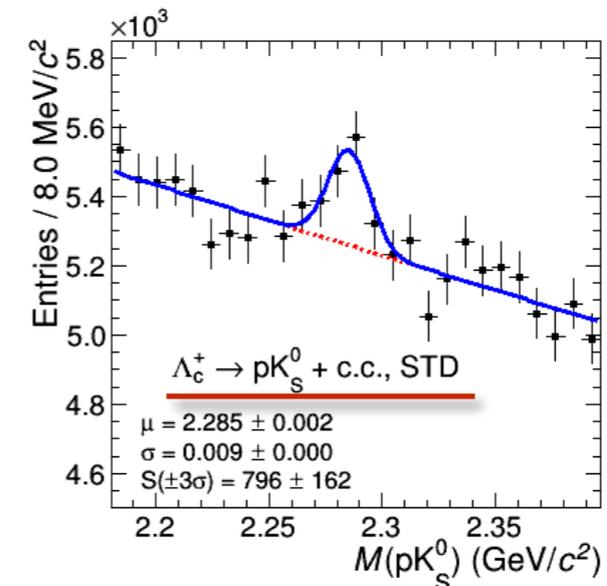
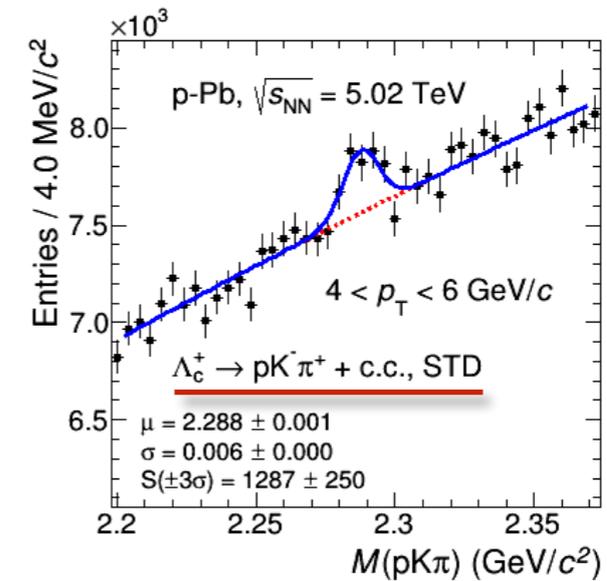
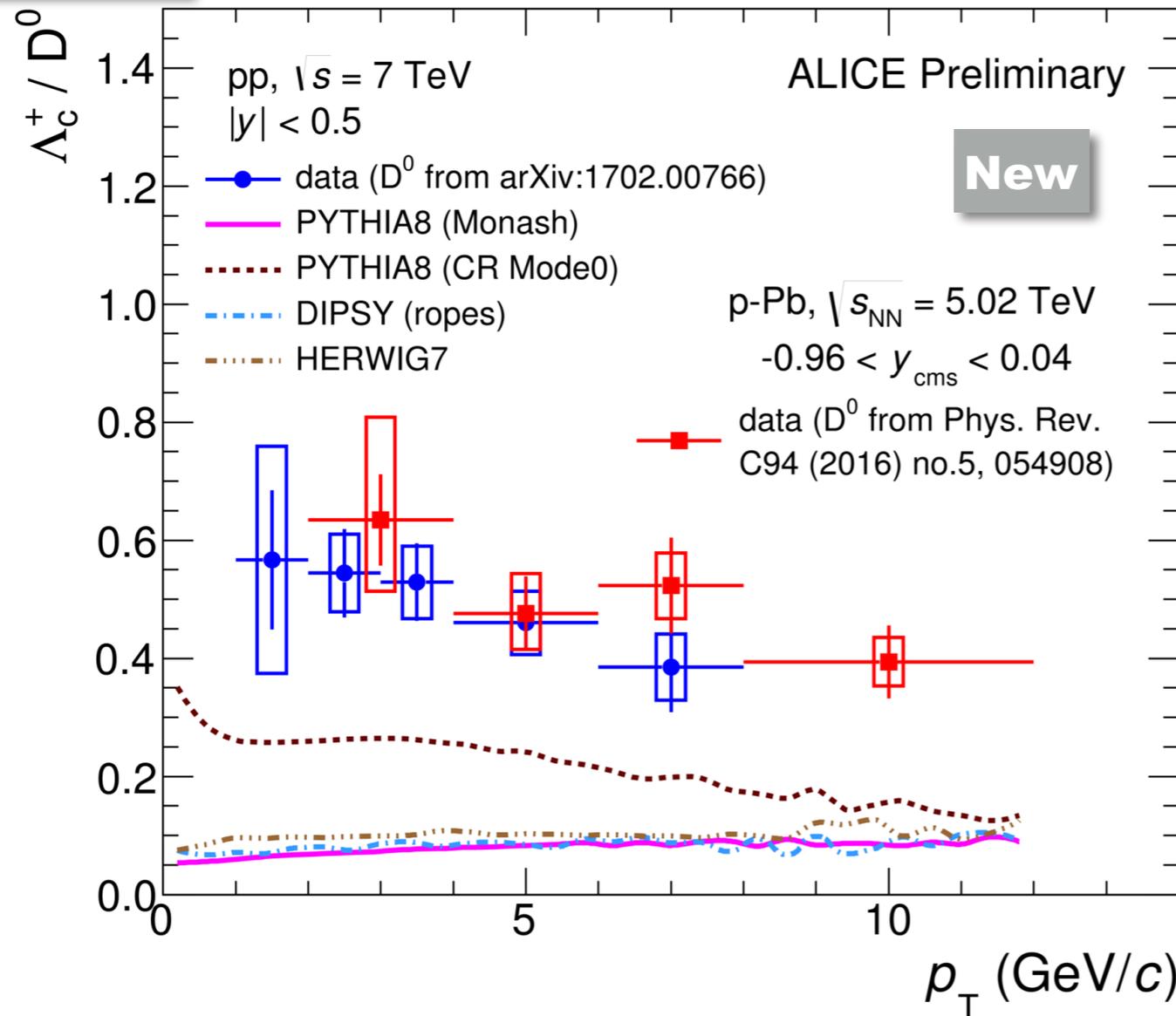
- ☑ Run II statistic allows for a finer  $p_T$  binning of D mesons  $R_{pPb}$  and a reduction of the uncertainties.  $D_s^+$   $R_{pPb}$  compatible with non-strange D  $R_{pPb}$
- ☑  $Q_{CP} > 1$  in 3-8 GeV/c at  $1.7\sigma$ . Initial or final state effect? possible hint of radial flow?

# p-Pb (and pp): $\Lambda_c$ production



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Run I data



ALI-PREL-132125

- ✓  $\Lambda_c$  production measured in three different decay channels in pp and p-Pb. **First measurement** of  $\Lambda_c/D^0$  ratio at mid-rapidity at LHC.
- ✓ Models fail to reproduce the  $\Lambda_c/D^0$  measurement.

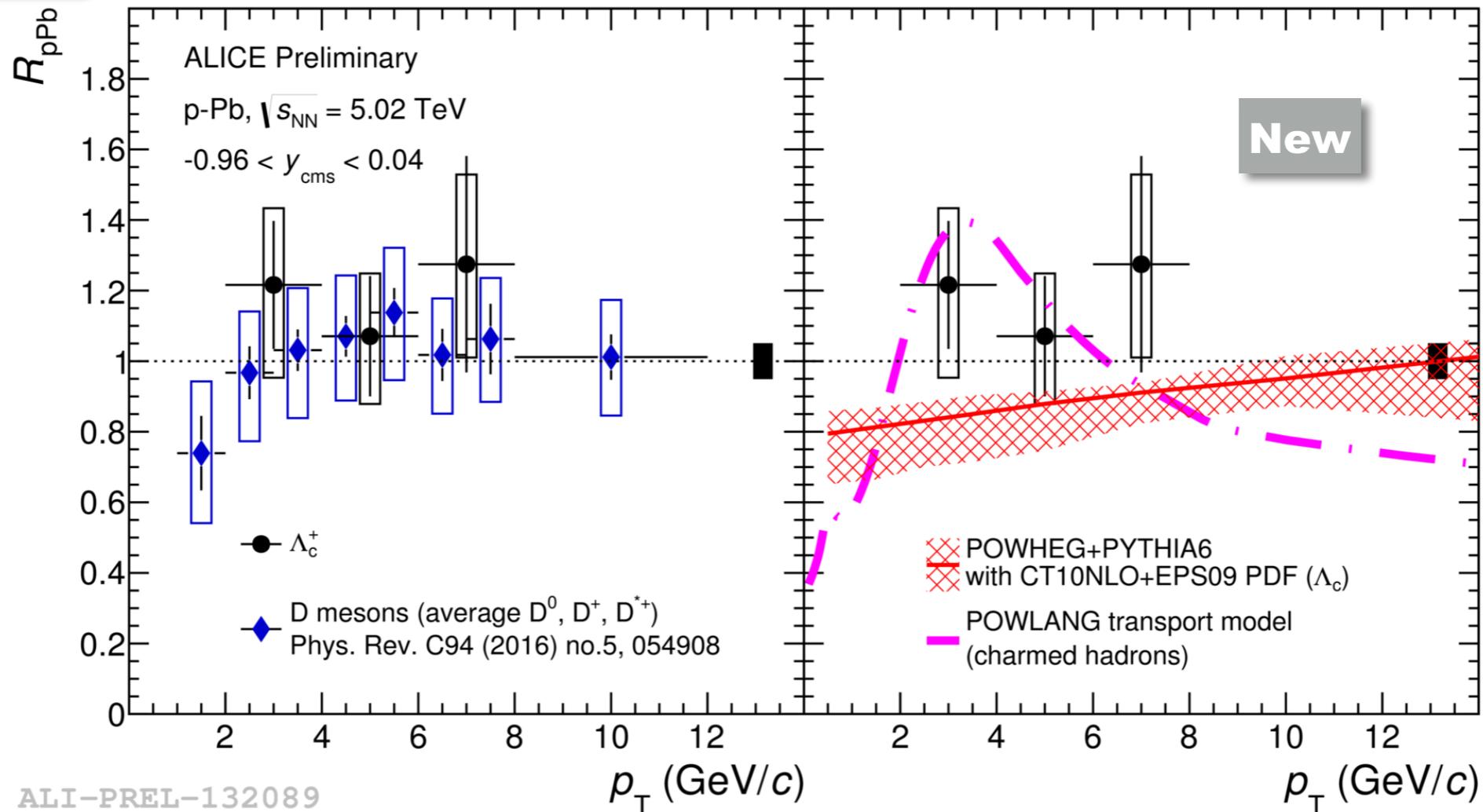
Jaime Norman, Fri 2.55 PM

# p-Pb: $\Lambda_c$ $R_{pPb}$



Run I data

Jaime Norman, Fri 2.55 PM



- ✓ **First measurement** of  $\Lambda_c$   $R_{pPb}$ .
- ✓  $R_{pPb}$  of  $\Lambda_c$  in agreement, within uncertainties with the one of the run I published D mesons and with unity.
- ✓ Need more precision  $\rightarrow$  Run II data.

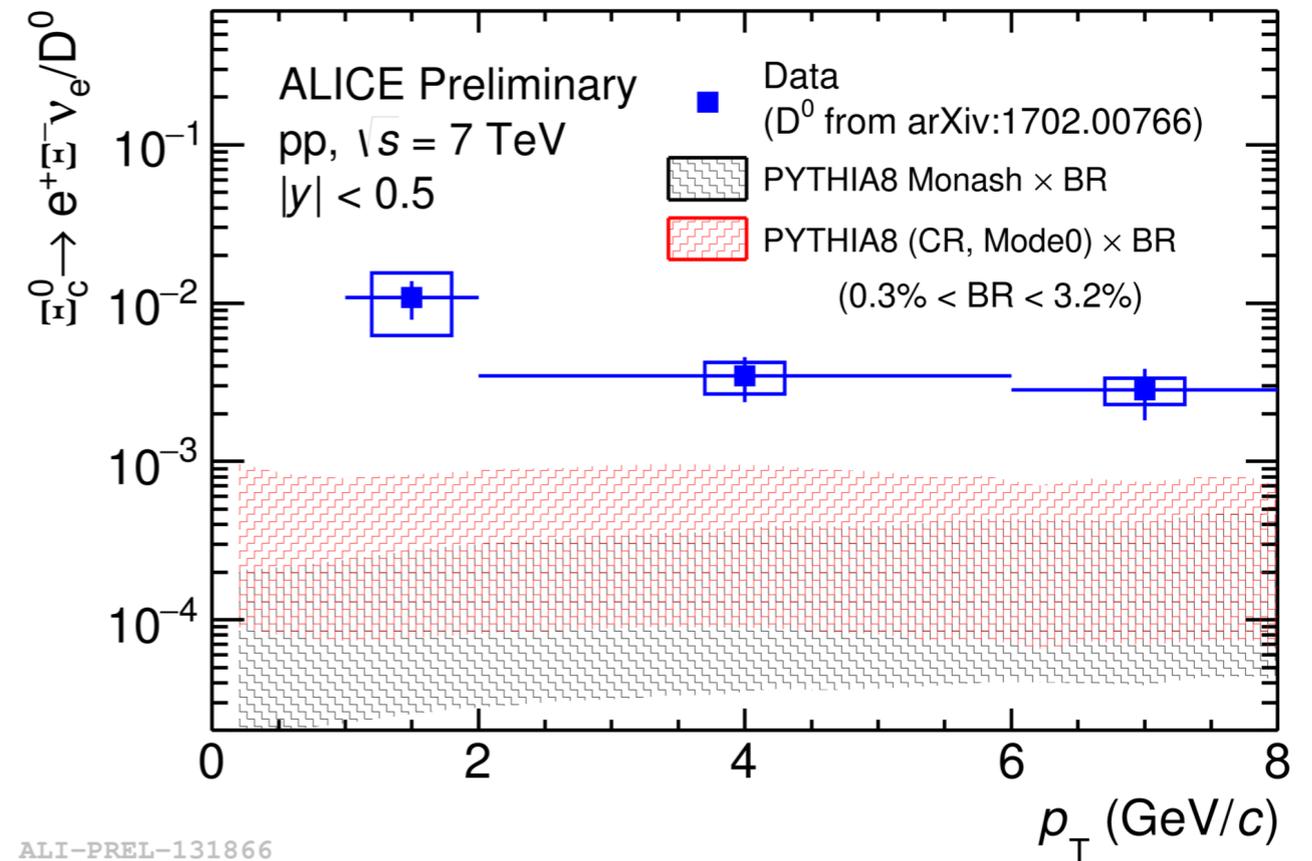
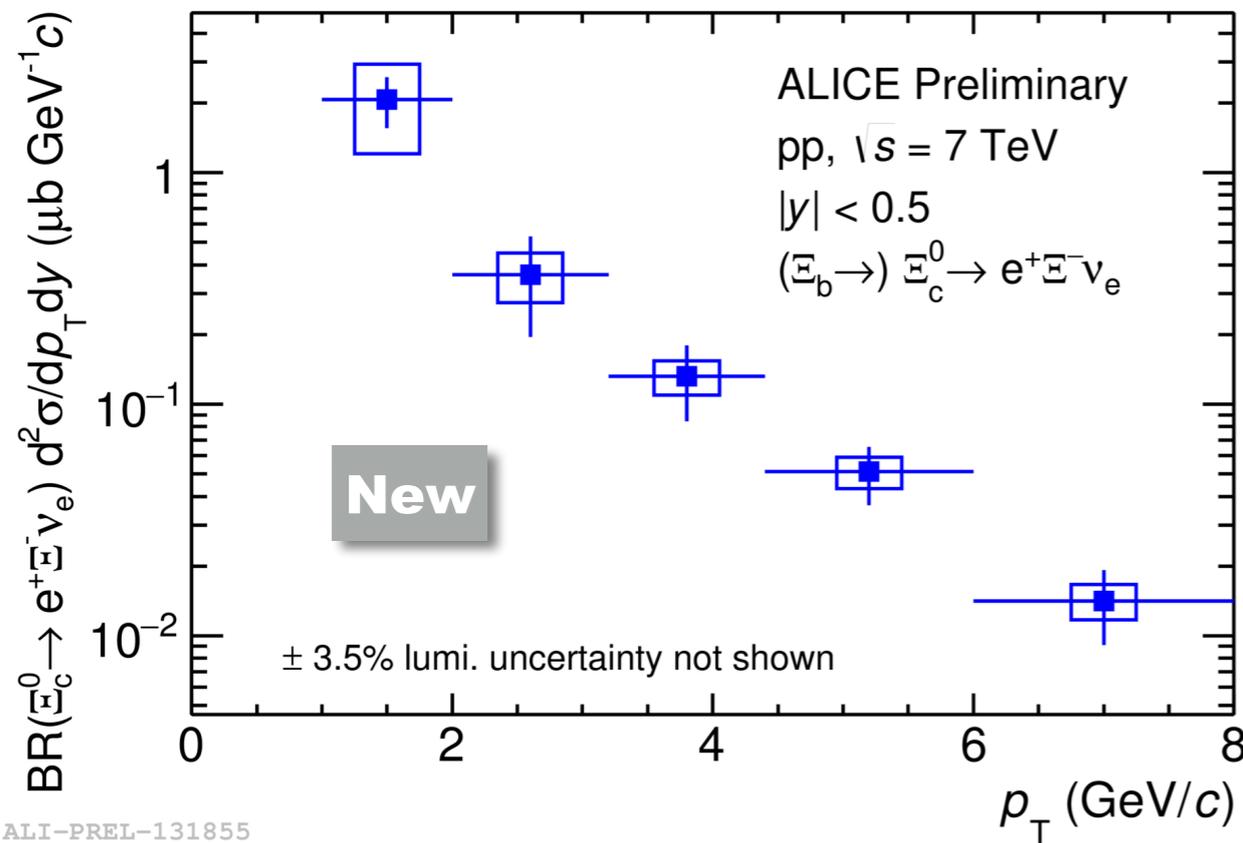
# pp: first measurement of $\Xi_c$ production



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Run I data

$$\Xi_c^0 \rightarrow \Xi^- e^+ \nu_e \rightarrow \Lambda \pi^- e^+ \nu_e \quad (c\tau \sim 30 \mu\text{m}, \text{BR unknown})$$



- ☑ **First measurement** of  $\Xi_c$  in pp at LHC.
- ☑ Various tunes for the hadronisation mechanism, underestimate the measured  $\Xi_c^0/D^0$  ratio.

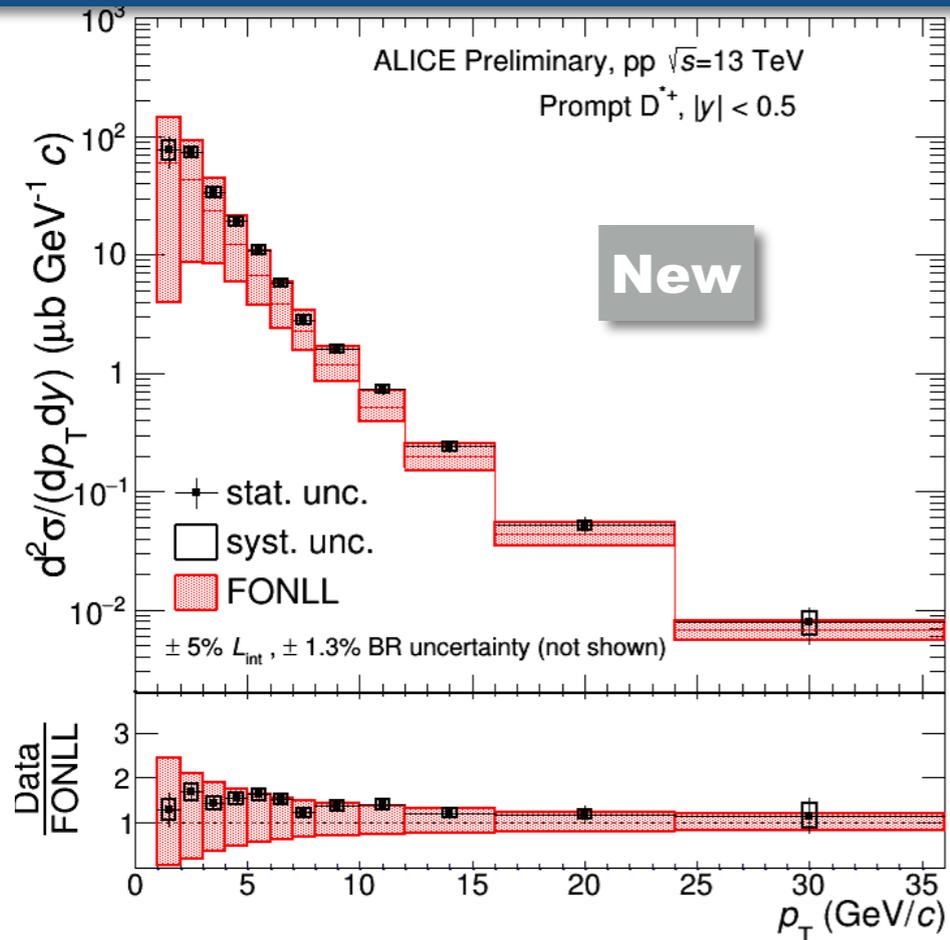
Jaime Norman, Fri 2.55 PM

# pp: $D, (c,b) \rightarrow e, \mu^\pm \leftarrow$ HF production



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Poster: Annelies M. Veen, Tue. 3PM (pp)



- ✓ New D meson preliminary measurements released at 8 ( $D^0$ ) and 13 ( $D^0, D^+$  and  $D^{*+}$ ) TeV.

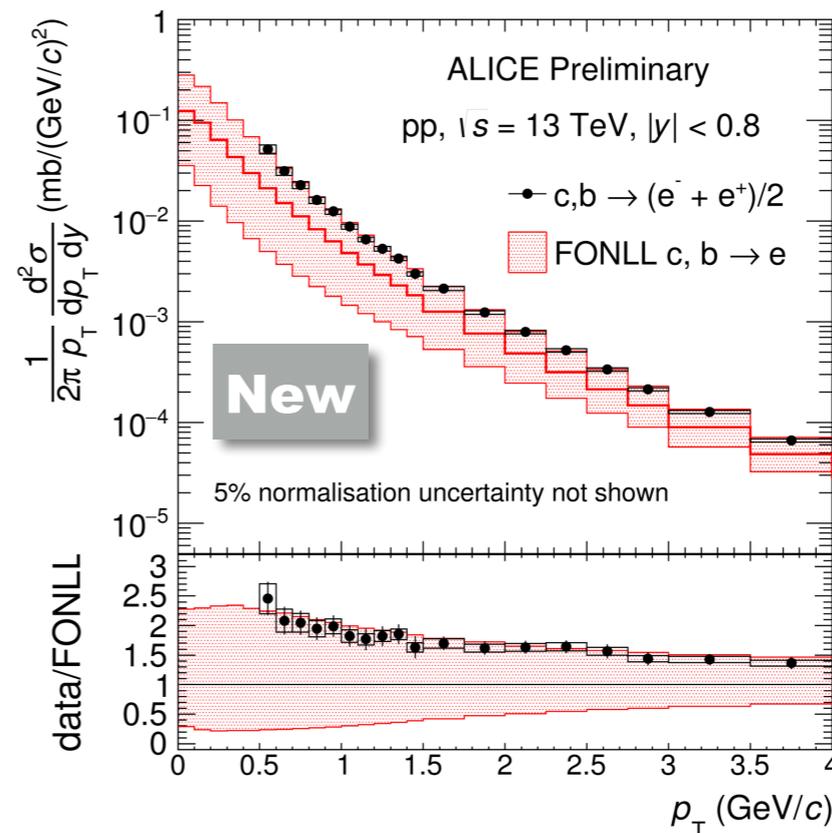
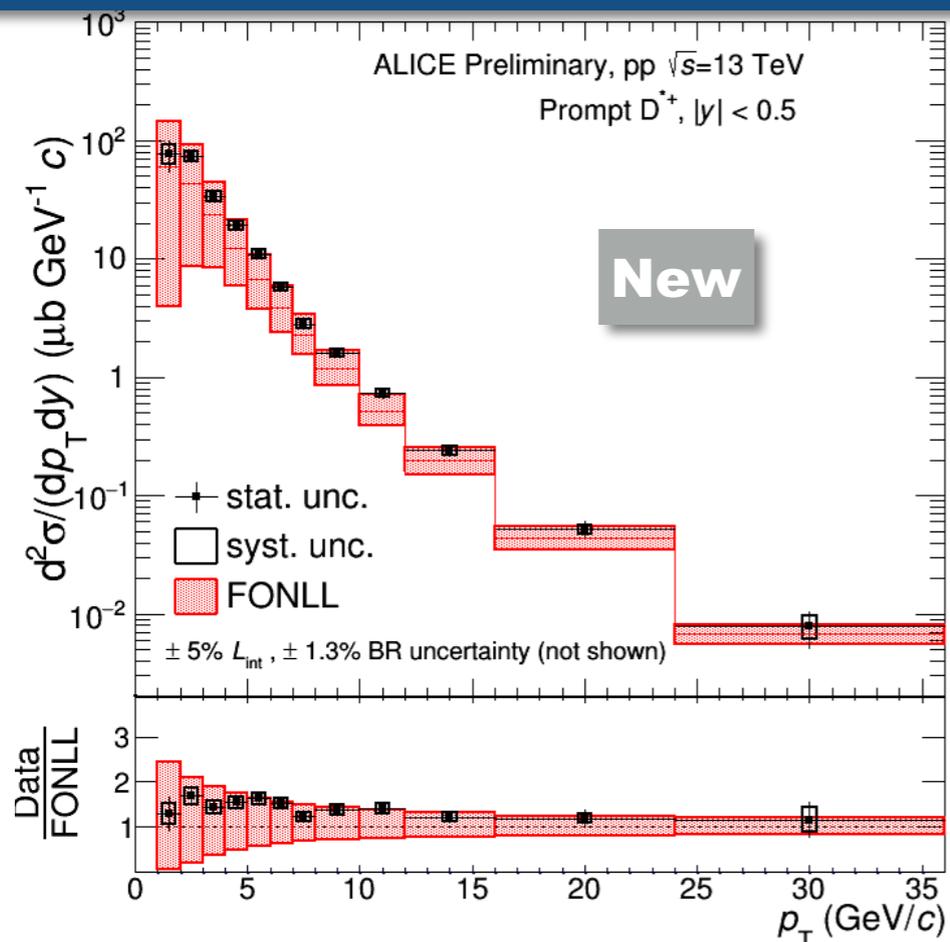
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Poster: Annelies M. Veen, Tue. 3PM (pp)

Poster: Camila de Conti, Tue. 3PM (pp)



- ☑ New D meson preliminary measurements released at 8 ( $D^0$ ) and 13 ( $D^0$ ,  $D^+$  and  $D^{*+}$ ) TeV.
- ☑ Electron spectra from heavy-flavour hadron decays at 13 TeV measured down to  $p_T = 0.5$  GeV/c.

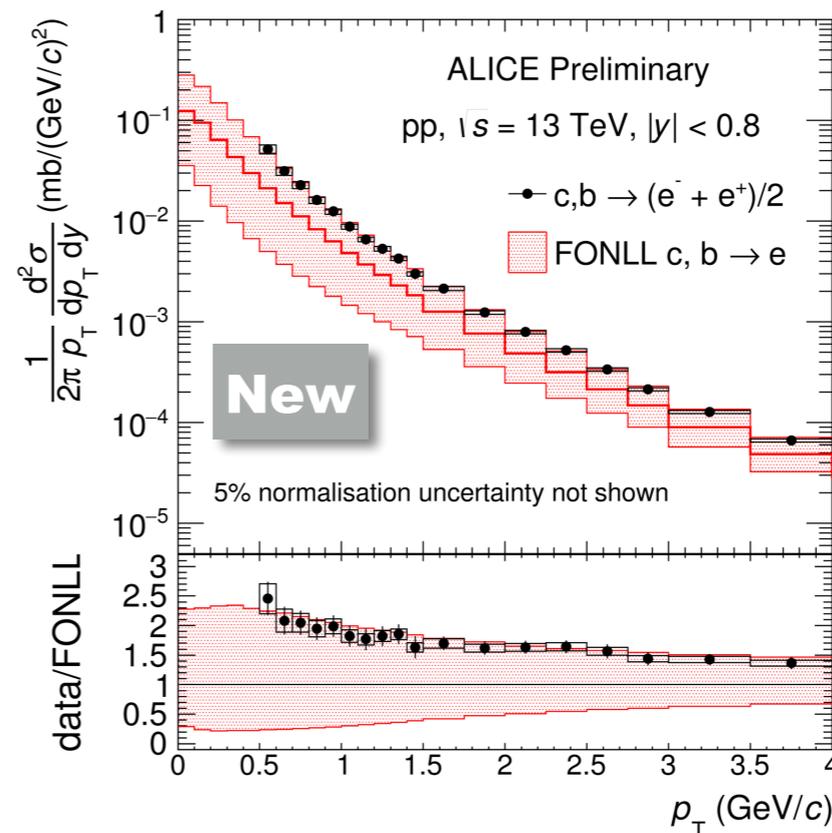
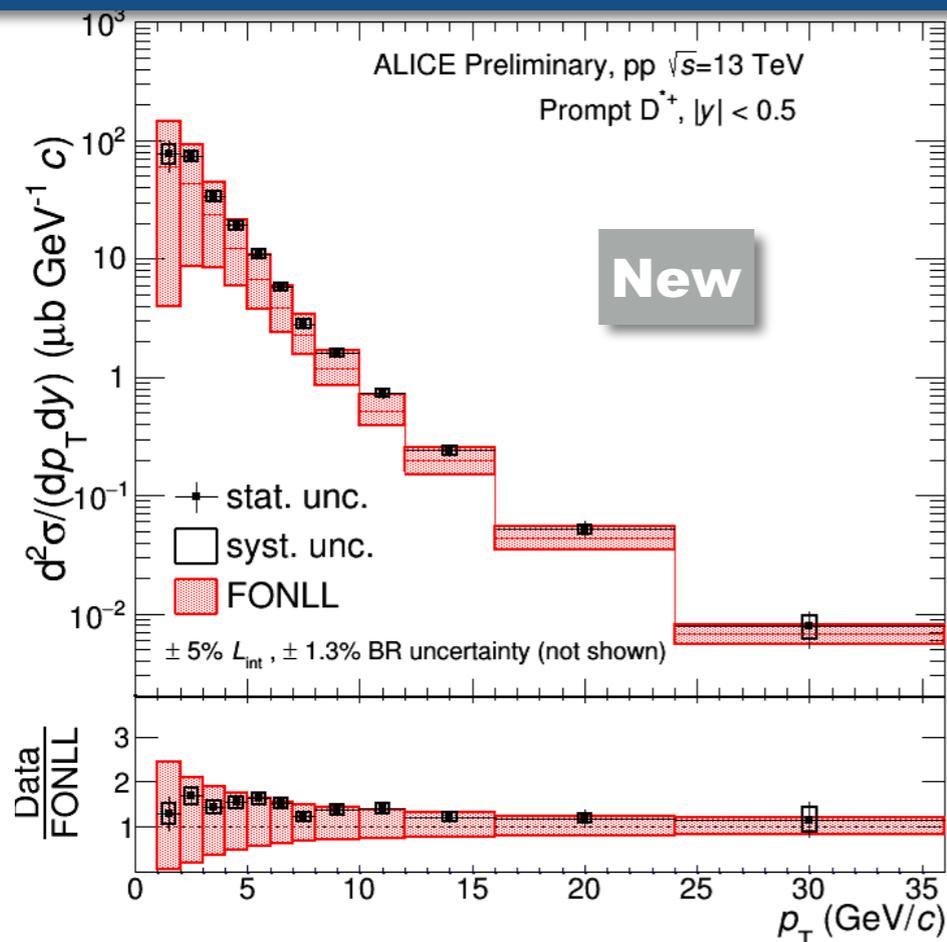
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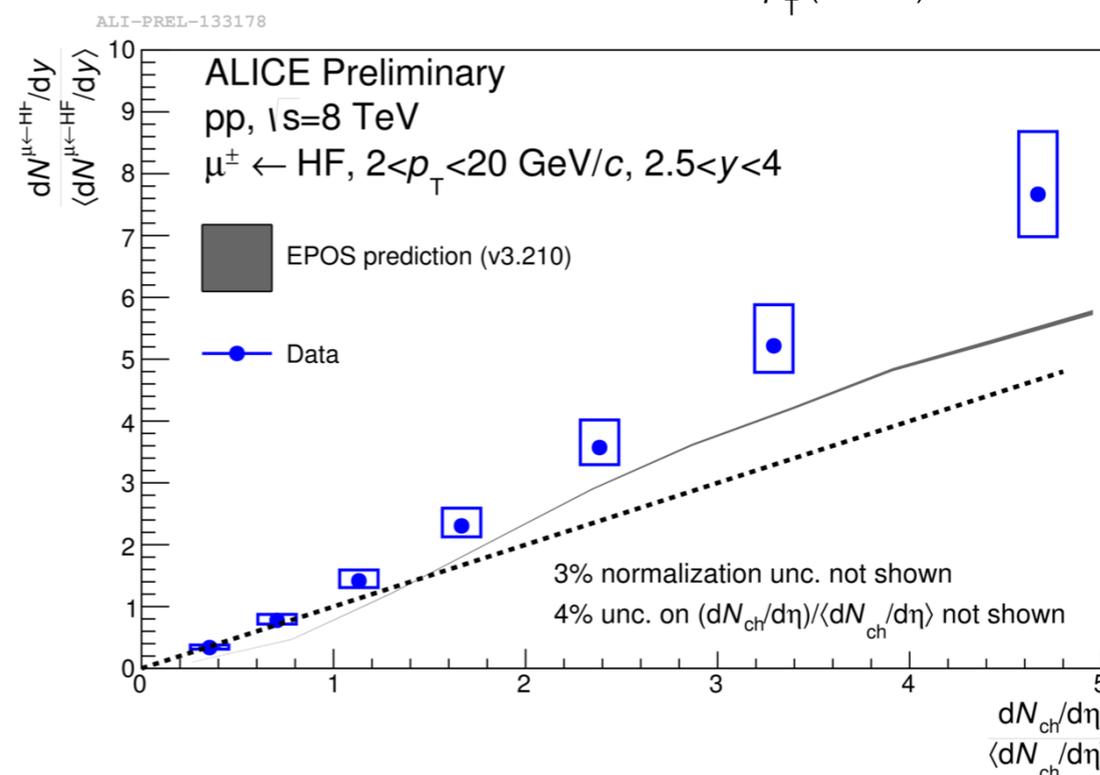
ALICE

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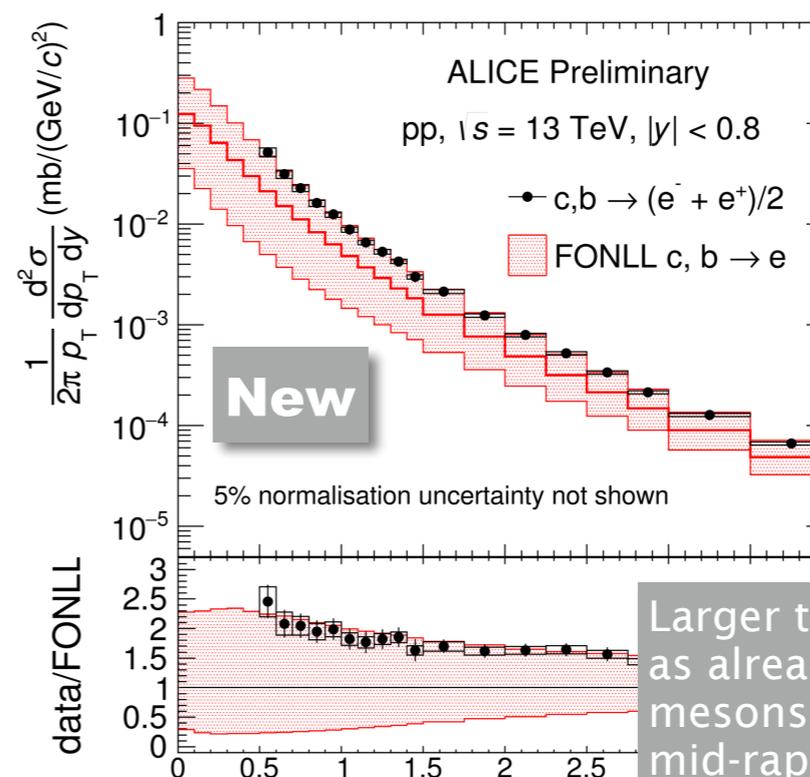
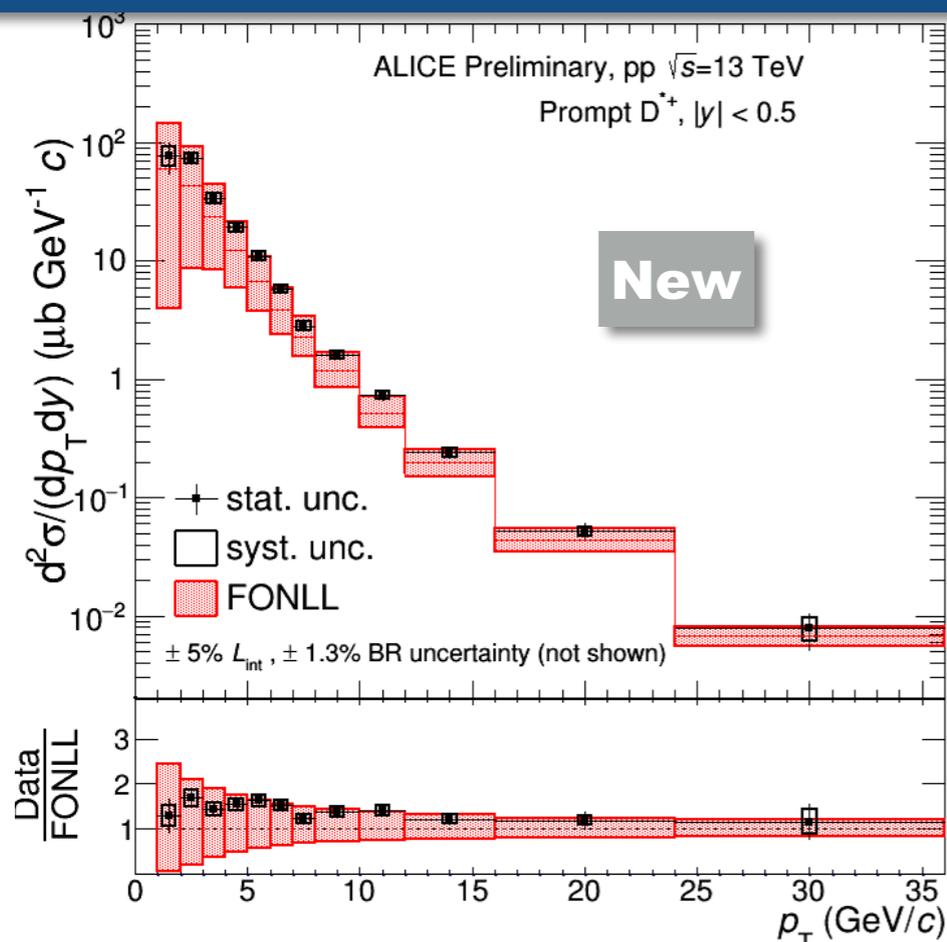
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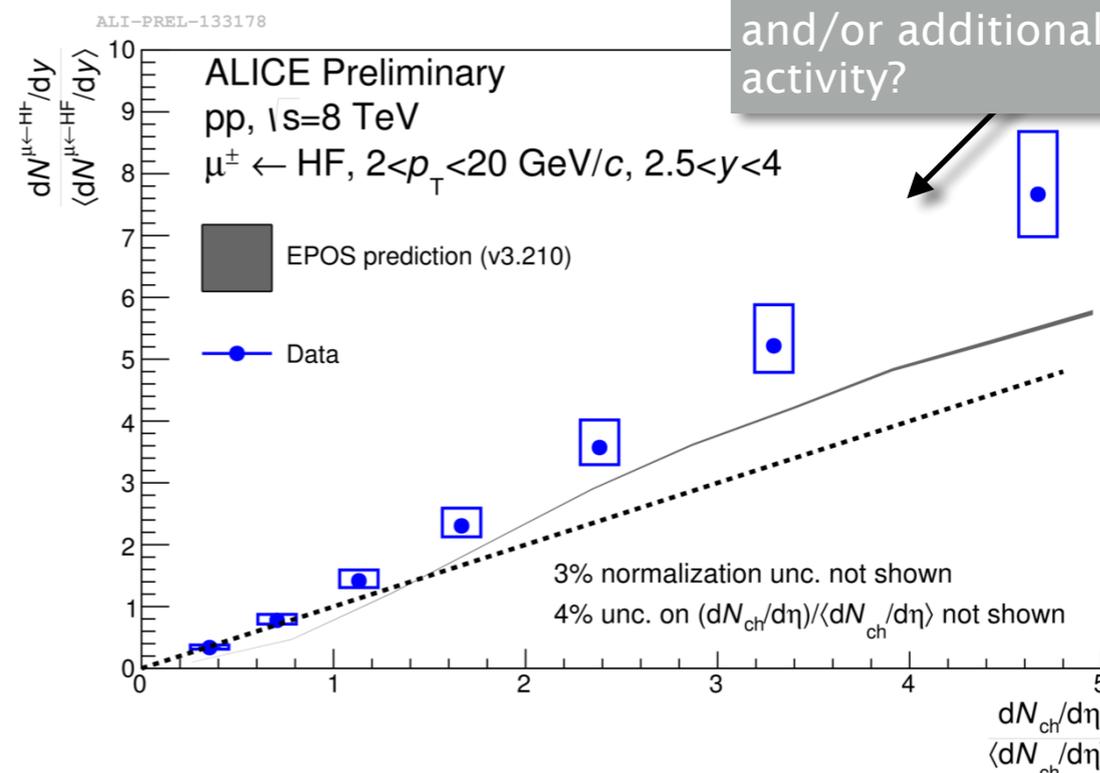
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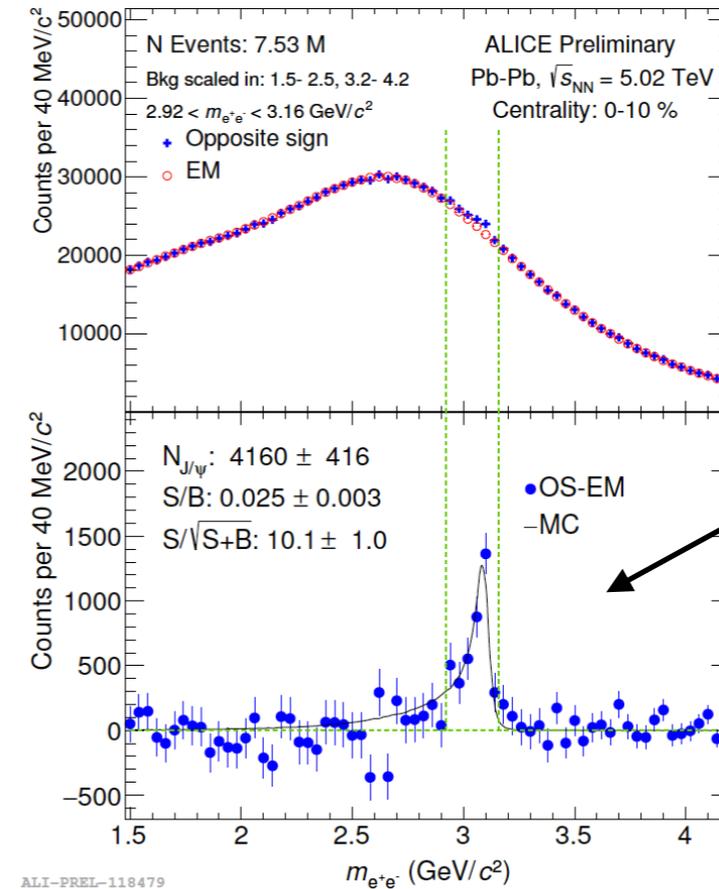
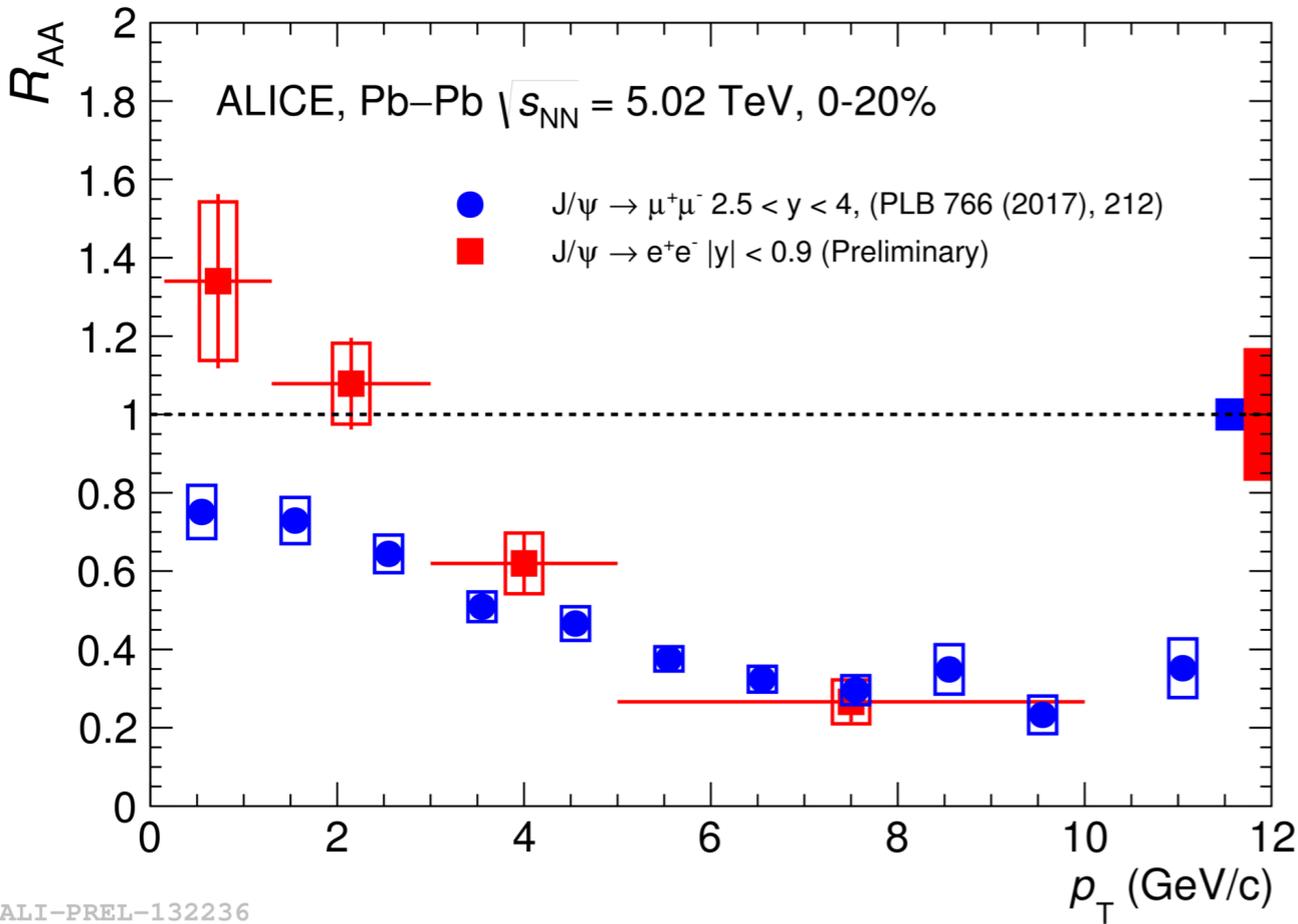


Larger than linear increase as already observed for D mesons and  $(c,b) \rightarrow e$  at mid-rapidity. Multi Parton Interactions and/or additional hadronic activity?

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# Pb-Pb: $J/\psi \rightarrow e^+e^- (\mu^+\mu^-)$ at (forward)mid-rapidity

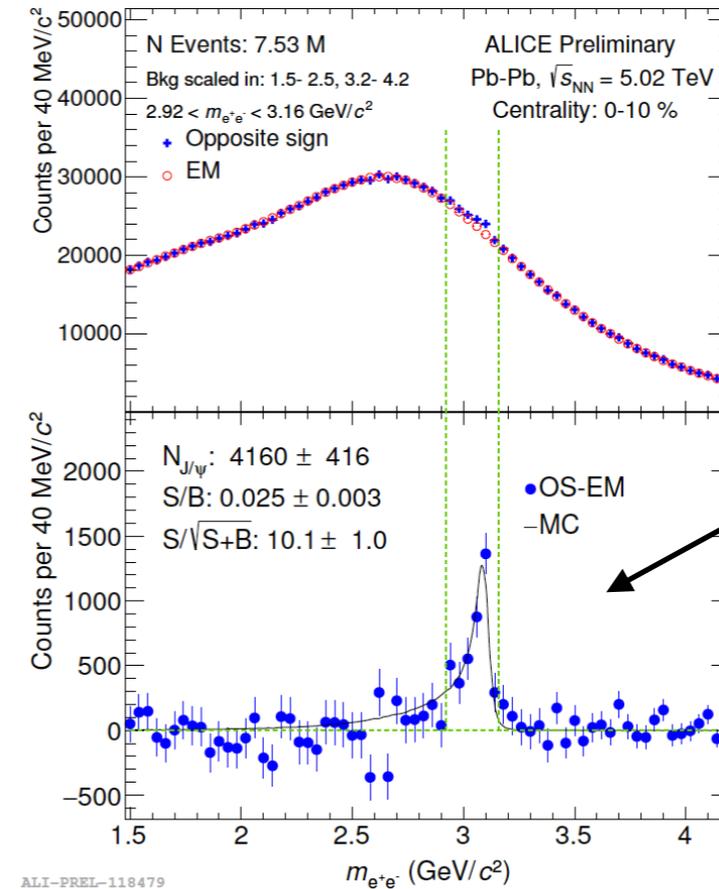
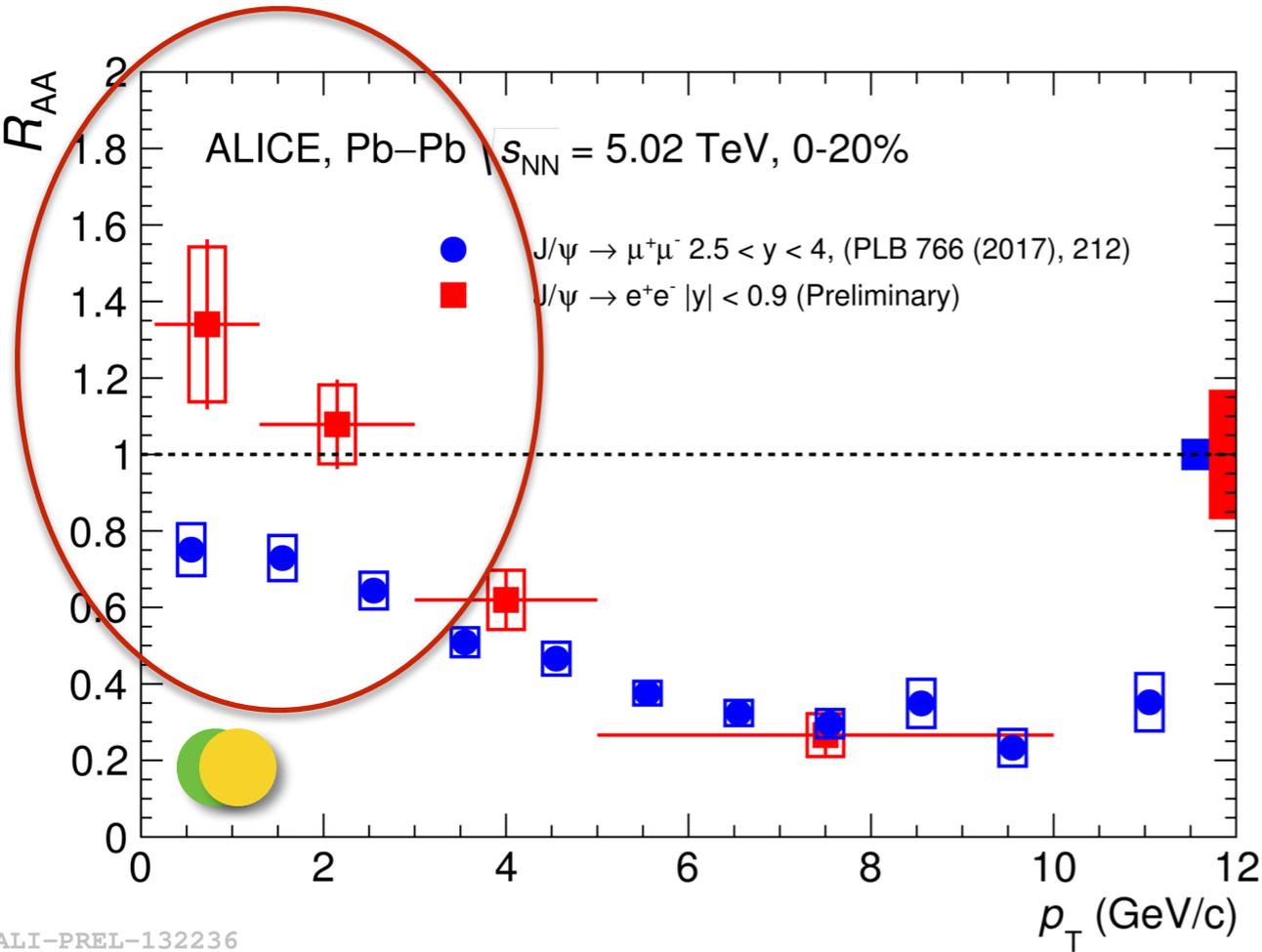


Dennis Weiser, Fri 5.25 PM

Poster: Cristiane Jahnke, Tue. 3PM (pp)

Astrid Morreale, Thu 9.40 AM

# Pb-Pb: $J/\psi \rightarrow e^+e^- (\mu^+\mu^-)$ at (forward)mid-rapidity



$J/\psi \rightarrow e^+e^-$

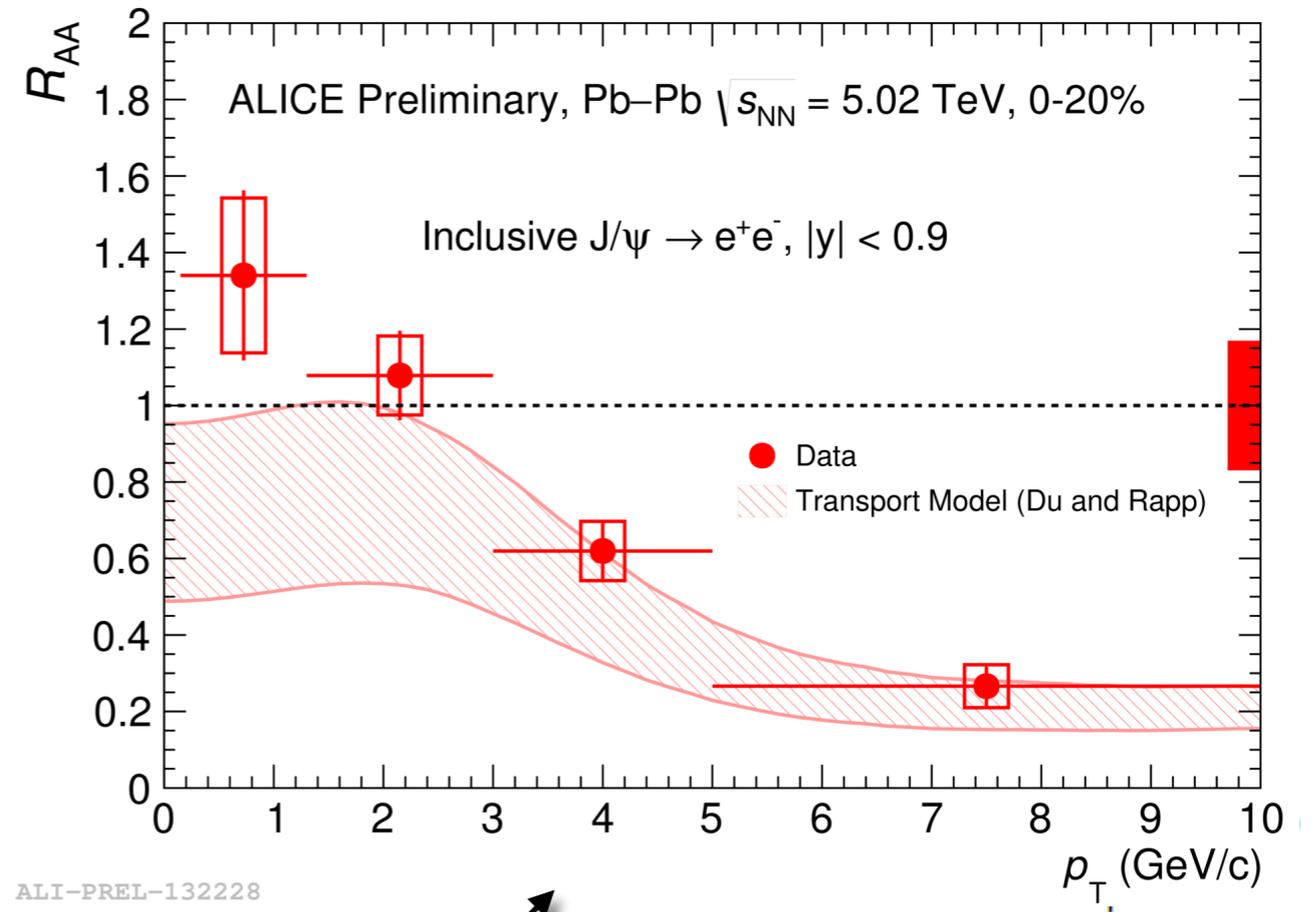
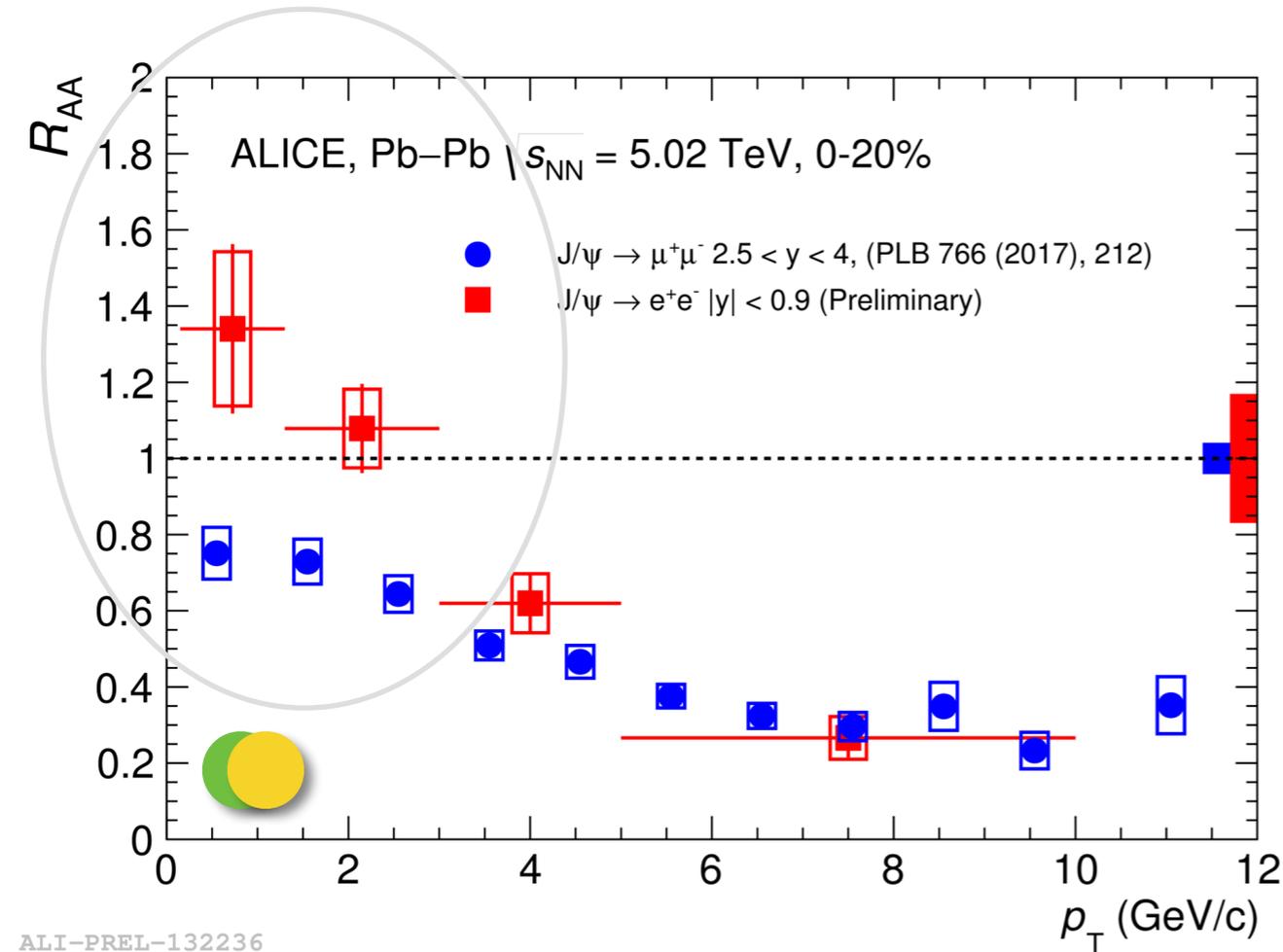
- Indication of Mid-rapidity result higher at low- $p_T$  compared to forward measurement ( $R_{AA} \geq 1$ ).

Dennis Weiser, Fri 5.25 PM

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Astrid Morreale, Thu 9.40 AM

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- Indication of Mid-rapidity result higher at low- $p_T$  compared to forward measurement ( $R_{AA} \geq 1$ ).
- Transport model by Du and Rapp describes data within uncertainties. Data sits on the upper side of the theory band.

Dennis Weiser, Fri 5.25 PM

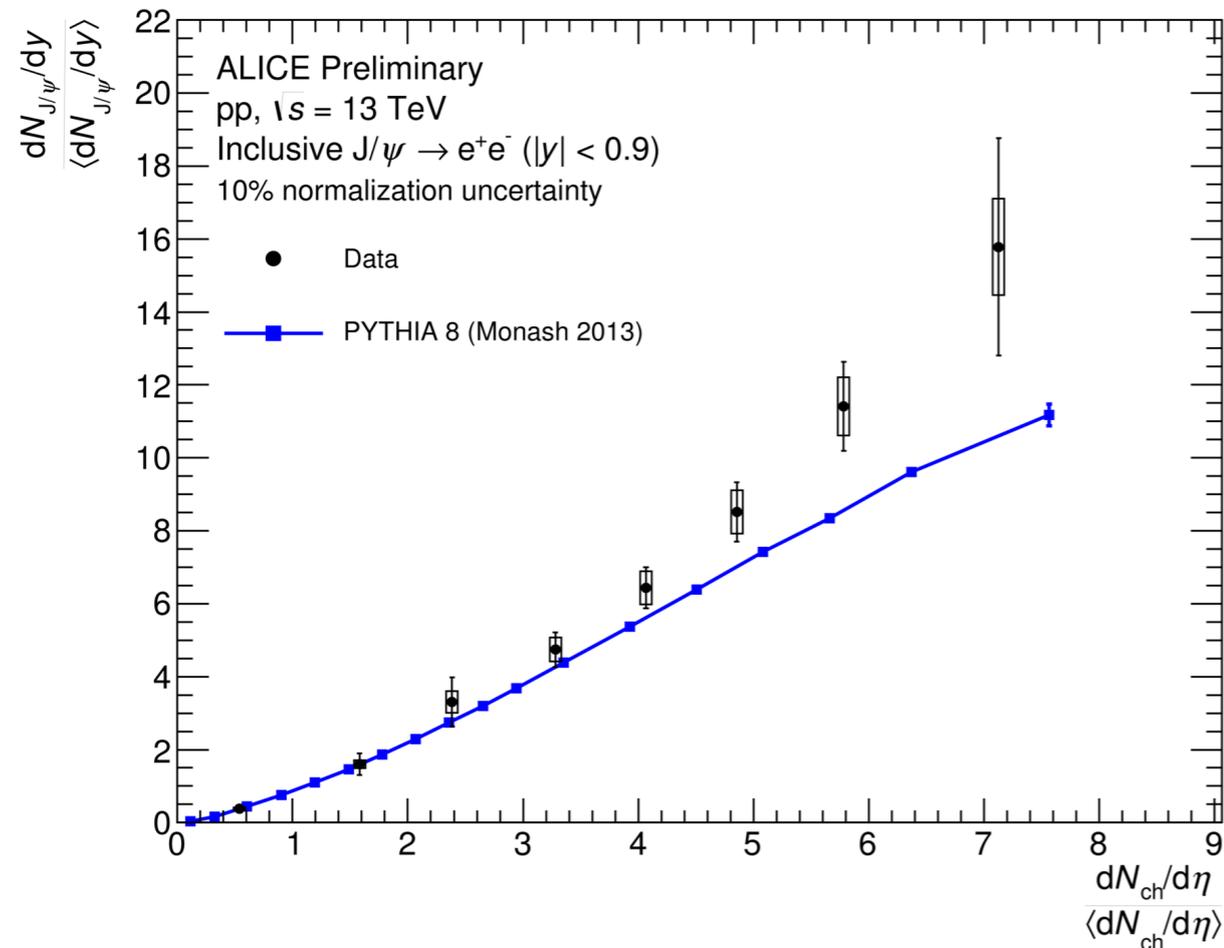
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Astrid Morreale, Thu 9.40 AM

# pp and pPb: $J/\psi$ as a function of event multiplicity



- ✓ Measurement in pp at 13 TeV allow to double the reach in multiplicity wrt. run I. Clear non linear slope with increasing multiplicity



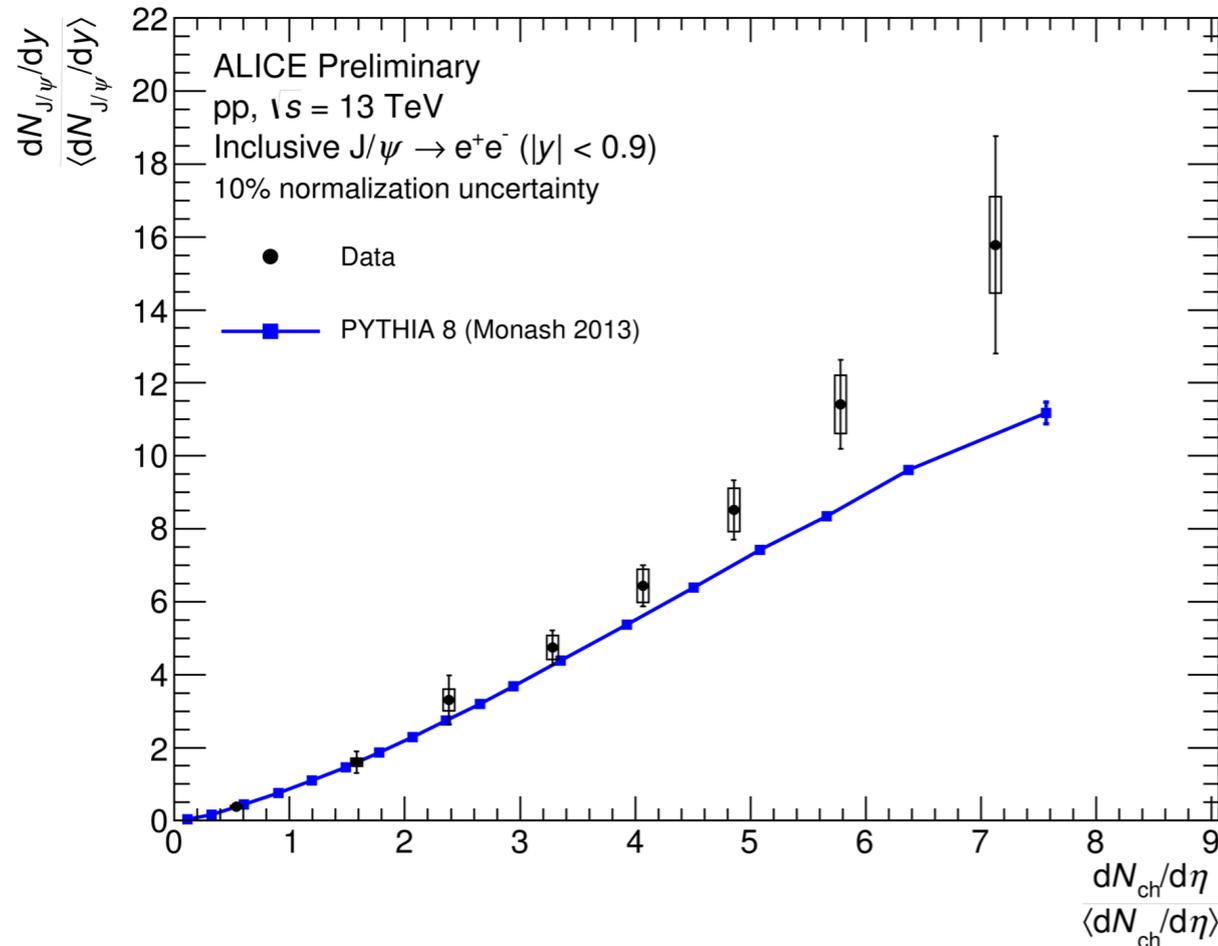
ALI-PREL-128839

Ionut Cristian Arsene, Thu 10 AM

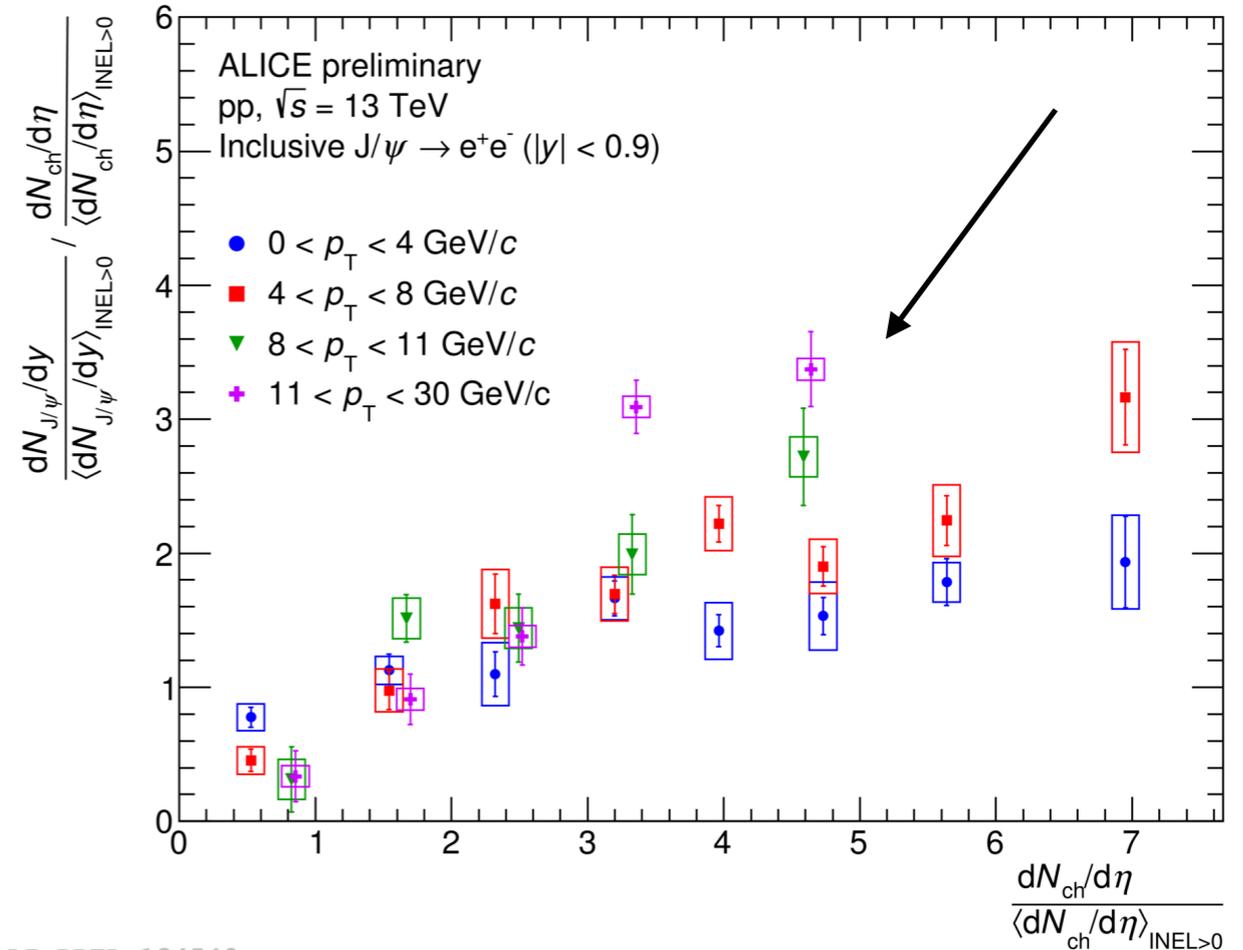
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ALI-PREL-128839



ALI-PREL-134549

- Indication of the increase is steeper with increasing  $J/\psi$   $p_T$ .

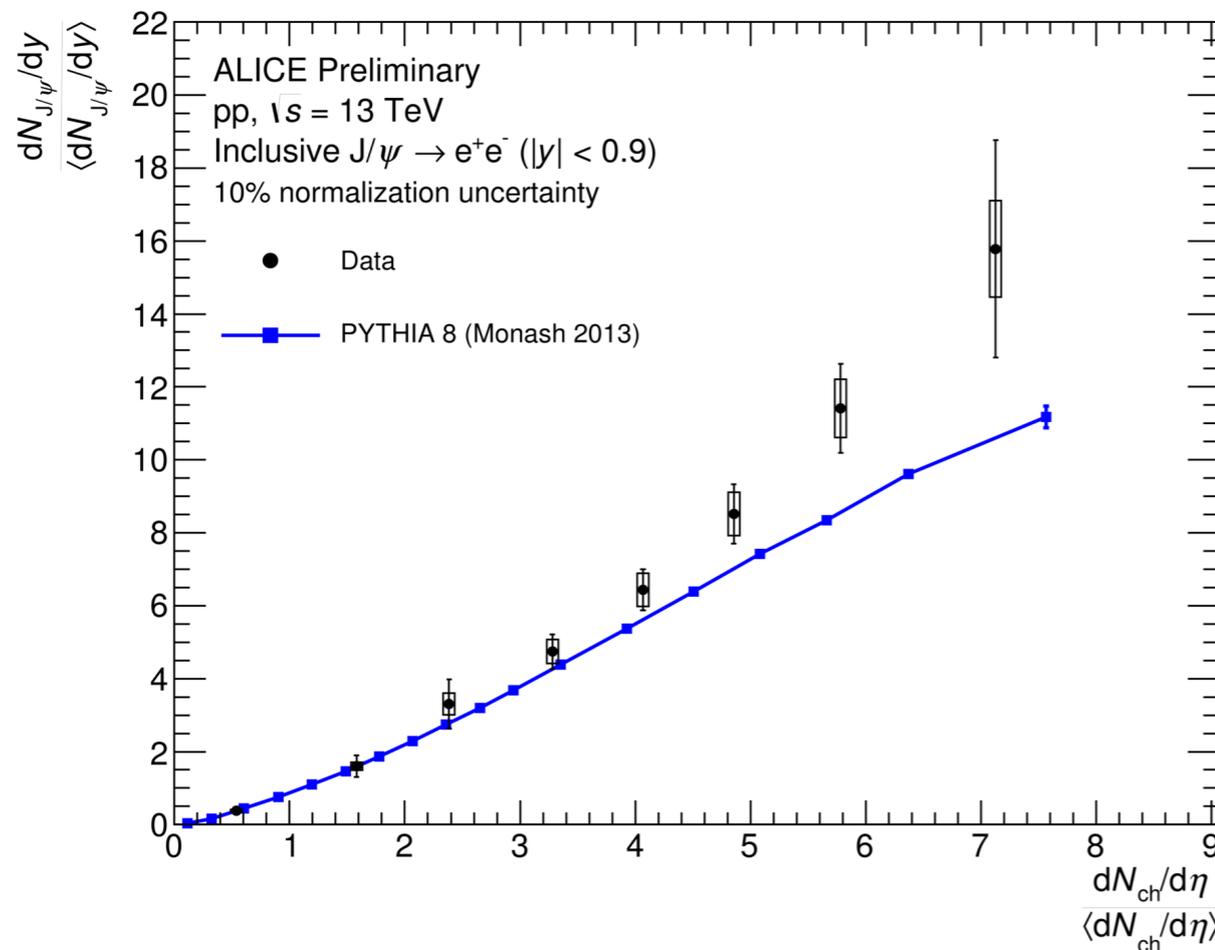
Ionuț Cristian Arsene, Thu 10 AM

# pp and pPb: J/ψ as a function of event multiplicity

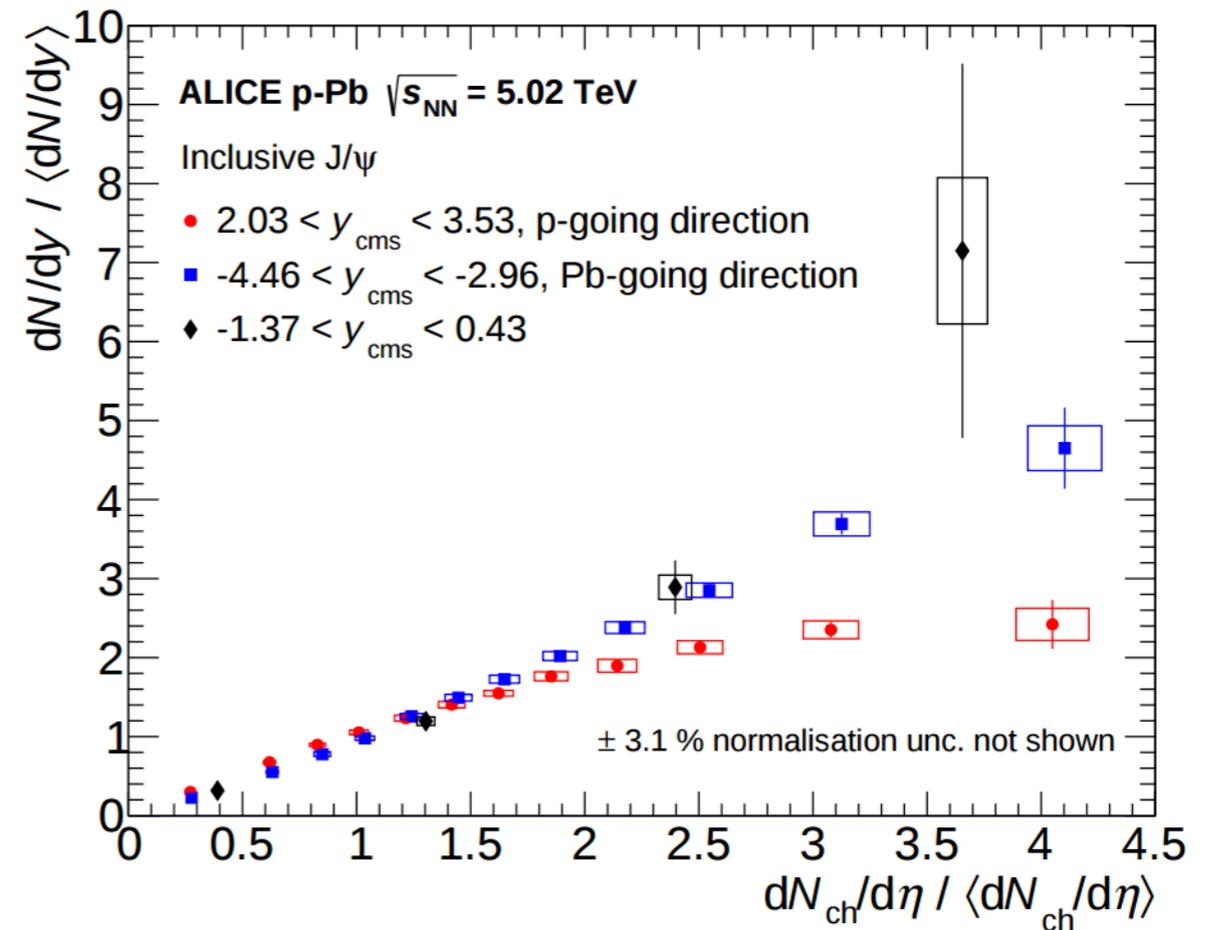


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ALI-PREL-128839



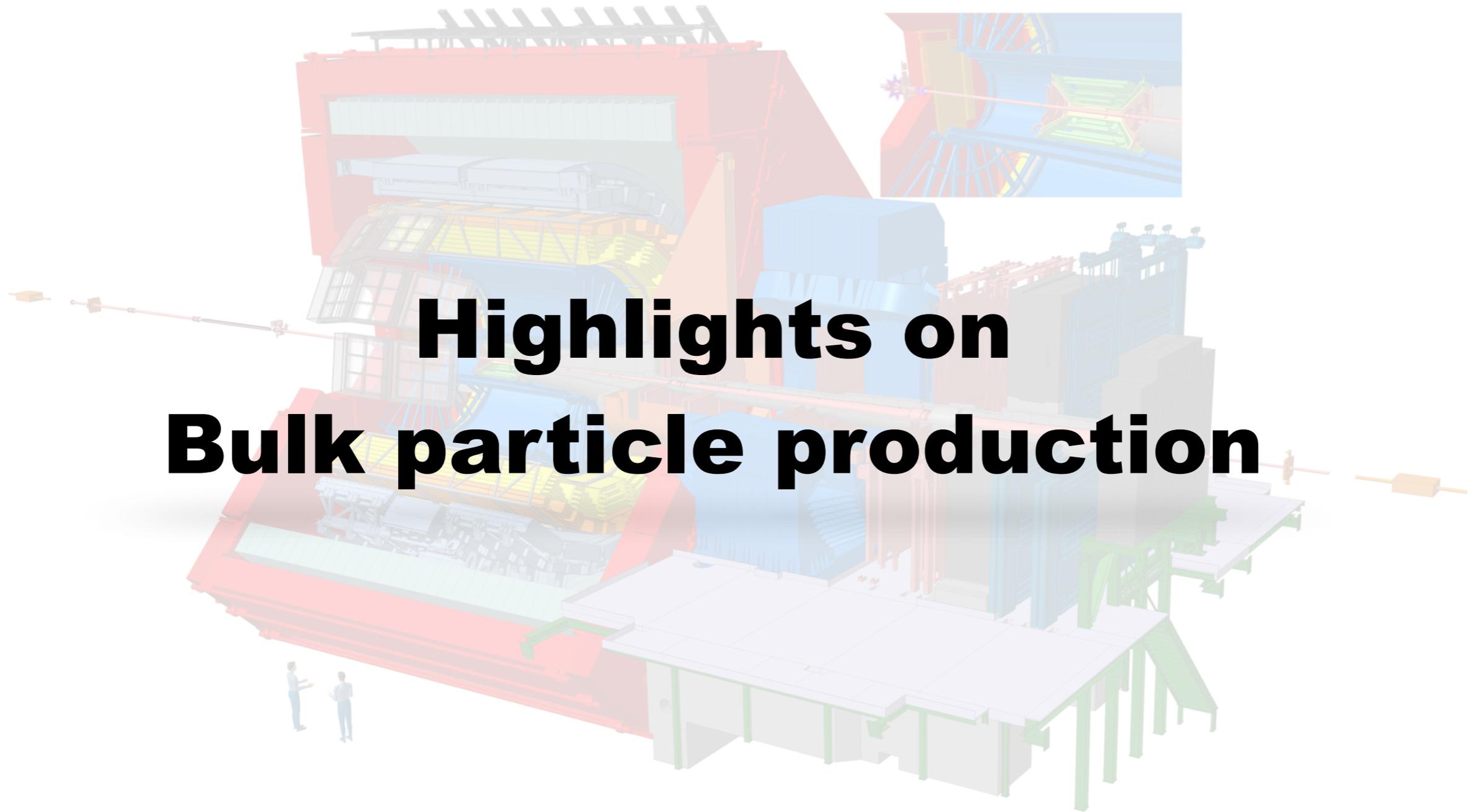
- Indication of the increase is steeper with increasing  $J/\psi$   $p_T$ .
- in p-Pb a saturation trend is observed at forward-y (the p-going direction)

Ionuț Cristian Arsene, Thu 10 AM



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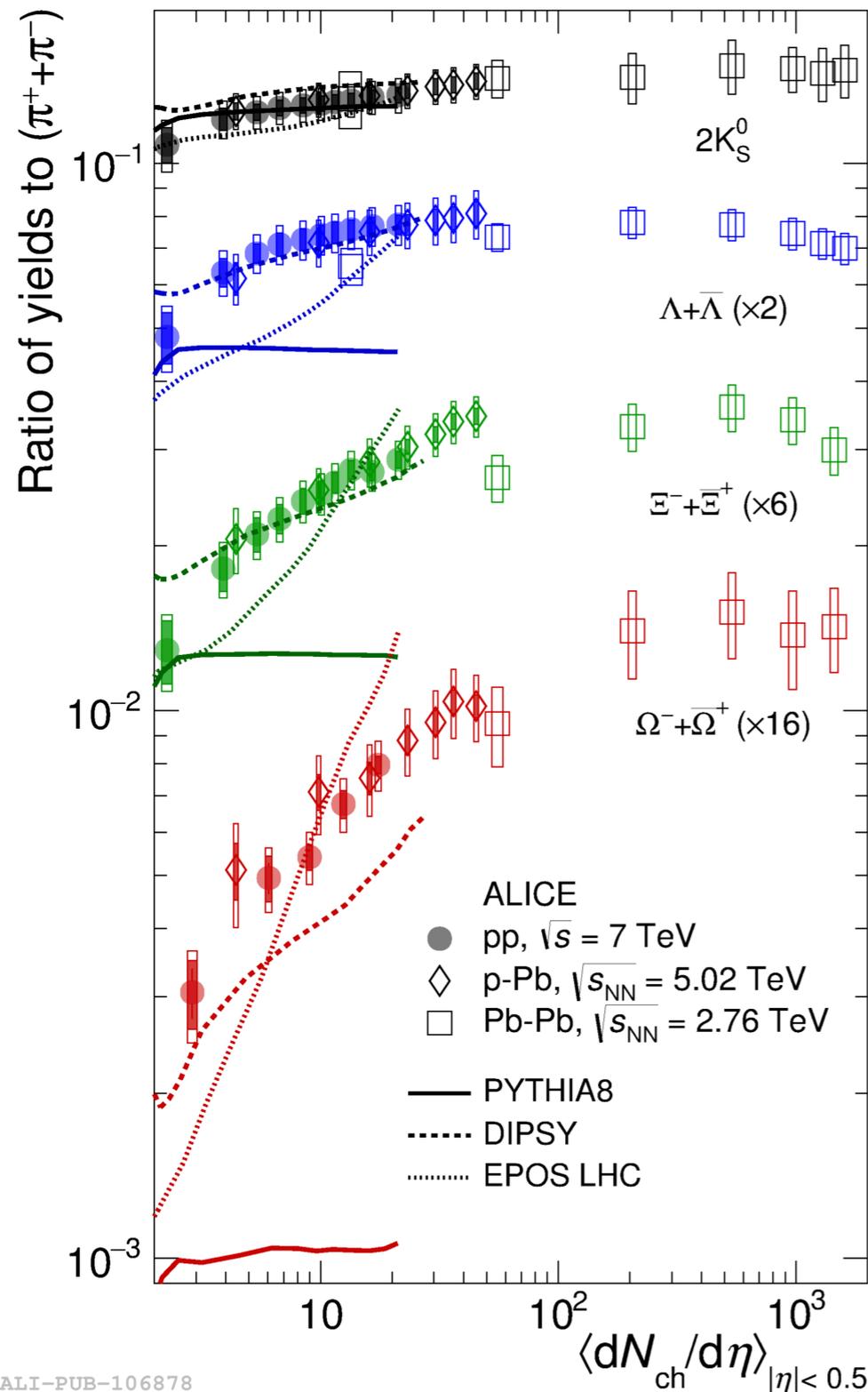
# Highlights on Bulk particle production



# Strangeness production (pp, pPb, Pb-Pb)



Nature Physics 2017; doi:10.1038/nphys4111



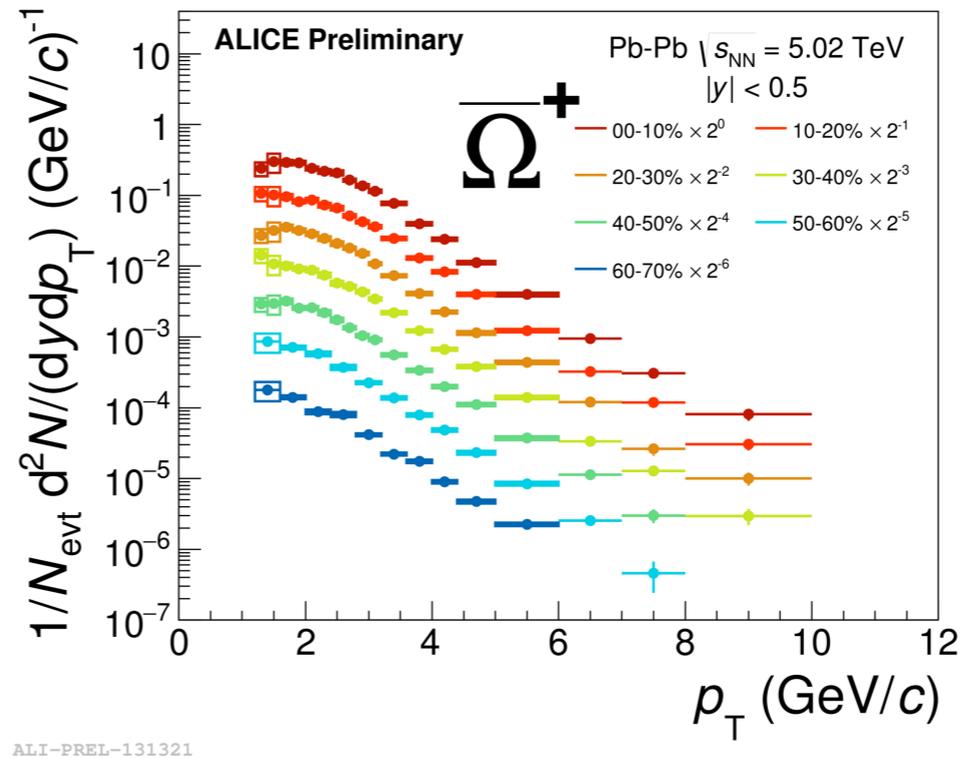
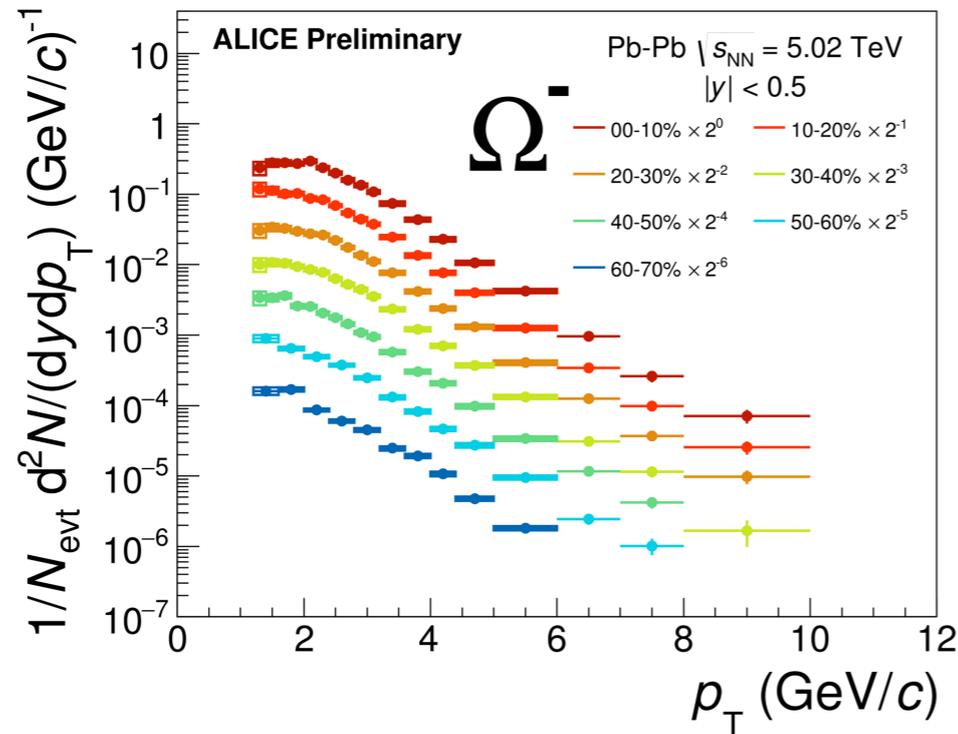
- ☑ Significant enhancement of strangeness with multiplicity in high multiplicity pp events
- ☑ pp behavior resembles p-Pb : both in terms of value of the ratio and shape
- ☑ No evident dependence on cms energy: strangeness production apparently driven by final state rather than collision system or energy
- ☑ At high mult. pp ratio reaches values similar to the one in Pb-Pb (when ratio saturates)
- ☑ Models fail to reproduce data. Only DIPSY gives a qualitative description.

# (multi-)Strange hadron spectra in Pb-Pb @ 5.02 TeV



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- ✓ Spectra of  $K^0_s$ ,  $\Lambda$ ,  $\bar{\Lambda}$ ,  $\Omega^-$ ,  $\bar{\Omega}^+$ ,  $\Xi^-$ ,  $\bar{\Xi}^+$  measured in (up to) ten centrality classes.



New

Michal Sefcik, Thu. 11.50 AM

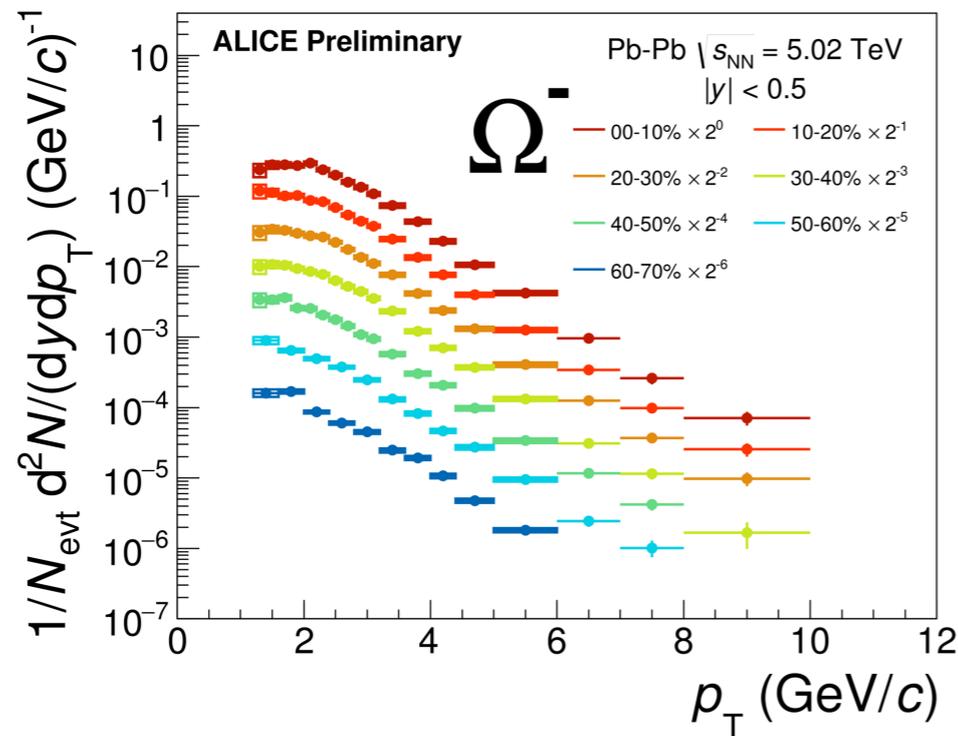
Poster: Rafael Derradi De Souza (pp@13 TeV)

# (multi-)Strange hadron spectra in Pb-Pb @ 5.02 TeV

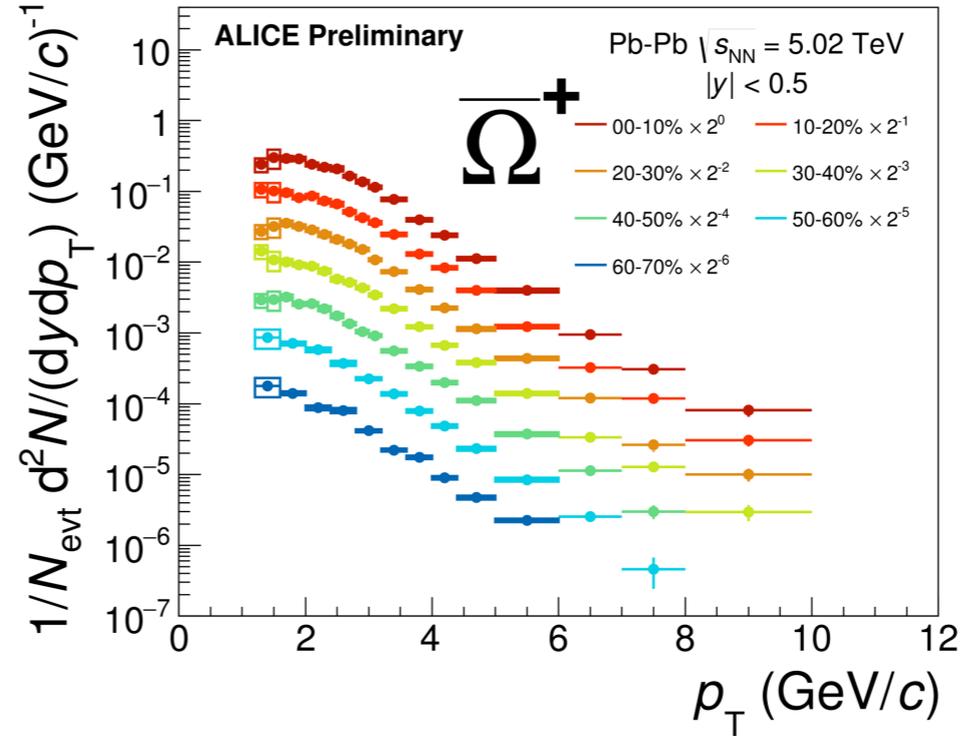


ALICE

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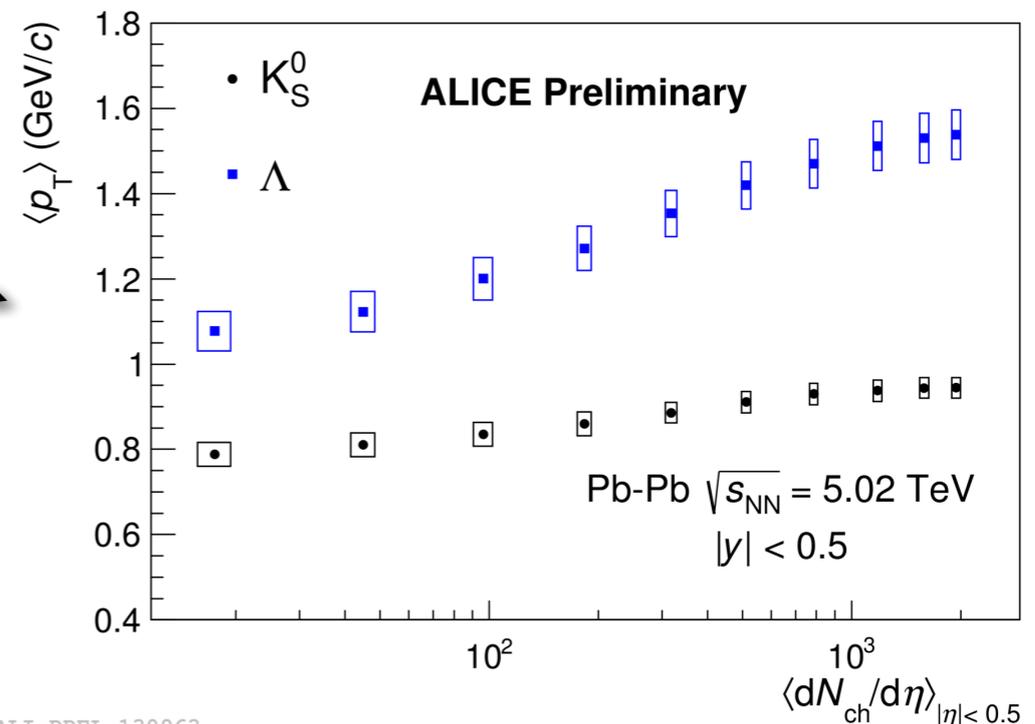
ALI-PREL-131316



ALI-PREL-131321

New

- ✓ Spectral shape becomes harder in central collisions (higher multiplicity) than in peripheral



ALI-PREL-130963

Michal Sefcik, Thu. 11.50 AM

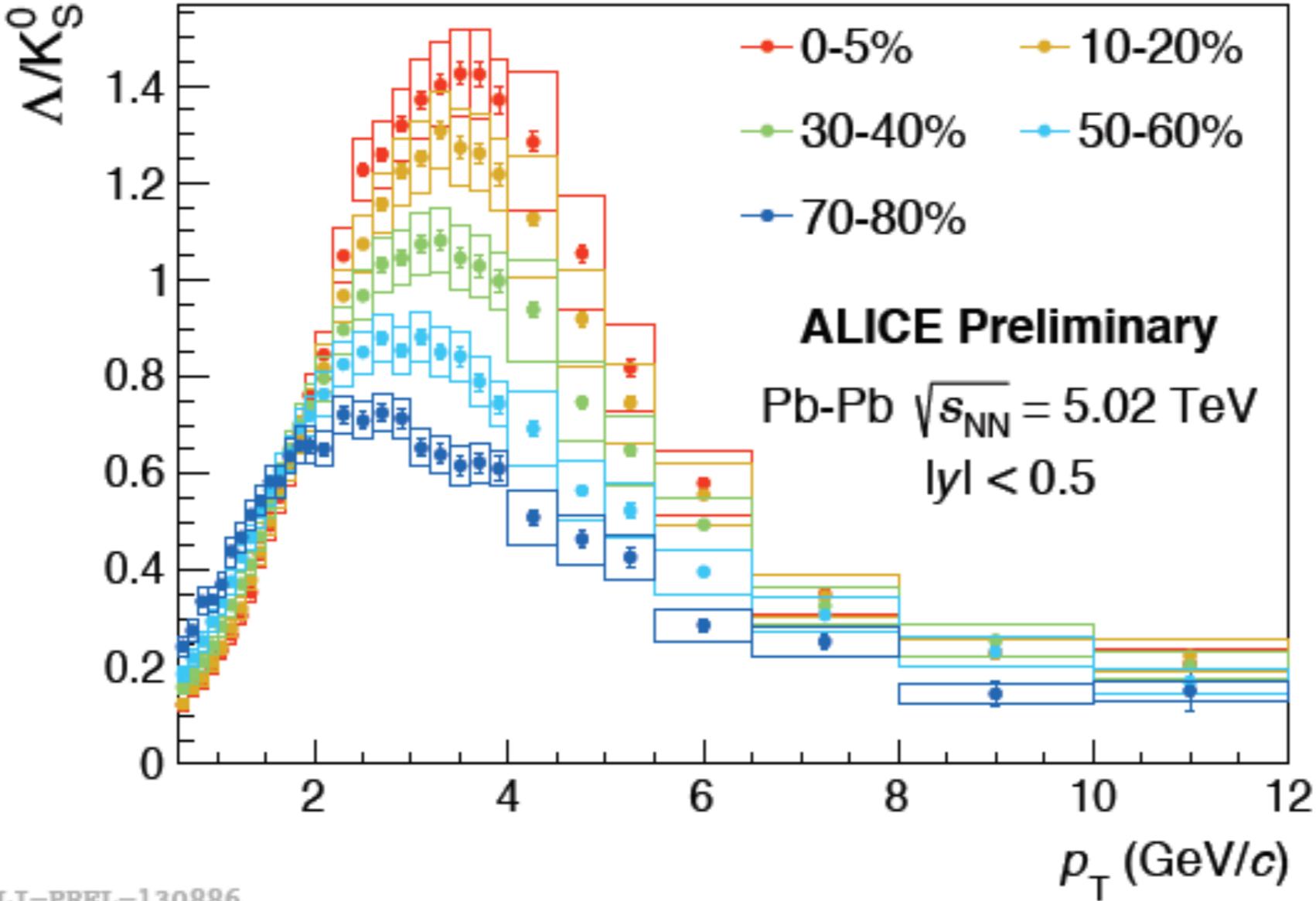
Poster: Rafael Derradi De Souza (pp@13 TeV)

# Baryons to mesons ratio in Pb-Pb @ 5.02 TeV



ALICE

New



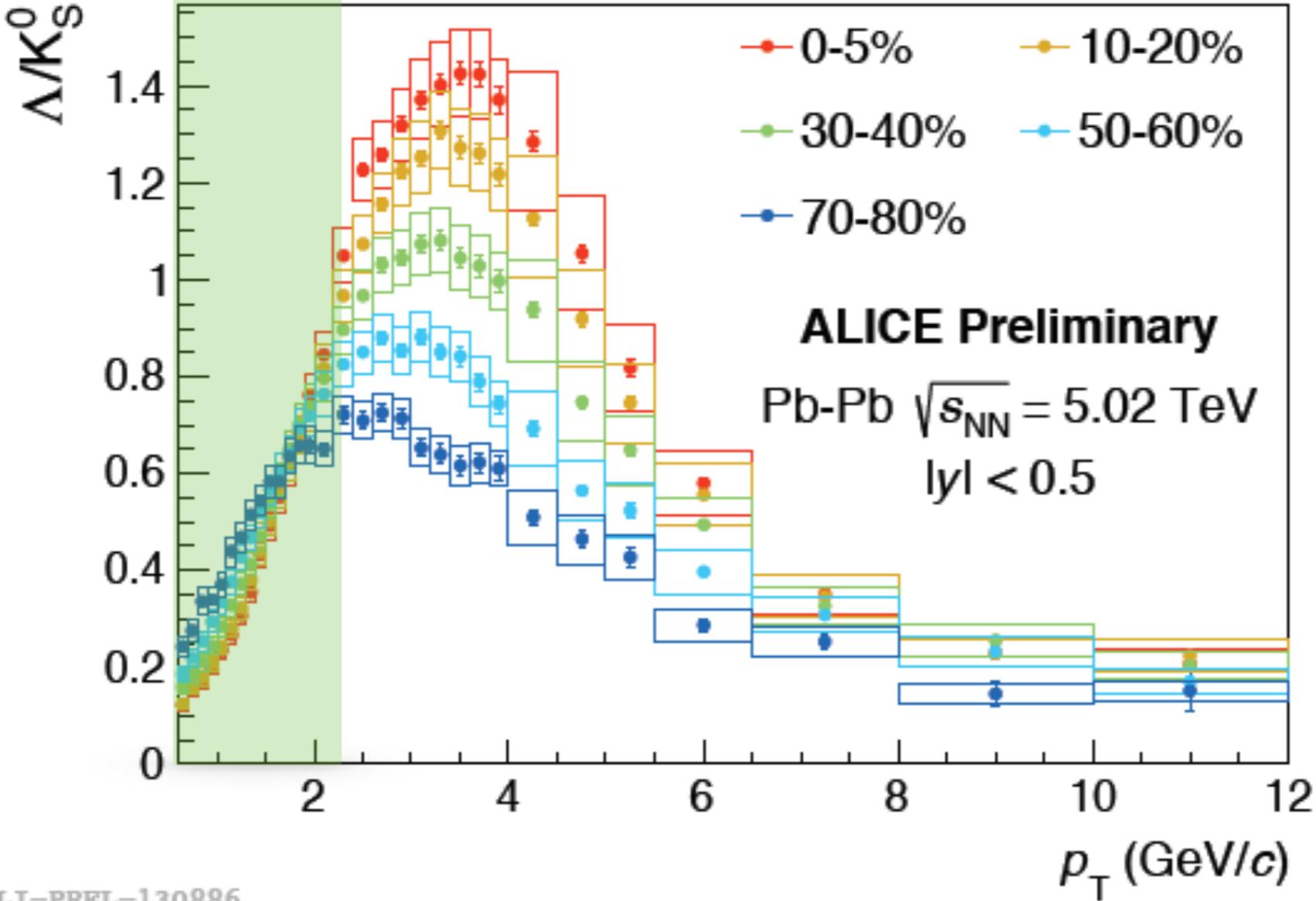
LI-PREL-130886

# Baryons to mesons ratio in Pb-Pb @ 5.02 TeV



ALICE

New



LI-PREL-130886

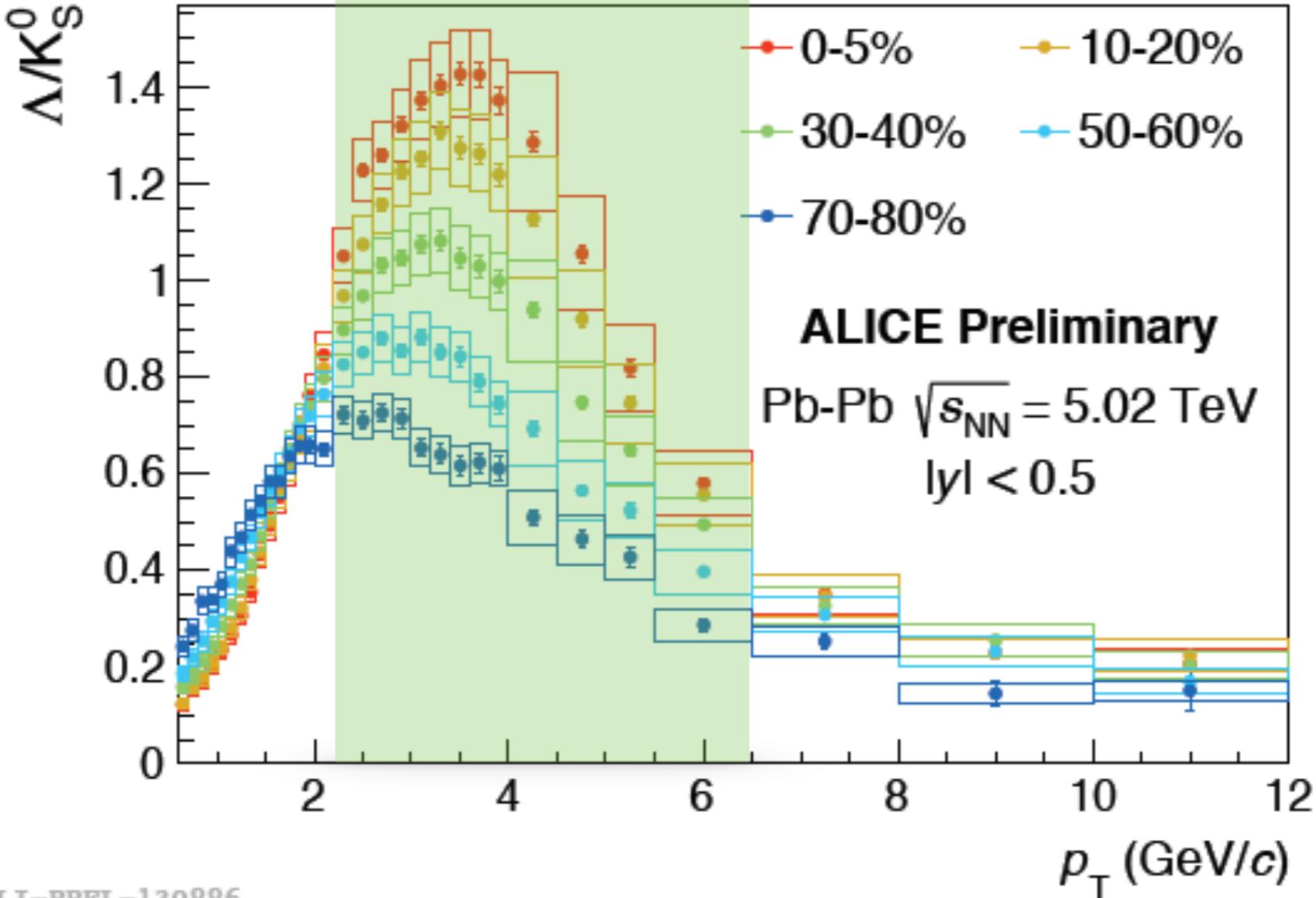
Depletion at low- $p_T$

# Baryons to mesons ratio in Pb-Pb @ 5.02 TeV



ALICE

New



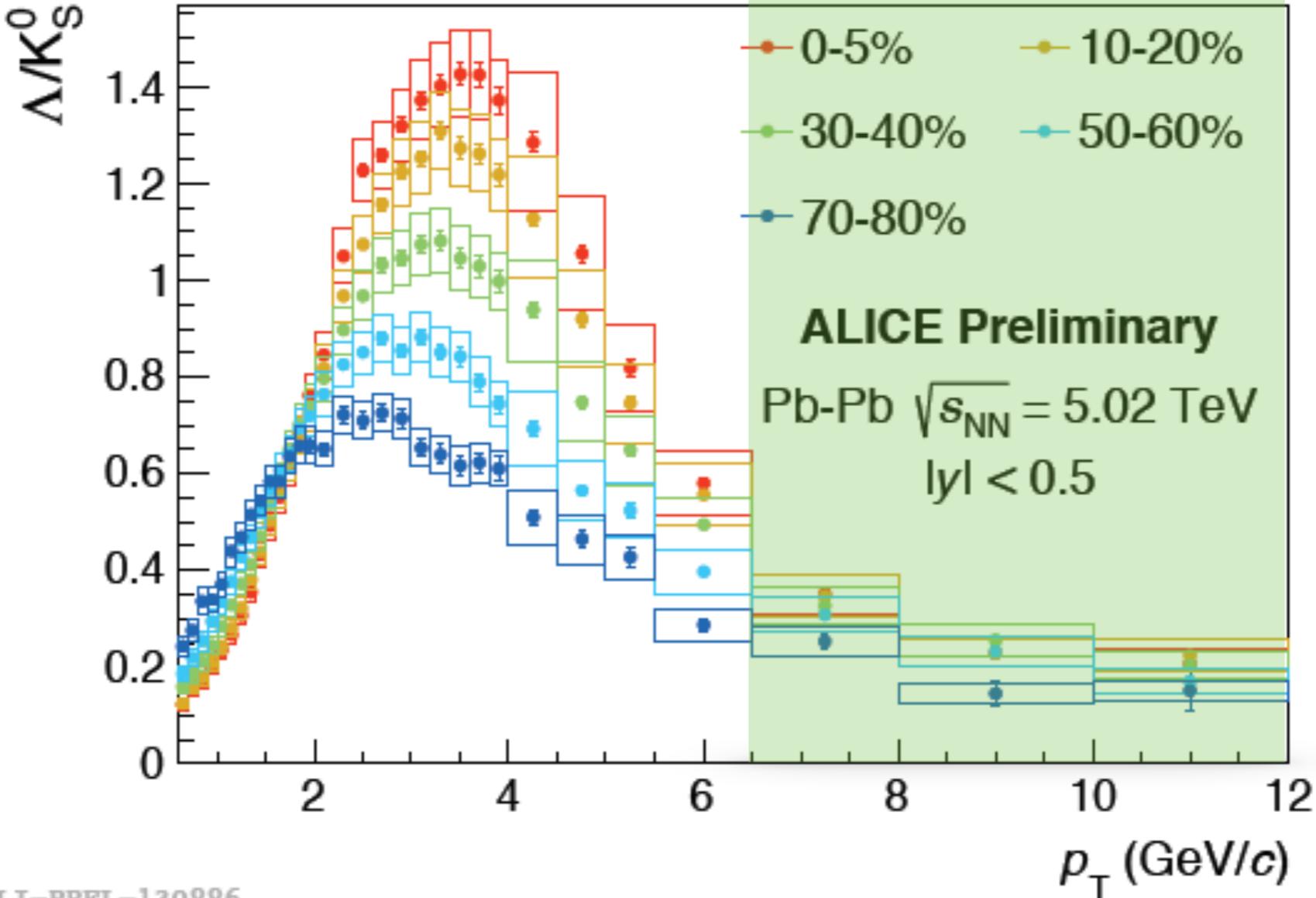
Enhancement at intermediate- $p_T$

# Baryons to mesons ratio in Pb-Pb @ 5.02 TeV



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New



LI-PREL-130886

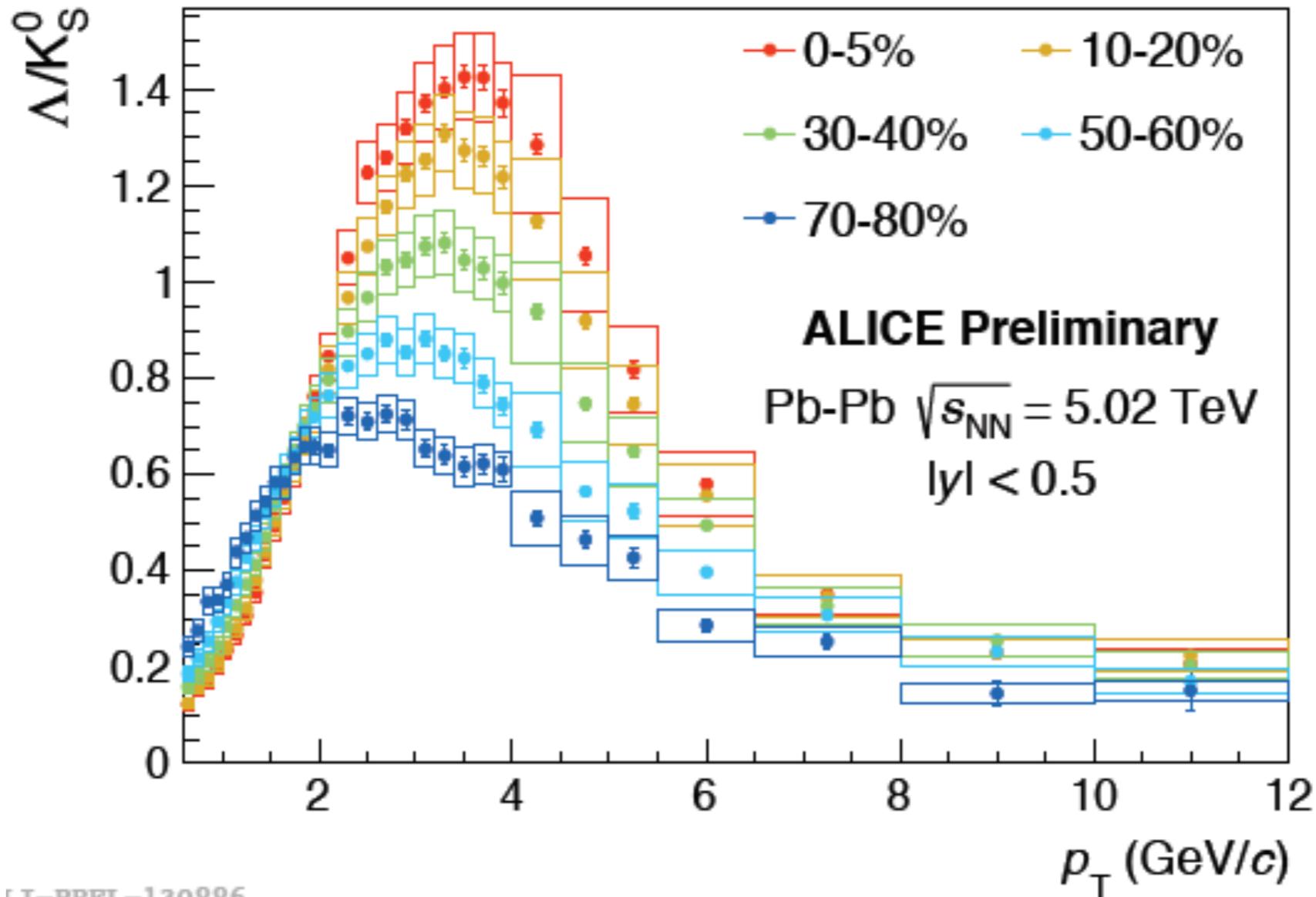
No change at high- $p_T$

# Baryons to mesons ratio in Pb-Pb @ 5.02 TeV



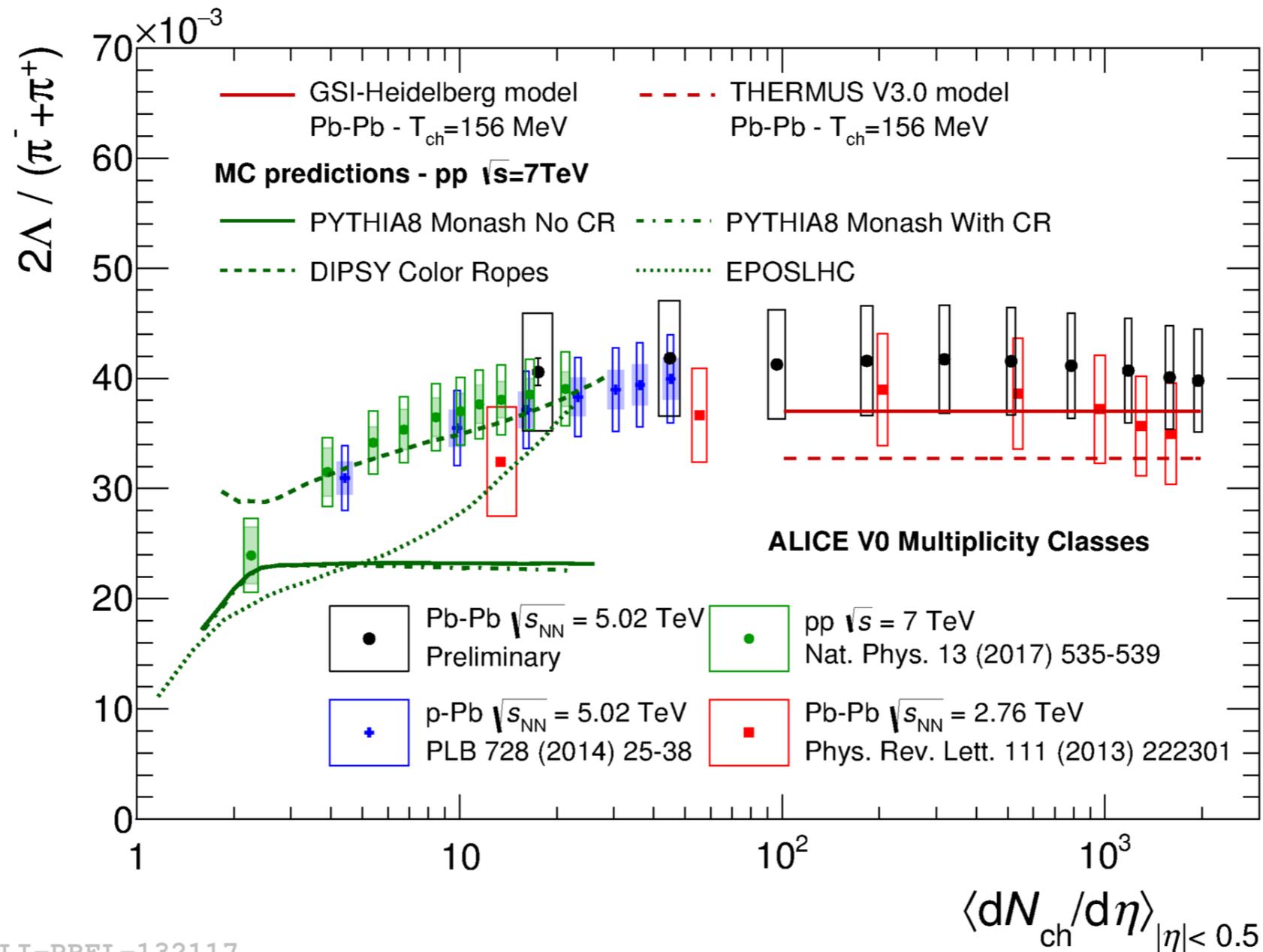
ALICE

New



LI-PREL-130886

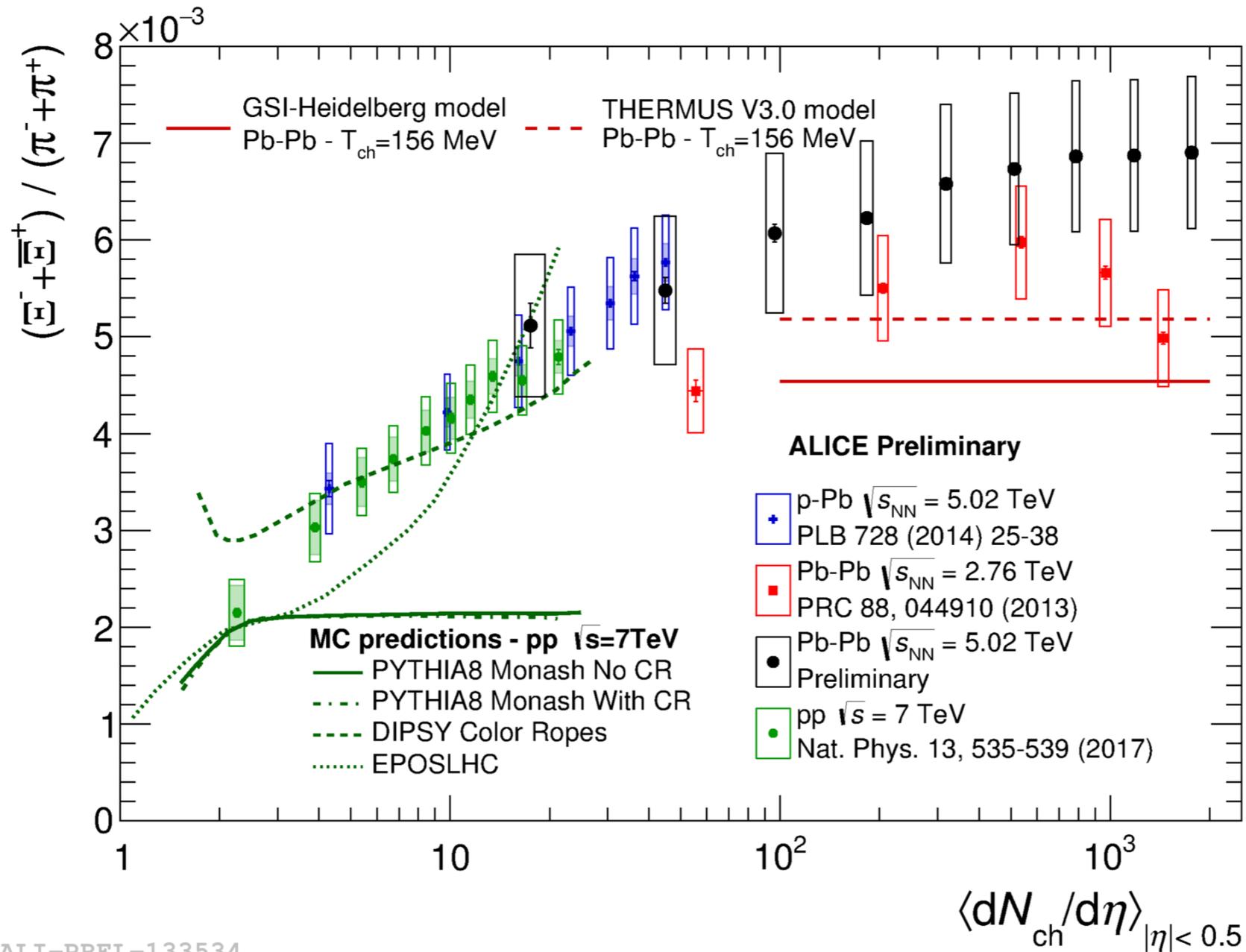
- ☑ The behaviour is consistent with hydrodynamics. (fragmentation/recombination can also contribute to the shape of this ratio)



ALI-PREL-132117

✓ Ratio of  $p_T$ -integrated yield to pions show compatibility among measurement at 2.76 TeV (red) and 5.02 TeV (black).  $K^0_s$  and  $\Omega$  show similar trend

- Smooth transition among systems (smoother with Pb-Pb @ 5.02 TeV)
- No evident energy dependence

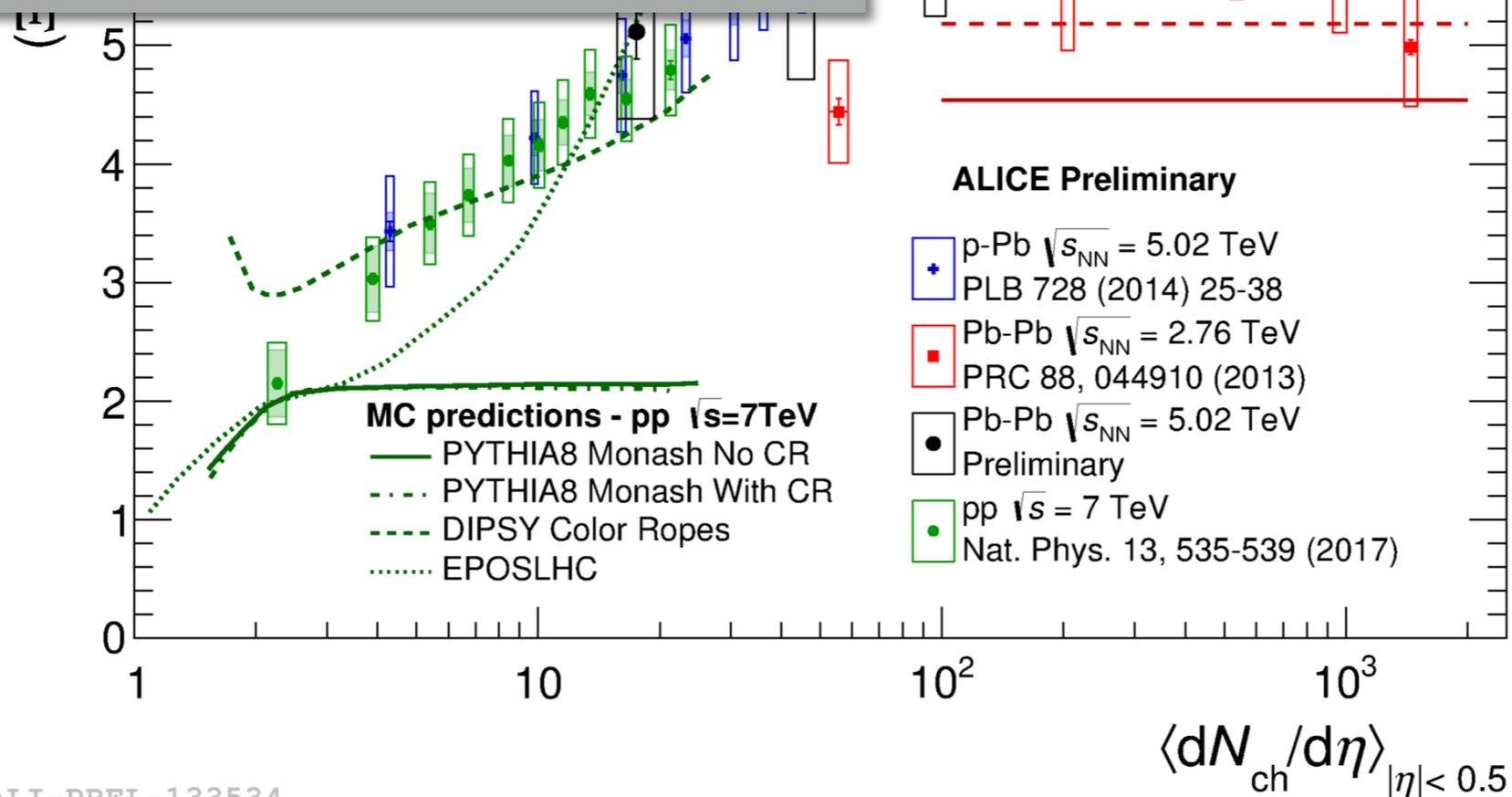


ALI-PREL-133534

✓ Ratio of  $p_T$ -integrated yield to pions show compatibility at systematic level

- $\bullet$  Pb-Pb @ 5.02 TeV: Tension with thermal model ? (fits still for 2.76 TeV! need to refit at 5.02 TeV)
- $\bullet$  No evident energy dependence. Smooth trend among systems

Pb-Pb 2.76 TeV under re-analysis. The difference is being investigated as a systematic effect due to different analysis strategies at the two energies. **Stay tuned!**



ALI-PREL-133534

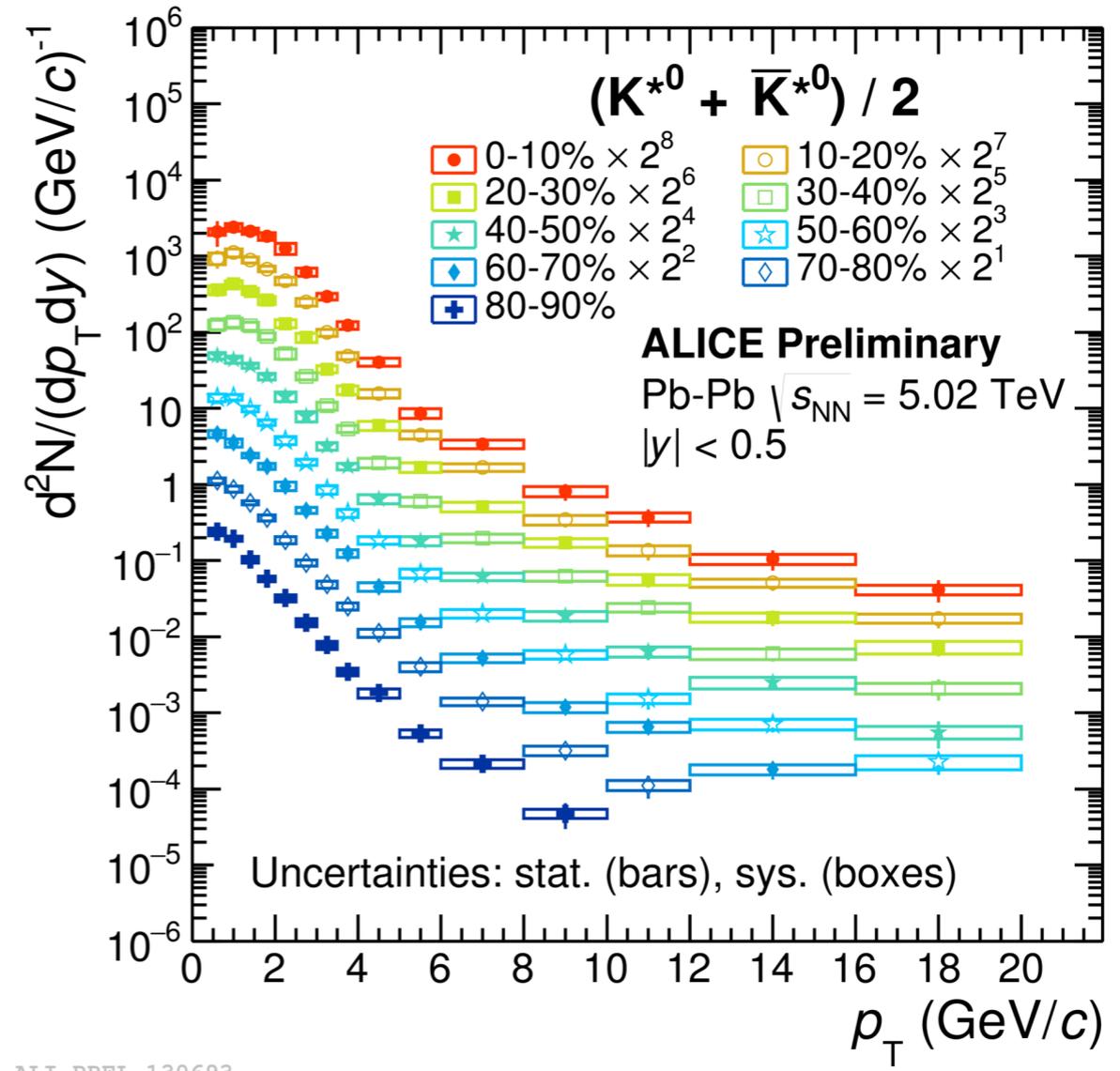
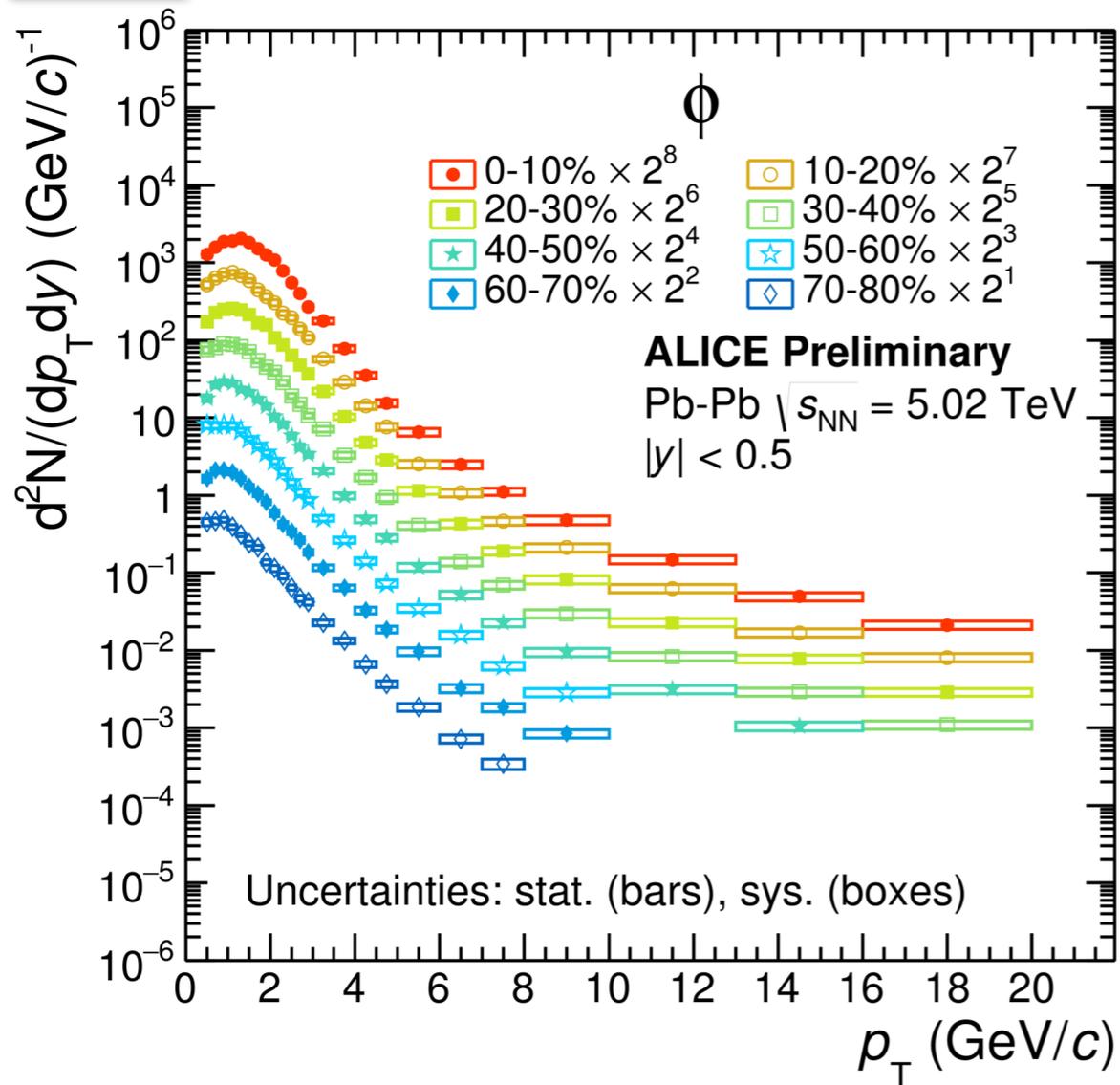
- ✓ Ratio of  $p_T$ -integrated yield to pions show compatibility at systematic level
  - 📌 Pb-Pb @ 5.02 TeV: Tension with thermal model ? (fits still for 2.76 TeV! need to refit at 5.02 TeV)
  - 📌 No evident energy dependence. Smooth trend among systems

# and what about resonances?



ALICE

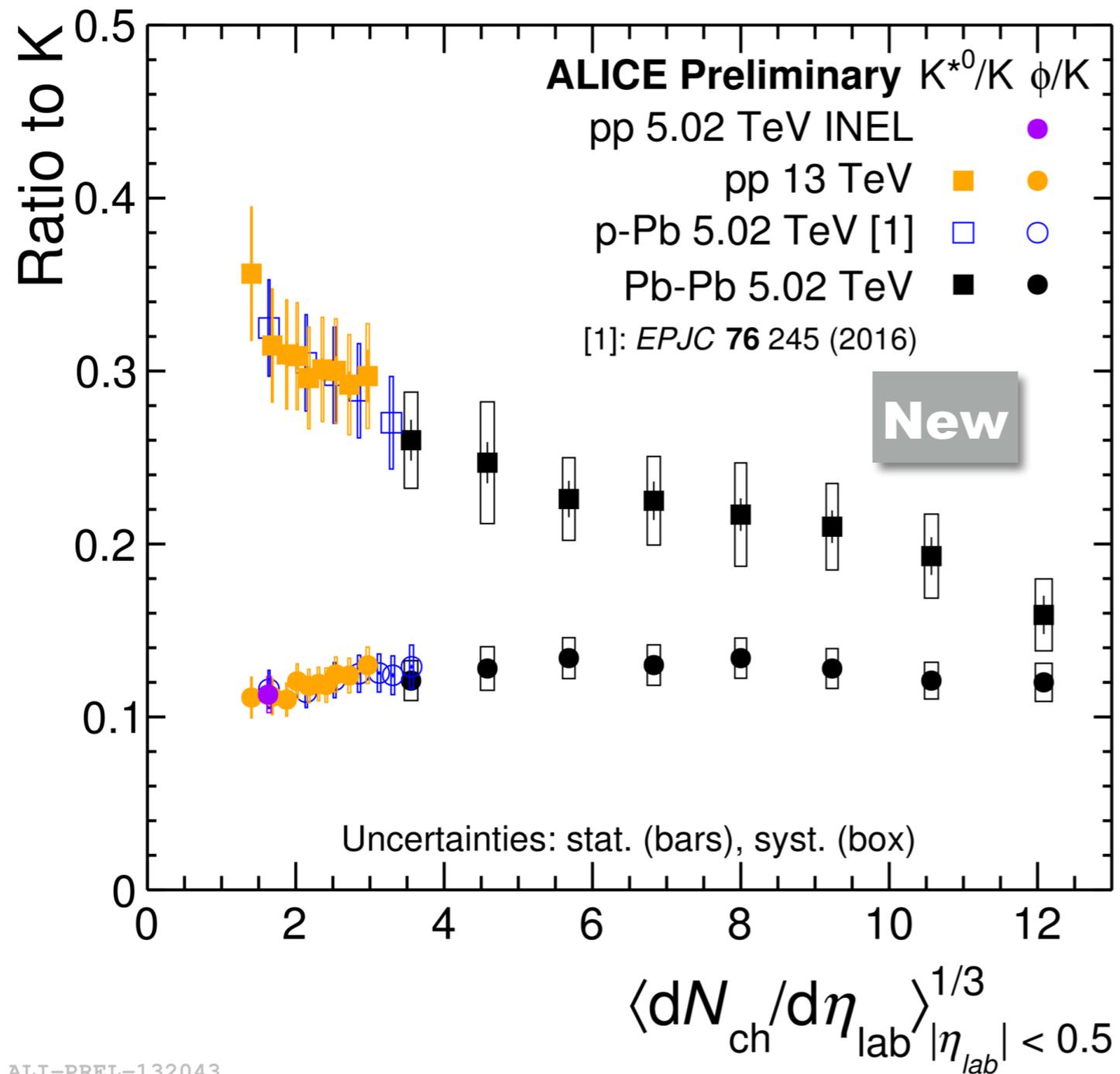
New



- ☑ The Run II Pb-Pb -allows for precision measurement of  $\phi$  and  $K^{0*}$  in several centrality intervals.

Neelima Agrawal, Fri. 4.45 PM

# Particle ratios

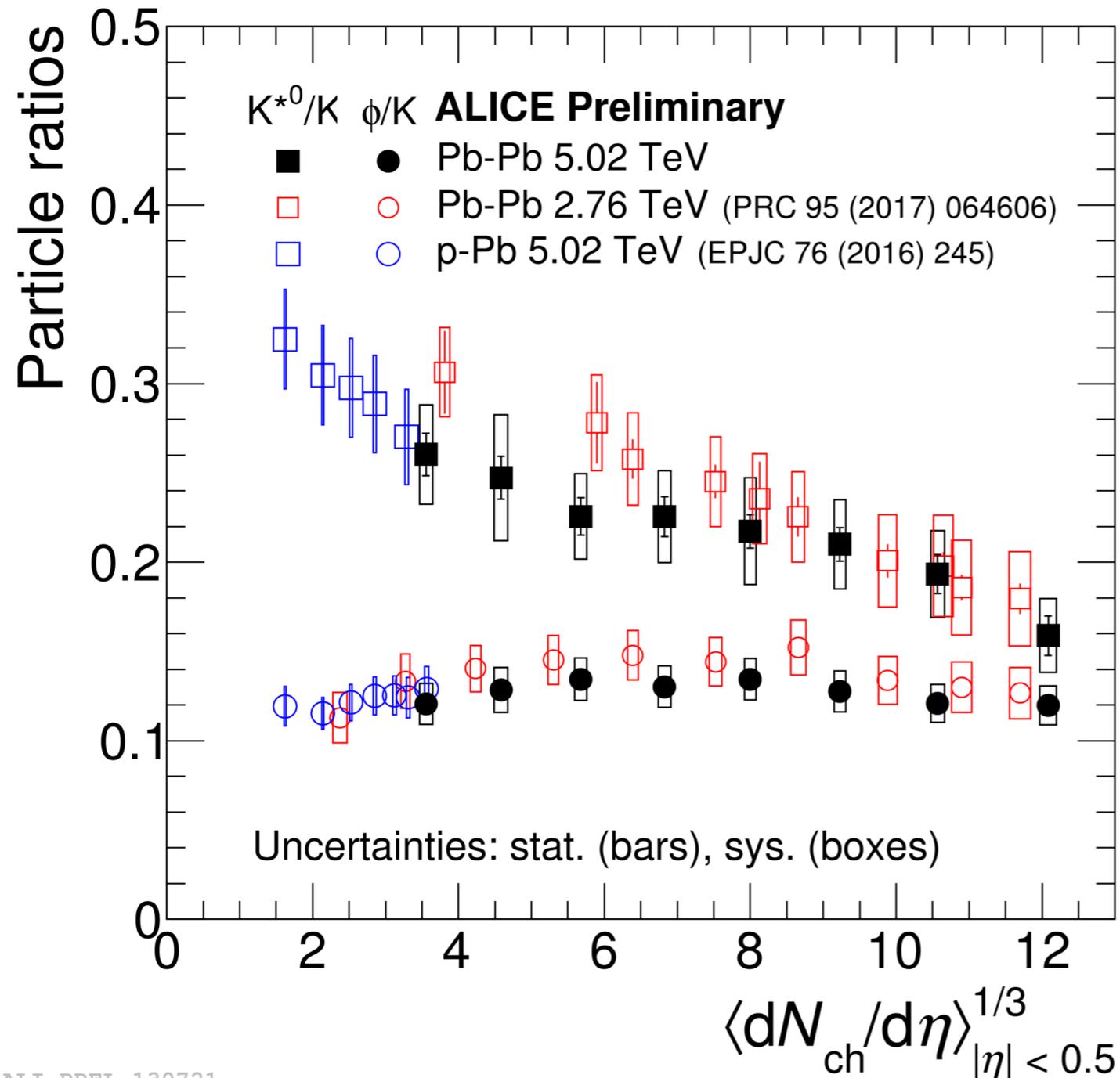


- $K^{*0}/K$  ratio shows clear suppression going from pp to central Pb-Pb
- $\phi/K$  shows no suppression ✓ almost constant behaviour

ALI-PREL-132043

Neelima Agrawal, Fri. 4.45 PM

# Particle ratios



- $K^{*0}/K$  ratio shows clear suppression going from pp to central Pb-Pb

- $\phi/K$  shows no suppression ✓ almost constant behaviour

- $K^{*0}$  suppression:

- No dependence on energy.
- Re-scattering of the decay daughters with final state hadronic medium

Neelima Agrawal, Fri. 4.45 PM



ALICE

# Highlights on Anisotropic Flow

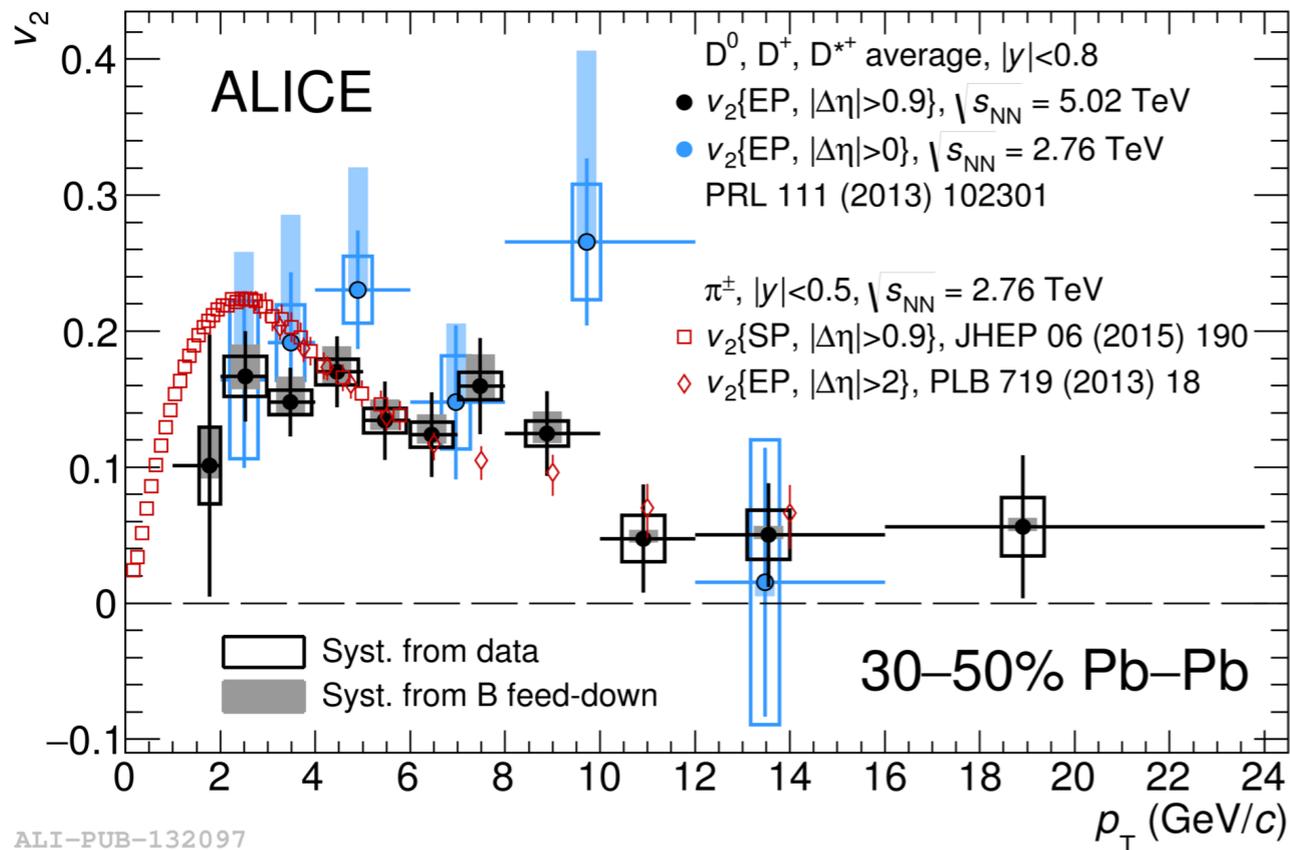


# $v_2$ of D mesons

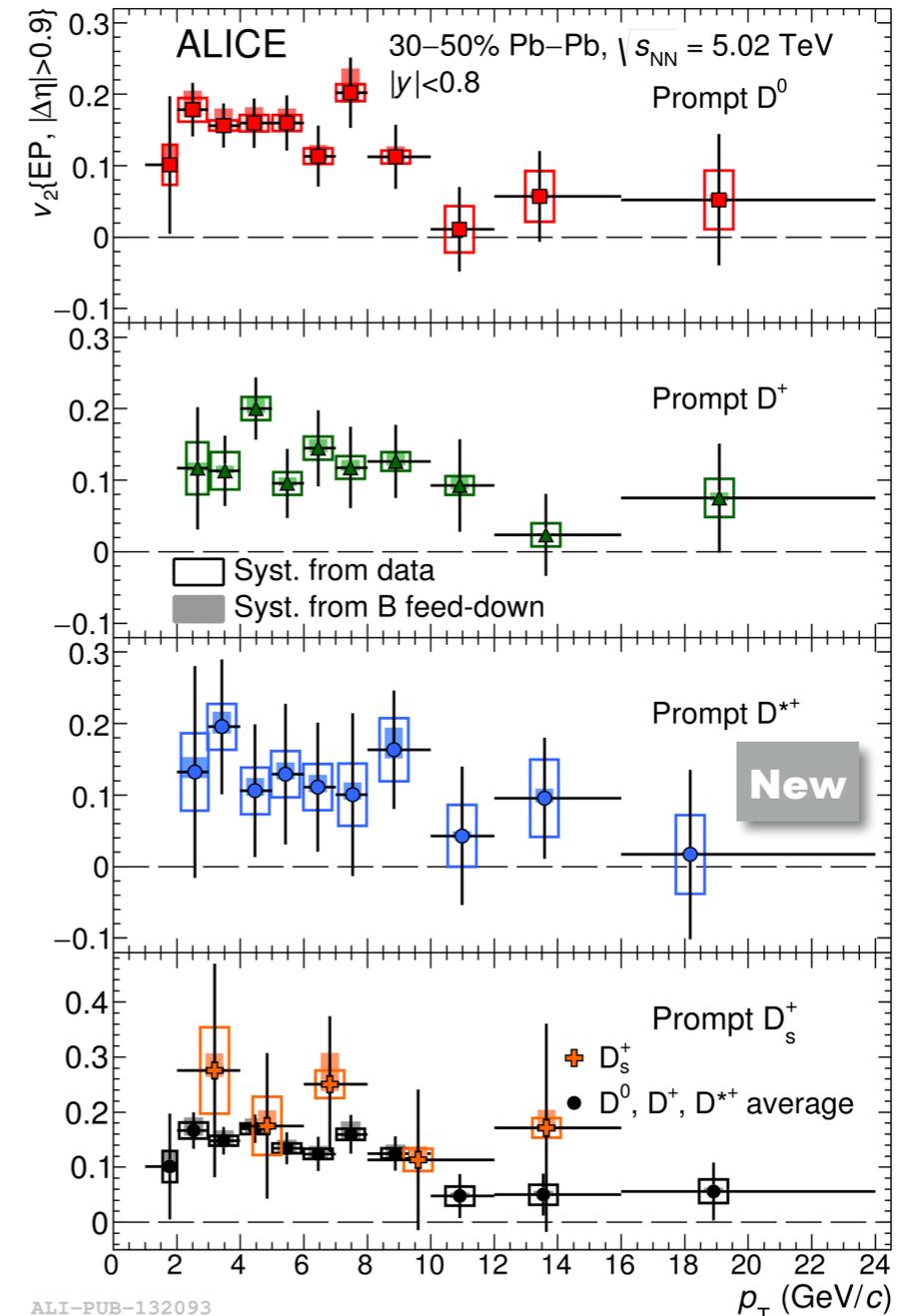


ALICE

- Run II results sent for publication, **look at arXiv:1707.01005**  
(first  $D_s$  measurement at LHC)



ALI-PUB-132097



ALI-PUB-132093

- Non-strange D-meson  $v_2$  larger than 0 for  $2 < p_T < 10$  GeV/c

- D-meson  $v_2$  similar to  $\pi^\pm v_2$

- Hint of difference for  $p_T < 4$  GeV/c D-meson  $v_2$  in mid-central Pb-Pb collisions
- More statistics needed to quantify it ...

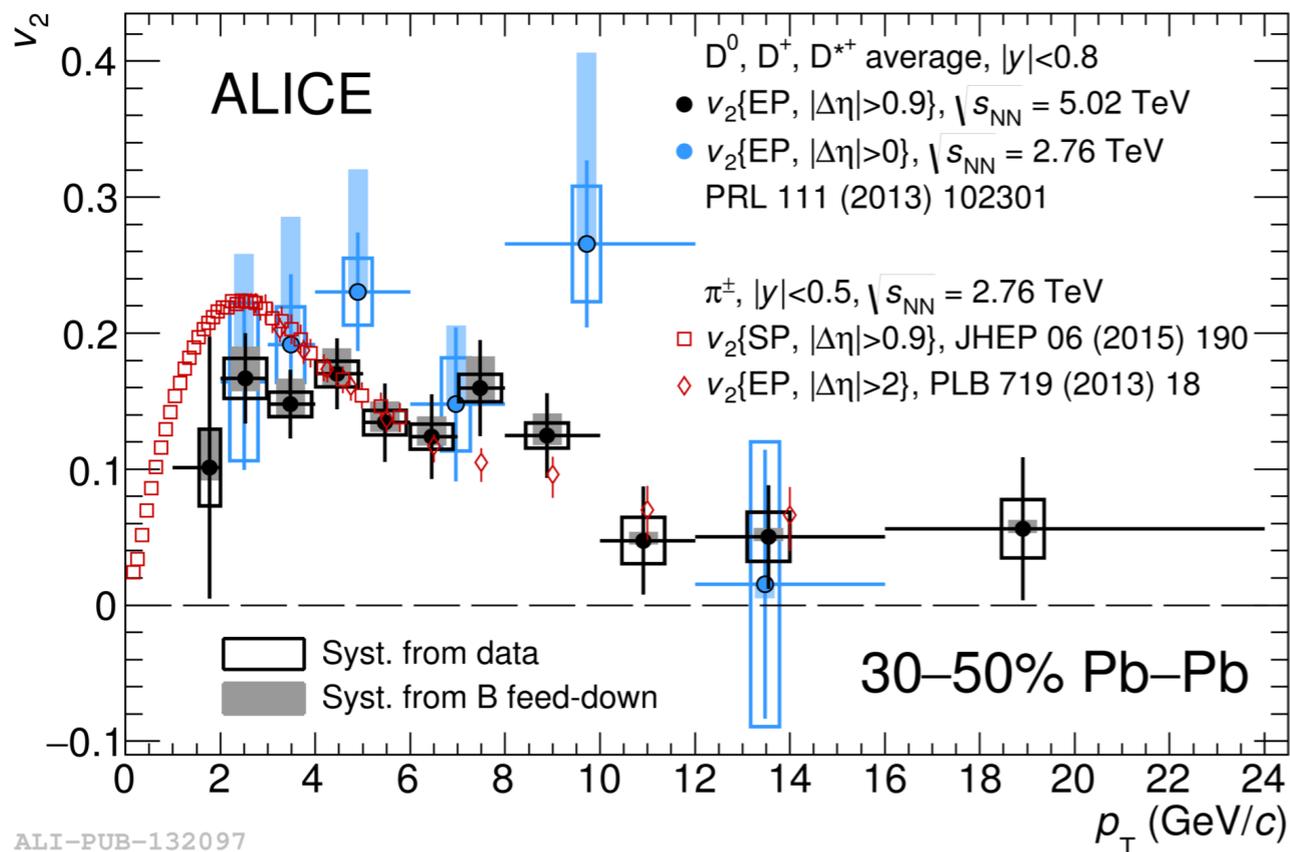
Fabrizio Grosa, Thu 11.30 AM

# $v_2$ of D mesons

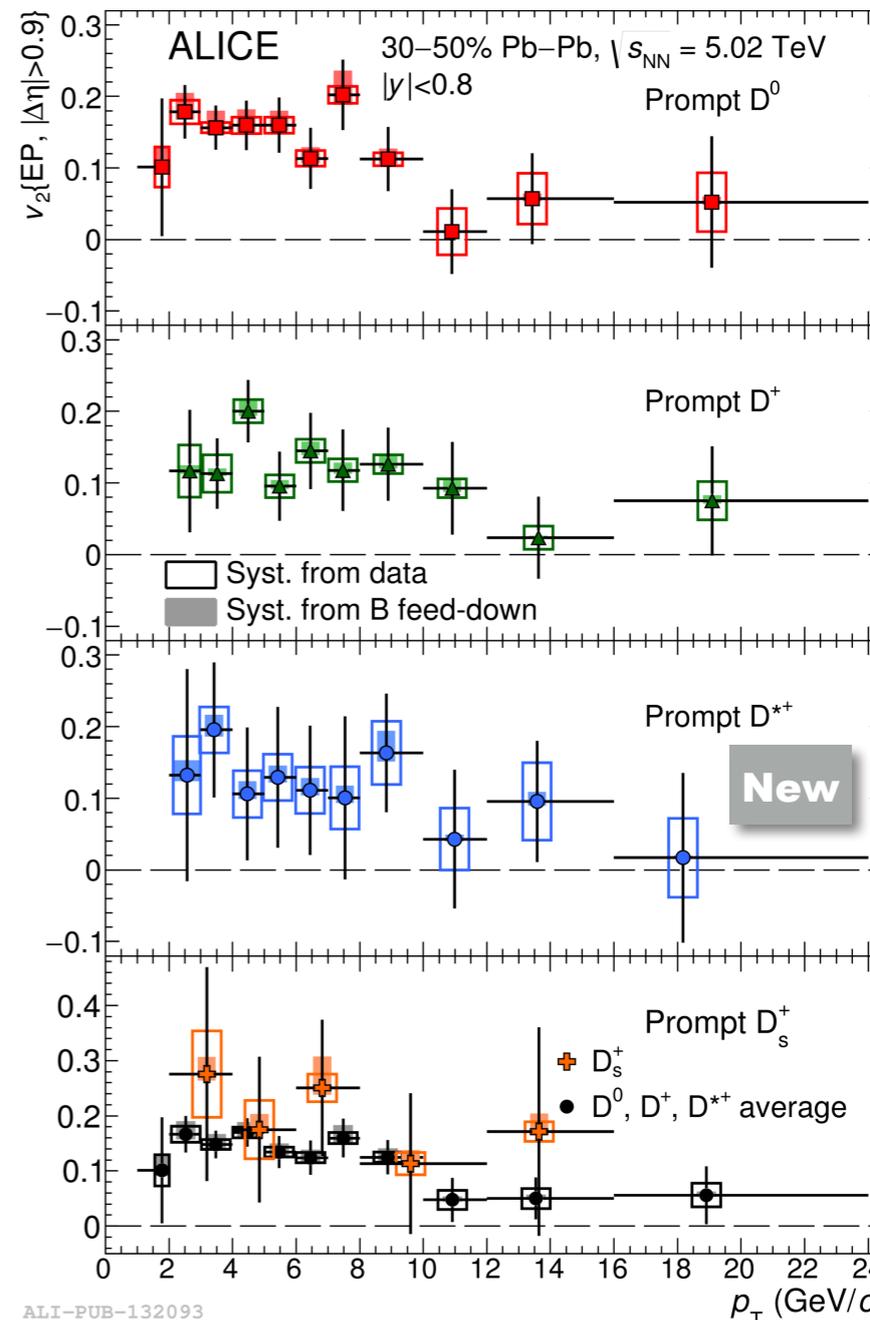


ALICE

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ALI-PUB-132097



ALI-PUB-132093

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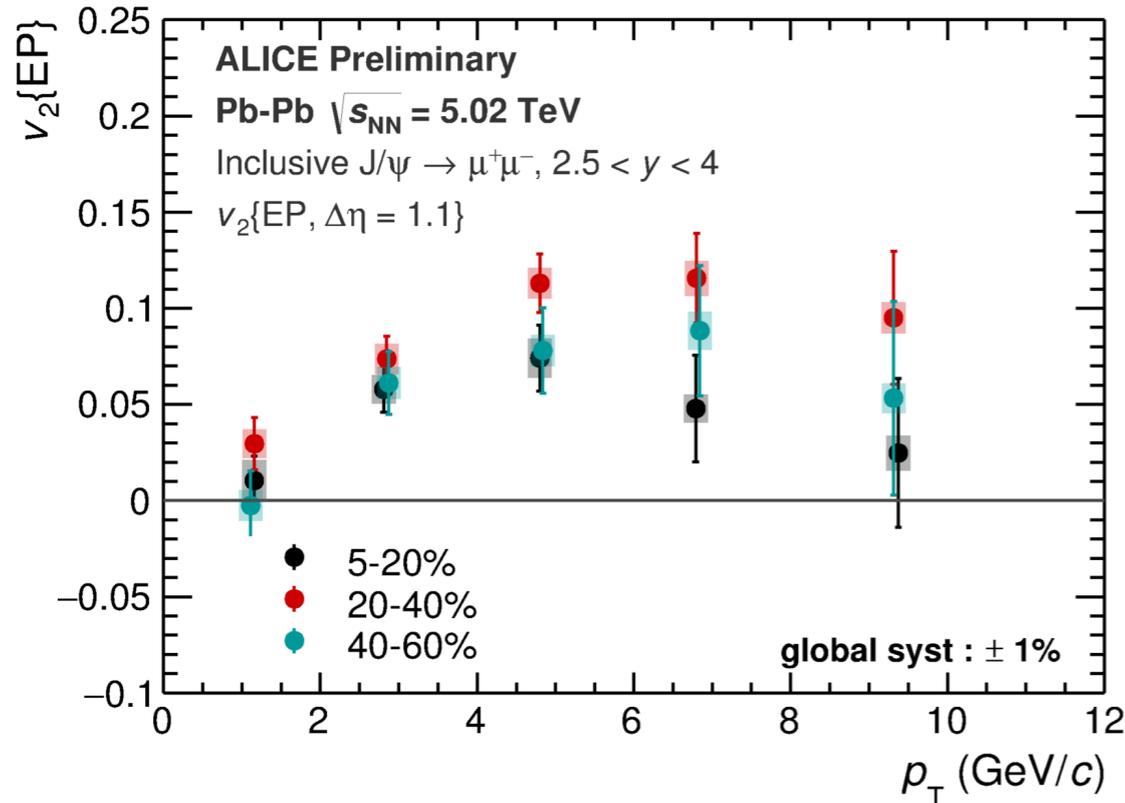
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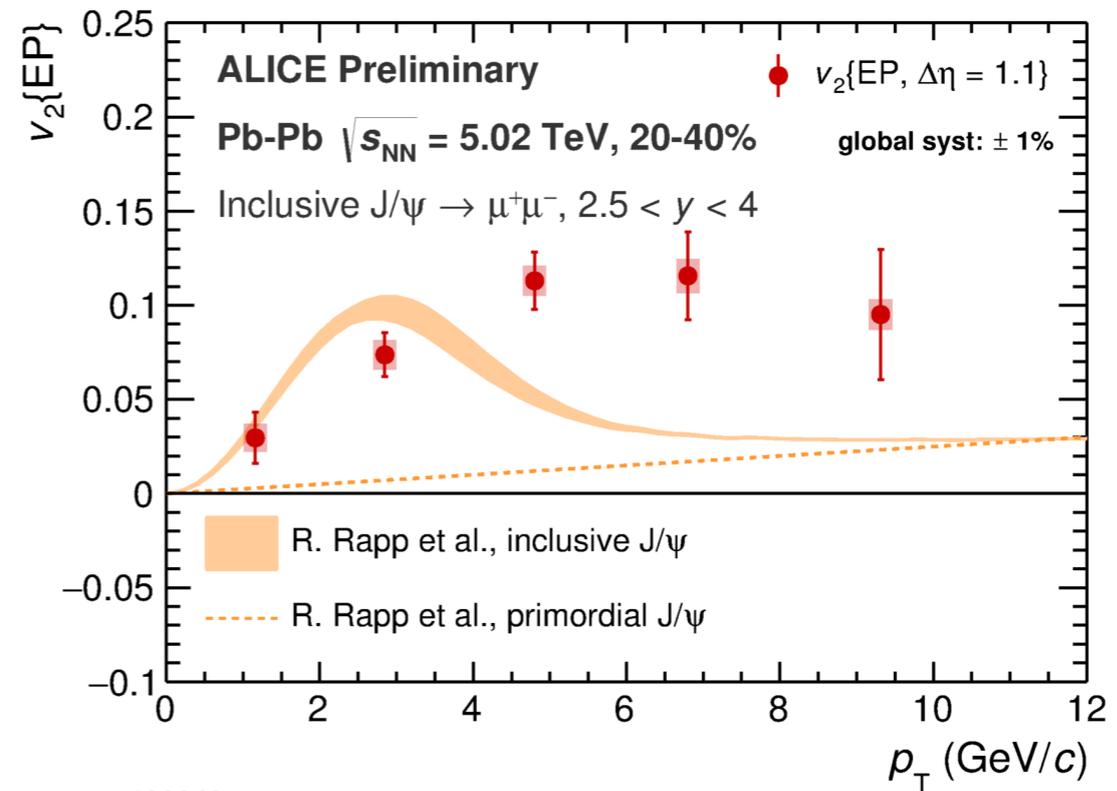
Strong coupling of c-quark with the medium

Fabrizio Grosa, Thu 11.30 AM

# $v_2$ of $J/\psi$



ALI-PREL-128122



ALI-PREL-129969

☑ A clear  $v_2$  signal is observed in various centrality and  $p_T$  bins

☑ Comparison with transport model :

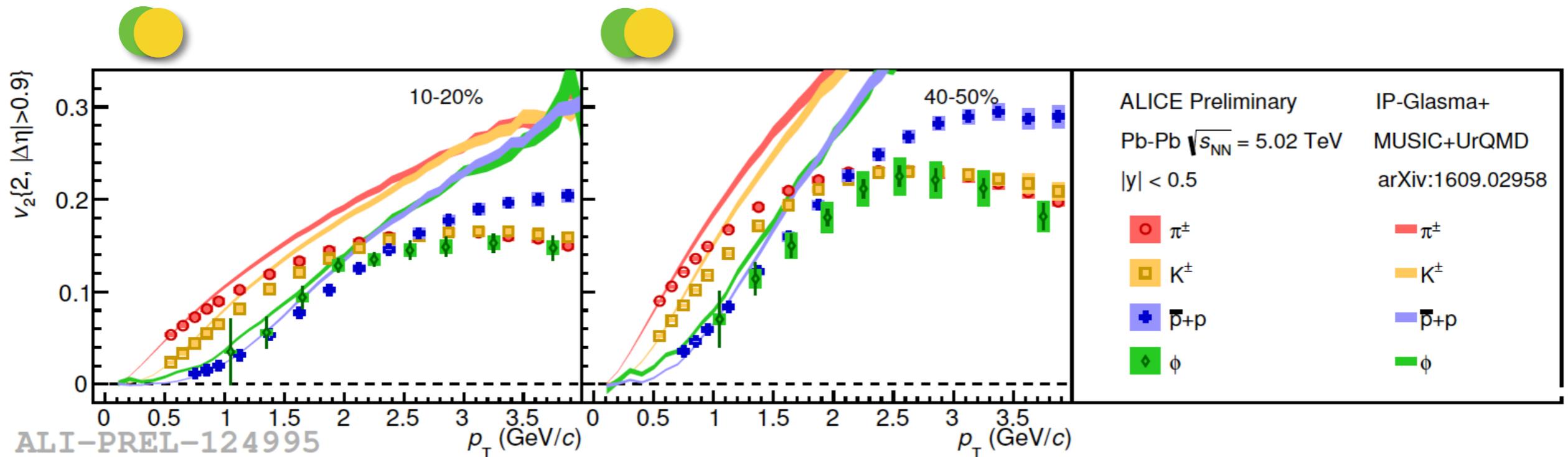
- 📌 magnitude at low- $p_T$  is reproduced by including a strong  $J/\psi$  (re)generation component.
- 📌 at high- $p_T$  the  $v_2$  is underestimated.

Audrey Francisco, Fry 3.15 PM

# $v_n$ of identified particles



- ☑ Low- $p_T$   $v_2$  as a test for hydrodynamic expansion and initial conditions:



- ☑ Hydro in good agreement with data for  $p_T < 1$  GeV/c in central collisions, overestimation of  $v_2$  in more peripheral:

IP-Glasma initial state, viscous hydrodynamic medium evolution,  $\eta/s = 0.095$ , temperature dependent bulk viscosity  $\zeta/s(T)$ , hadronic cascade after hadronization (arXiv:1609.02958)

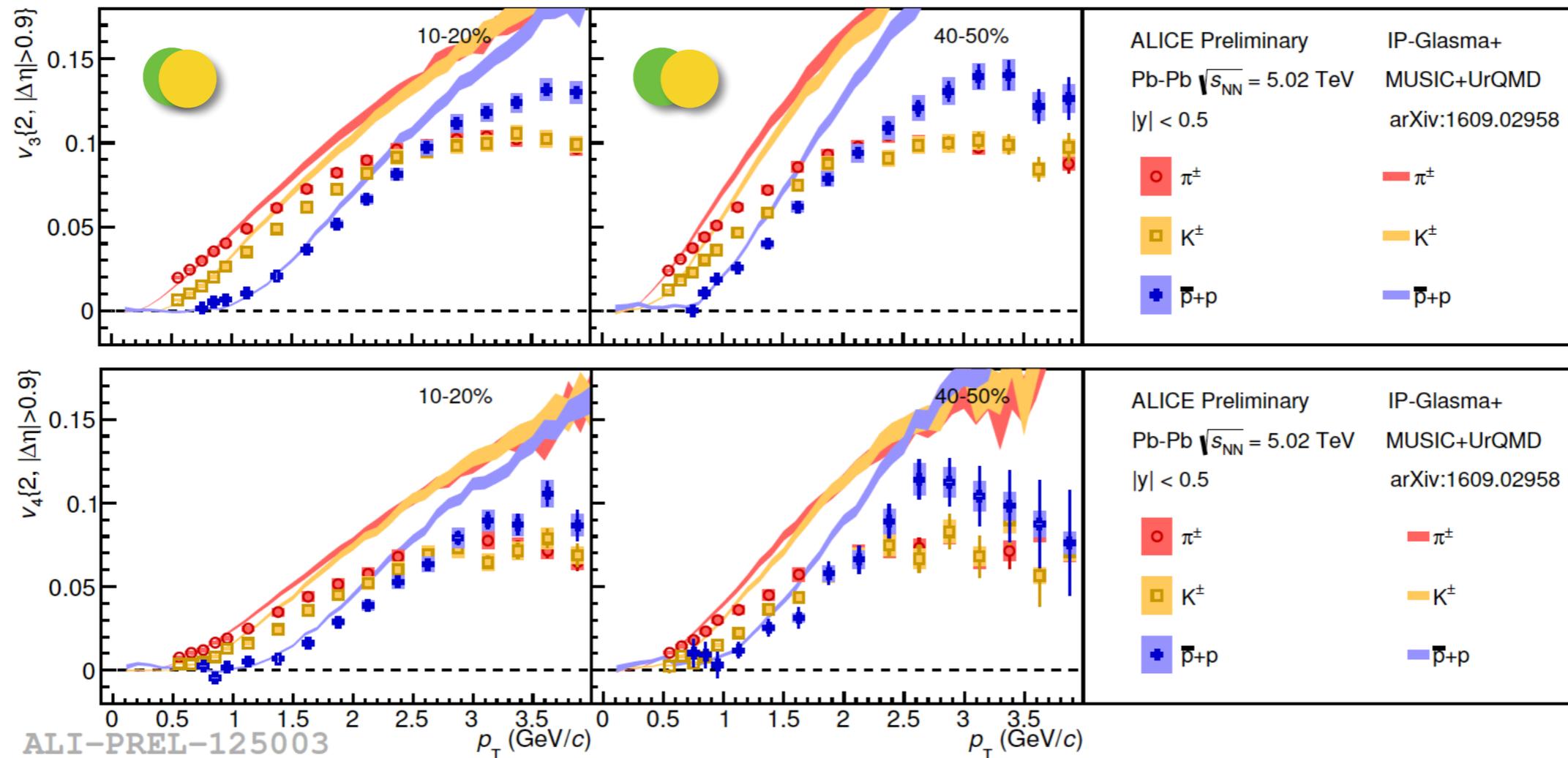
Redmer Alexander Bertens, Thu 9.20 AM

# $v_n$ of identified particles



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☑  $v_n$ ;  $n > 2$  are more sensitive to transport coefficients of medium than  $v_2$



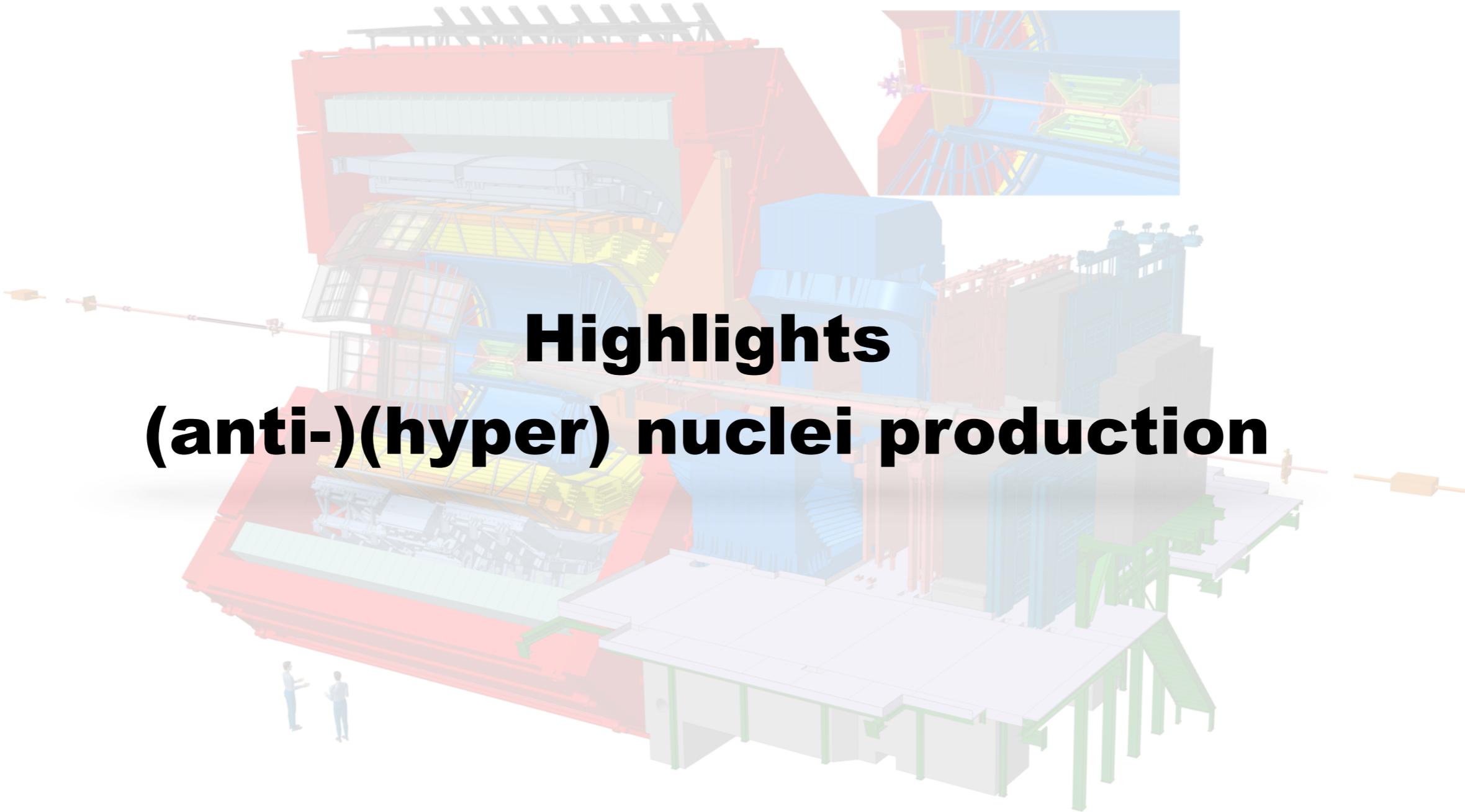
## Comparison to hydrodynamic:

- Good agreement for  $p_T < 1$  GeV/c in central collisions
- General features described in central collisions at intermediate  $p_T$  ( $1 < p_T < 2$  GeV/c)

Redmer Alexander Bertens, Thu 9.20 AM



ALICE

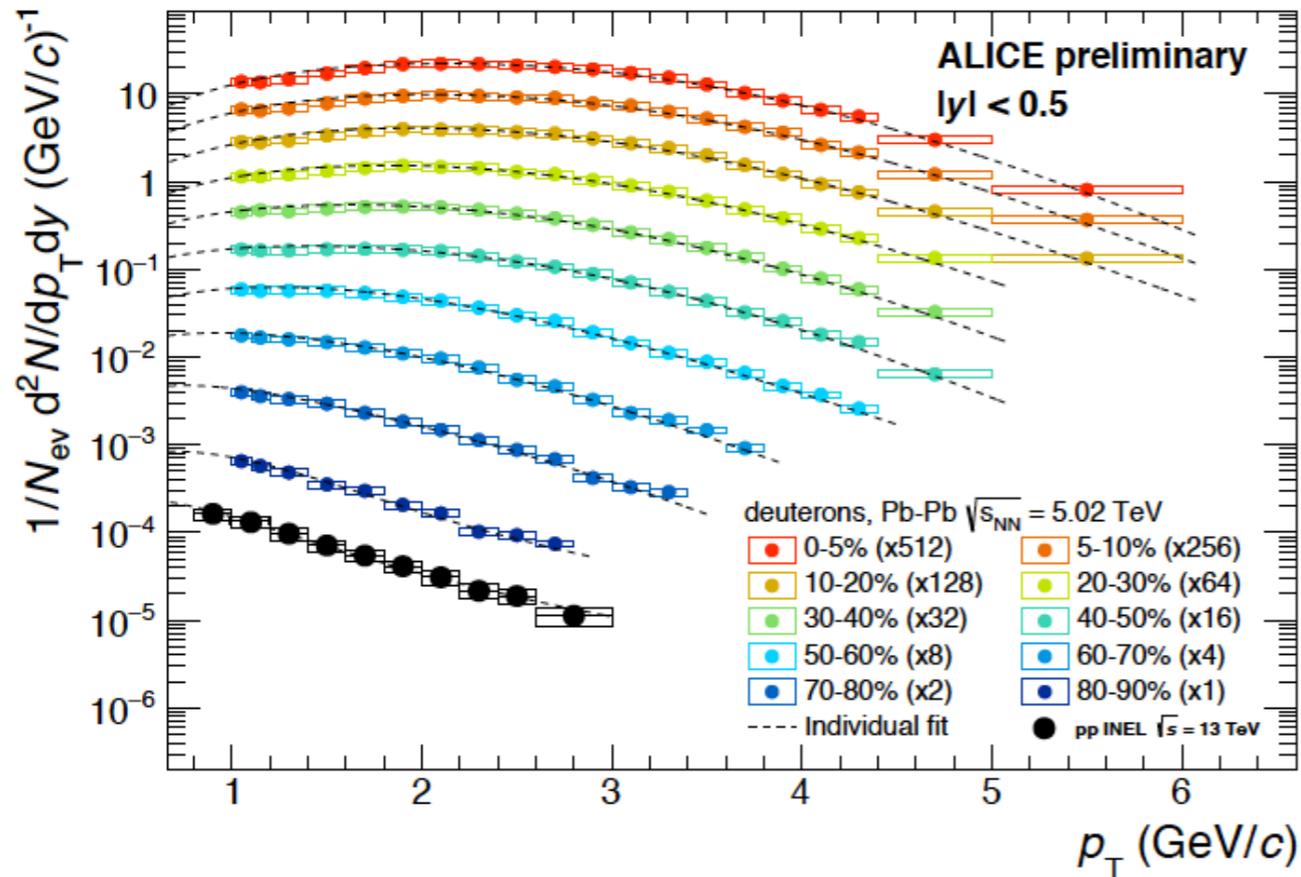


# Highlights (anti-)(hyper) nuclei production

# Pb-Pb: (anti-)(hyper) nuclei production



ALICE-PUBLIC-2017-006



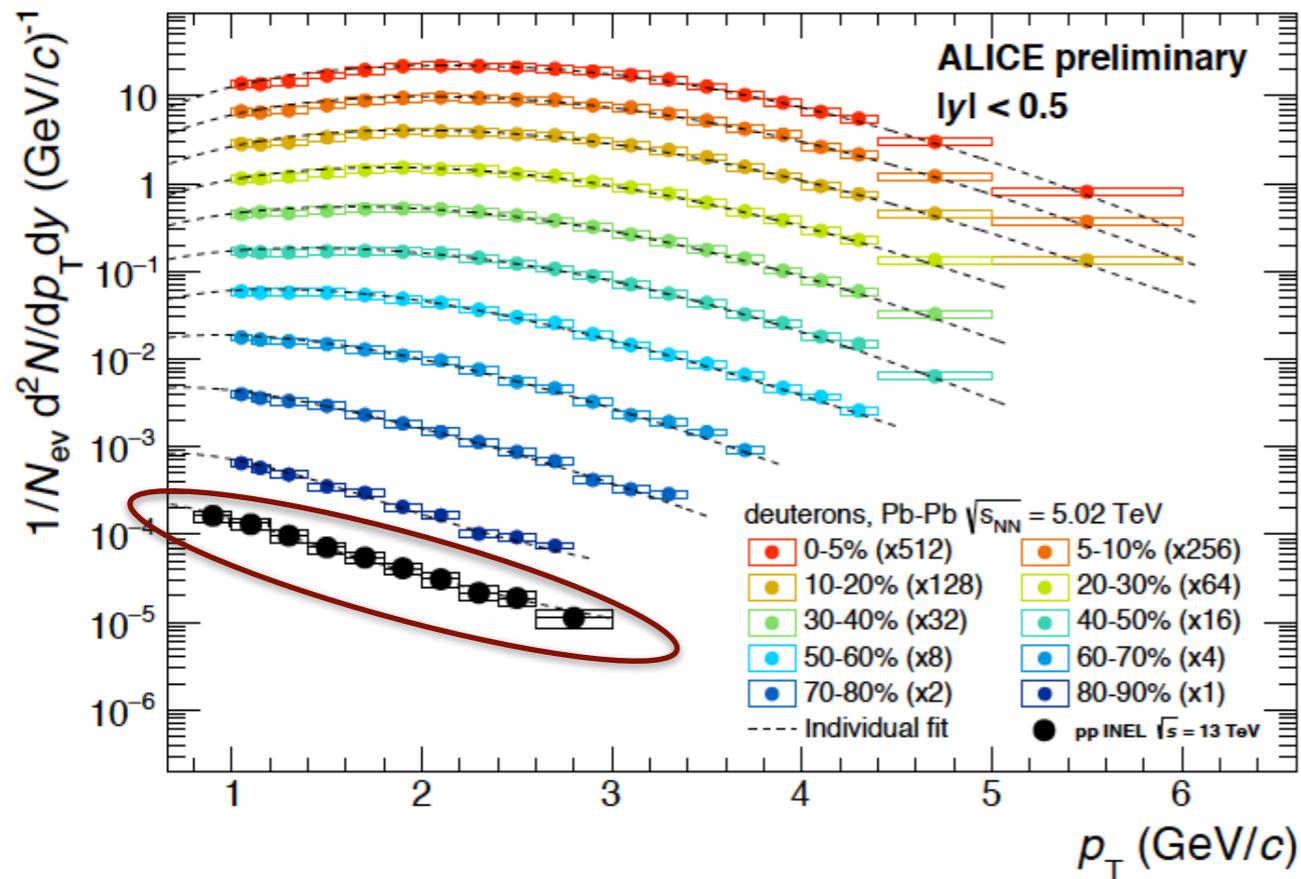
☑ (anti-) deuterium production was measured in pp (**new**) and Pb-Pb in ten different centrality classes.

Maximilano Puccio, Fri 5.25 PM

# Pb-Pb: (anti-)(hyper) nuclei production



ALICE-PUBLIC-2017-006



☑ (anti-) deuterium production was measured in pp (**new**) and Pb-Pb in ten different centrality classes.

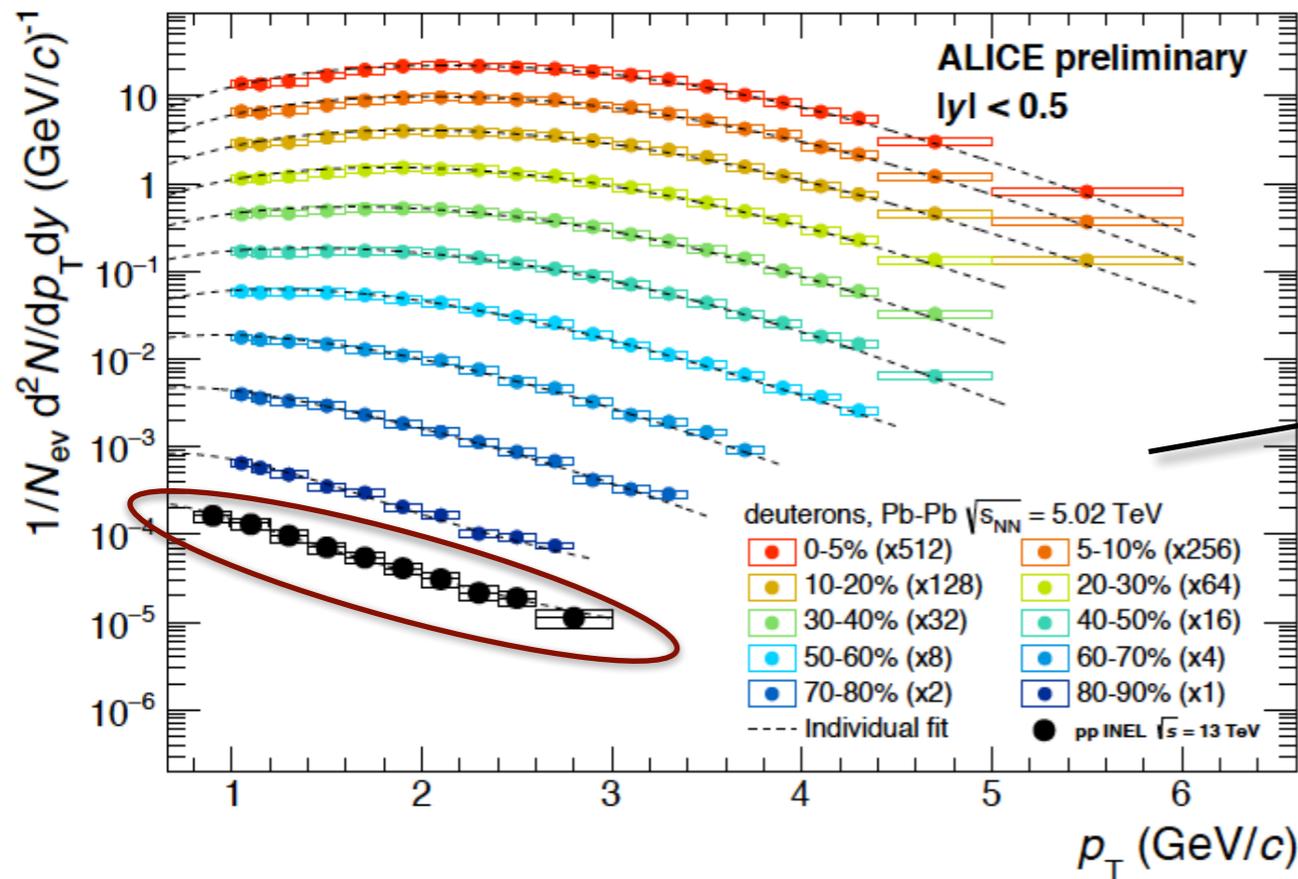
Maximilano Puccio, Fri 5.25 PM

# Pb-Pb: (anti-)(hyper) nuclei production

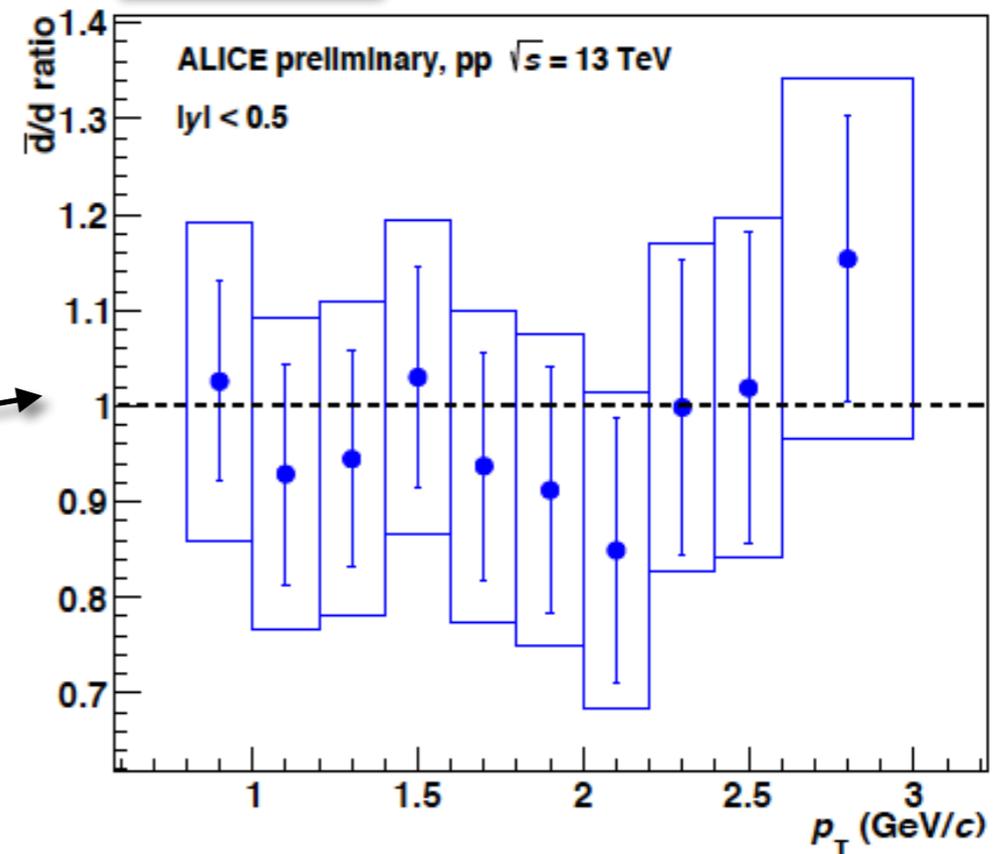


ALICE

ALICE-PUBLIC-2017-006



ratio  $\bar{d}/d$



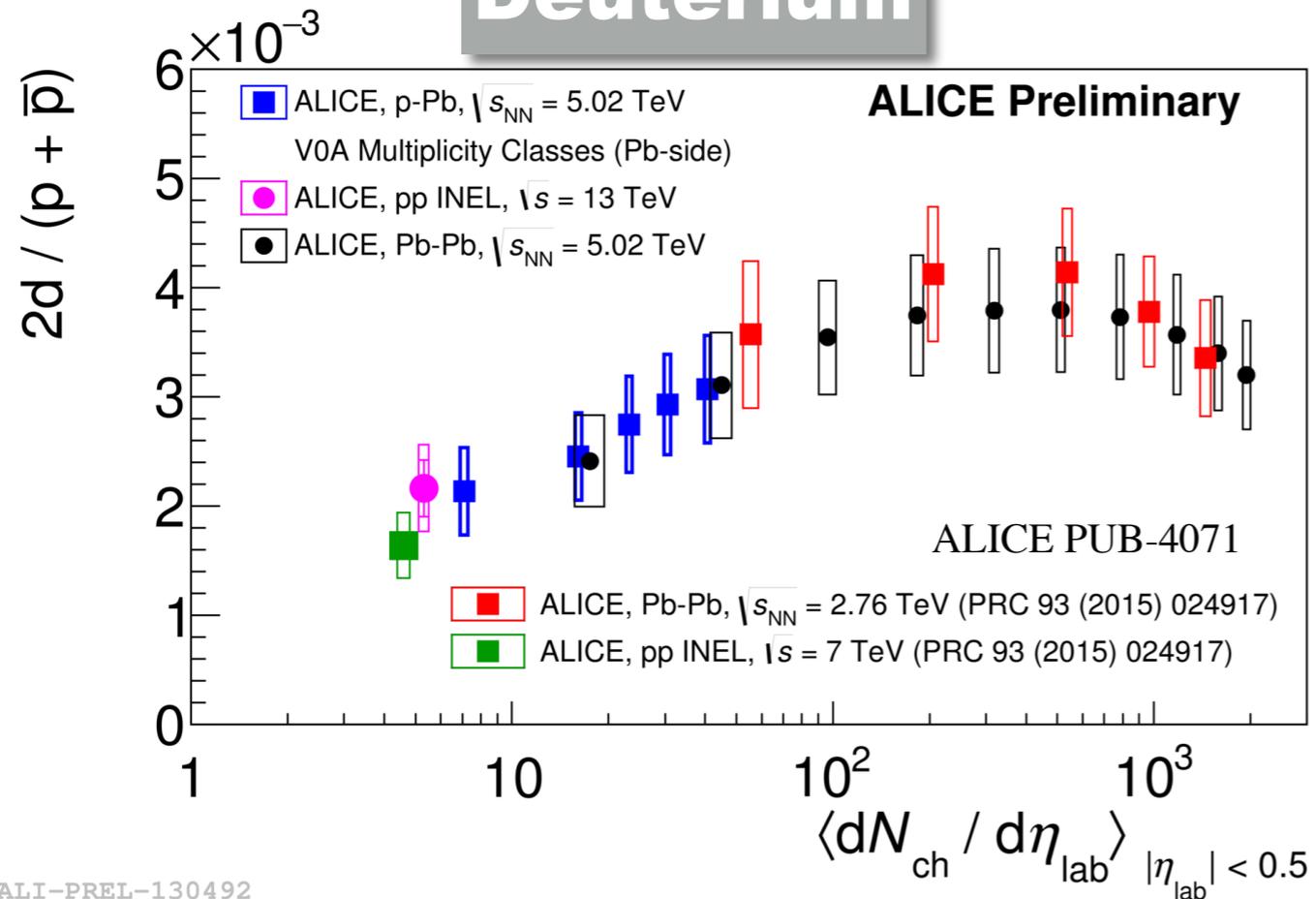
- ✓ (anti-) deuterium production was measured in pp (**new**) and Pb-Pb in ten different centrality classes.
- ✓ Ratio anti-d/d consistent with unity within uncertainties.

Maximilano Puccio, Fri 5.25 PM

# Pb-Pb: (anti-)(hyper) nuclei production



## Deuterium



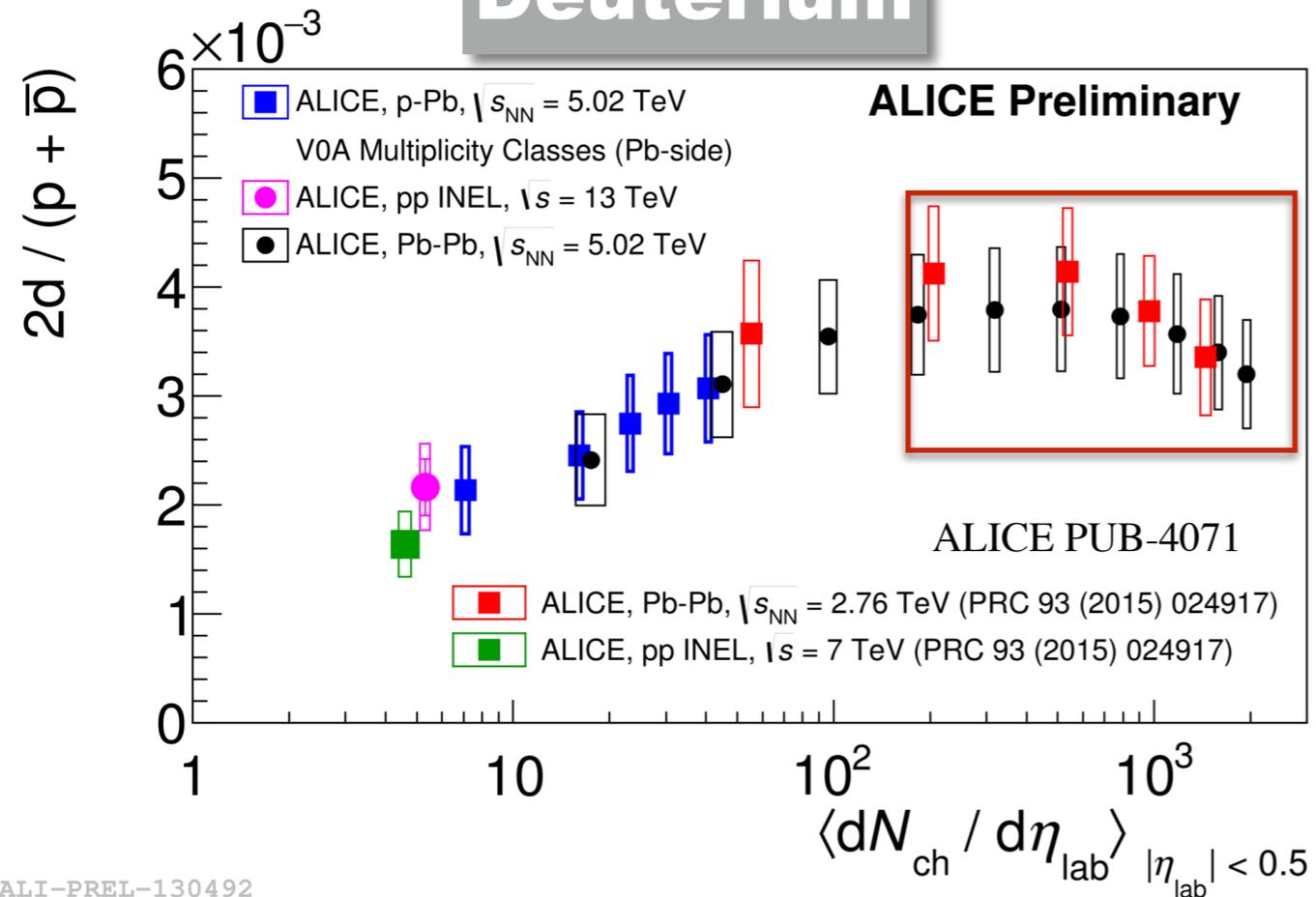
- ☑ Production of deuterium increase with increasing neutron and proton density, as expected from coalescence model.

simple coalescence seem to work in small systems

# Pb-Pb: (anti-)(hyper) nuclei production



## Deuterium



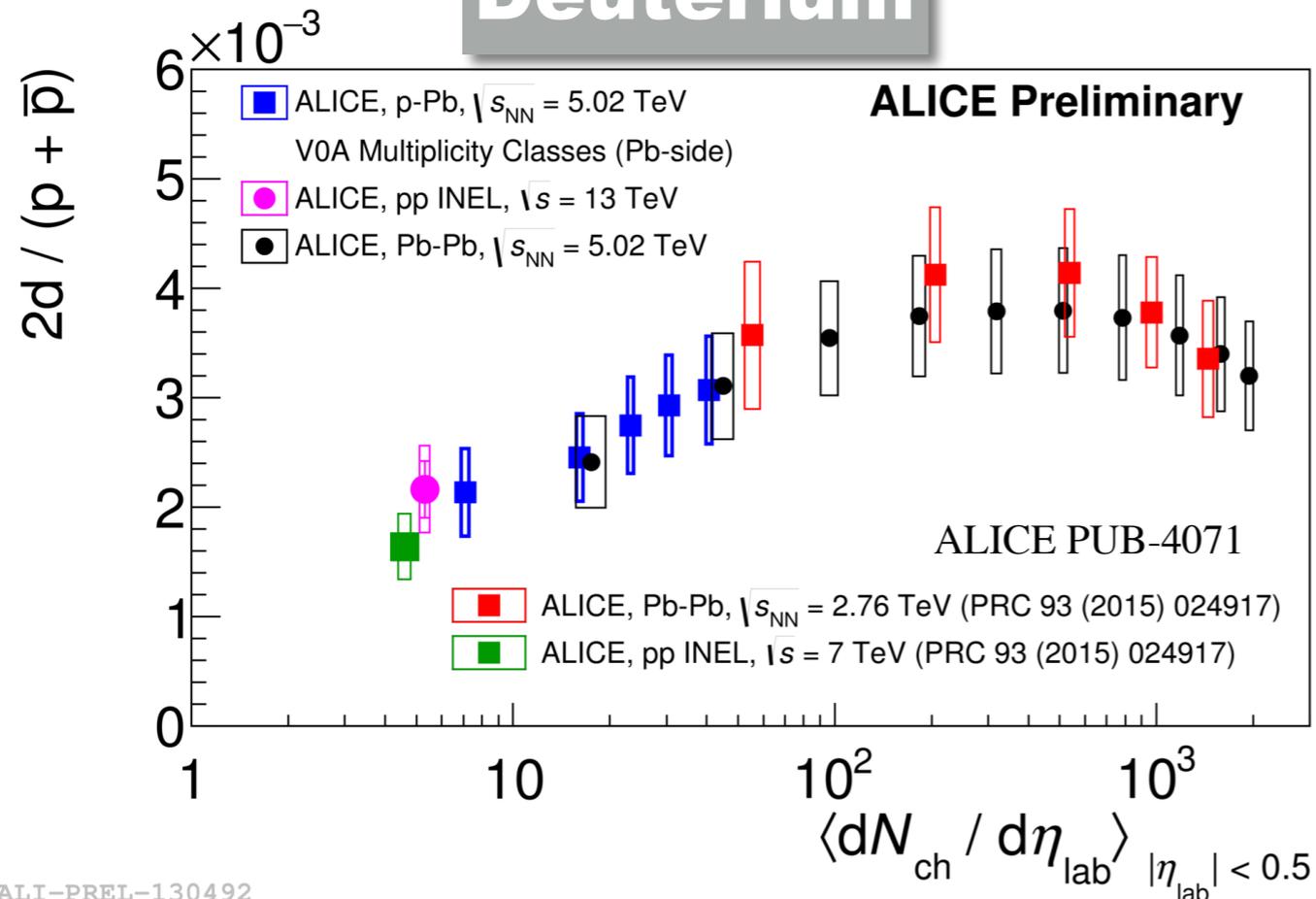
- ☑ Production of deuterium increase with increasing neutron and proton density, as expected from coalescence model. At Pb-Pb multiplicities the d/p ratio saturates at the value expected from thermal model calculations.

# Pb-Pb: (anti-)(hyper) nuclei production

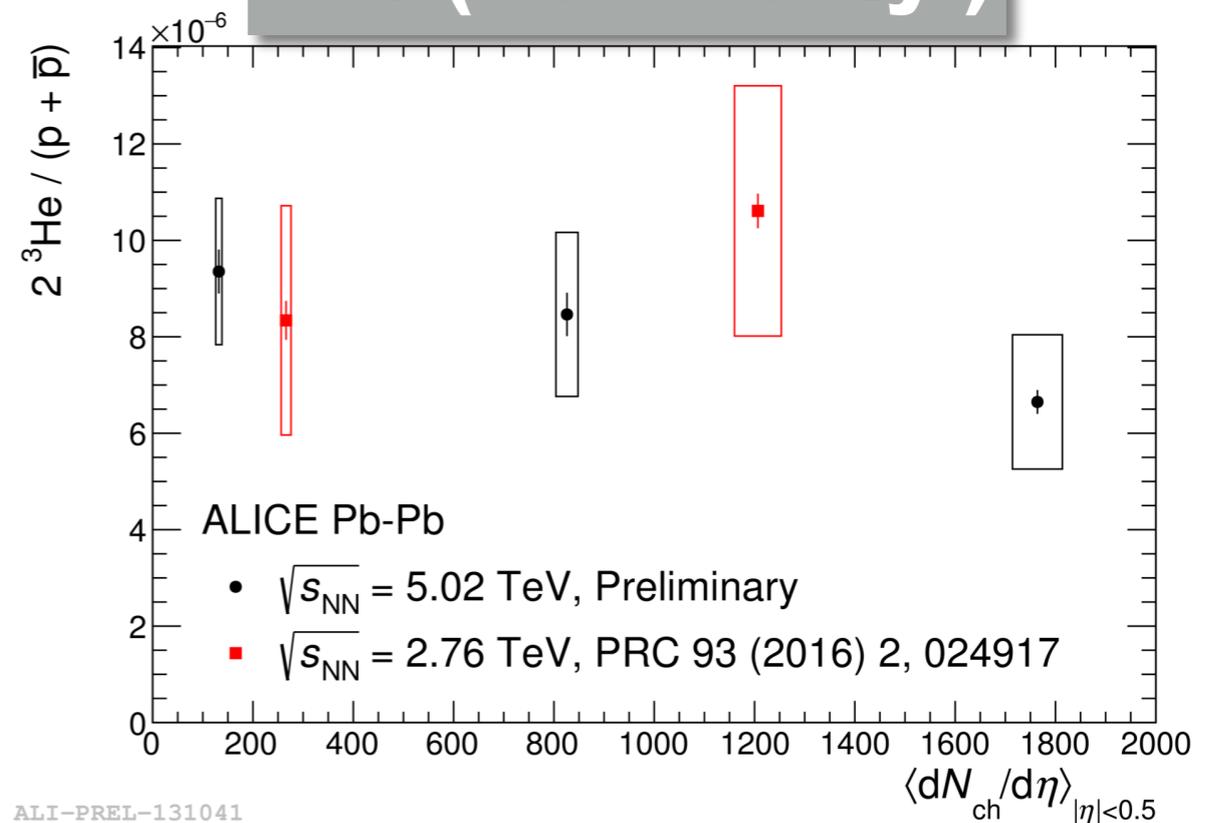


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## Deuterium



## $^3\text{He}$ (Pb-Pb only!)

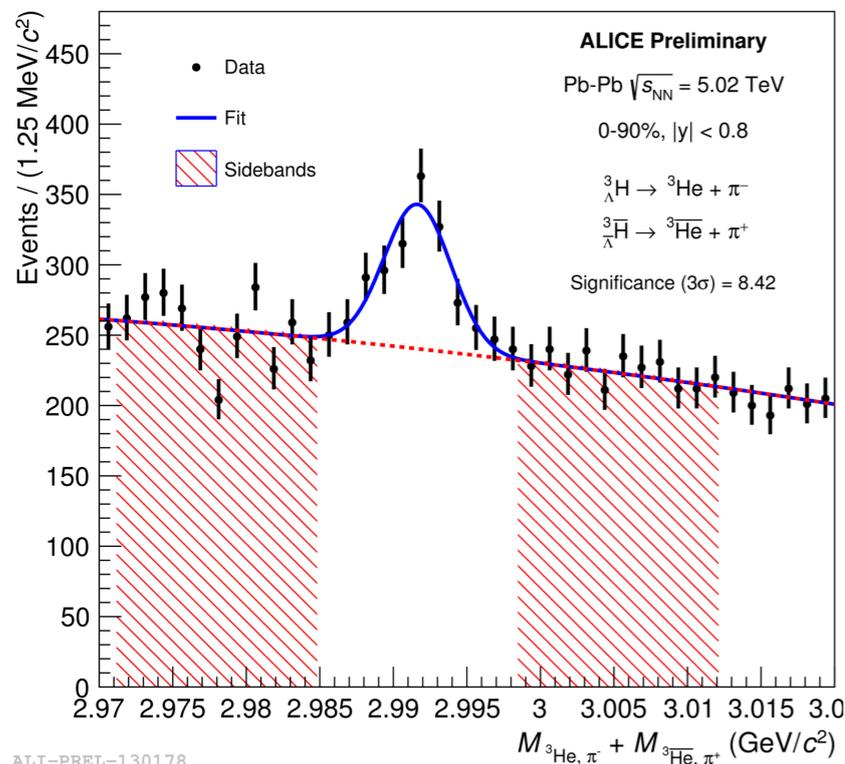


- ☑ Production of deuterium increase with increasing neutron and proton density, as expected from coalescence model. At Pb-Pb multiplicities the d/p ratio saturates as expected from thermal model calculations.
- ☑ Ratio  $^3\text{He}$  to proton constant within uncertainties as expected by thermal model.

# Pb-Pb: (anti-)(hyper) nuclei production

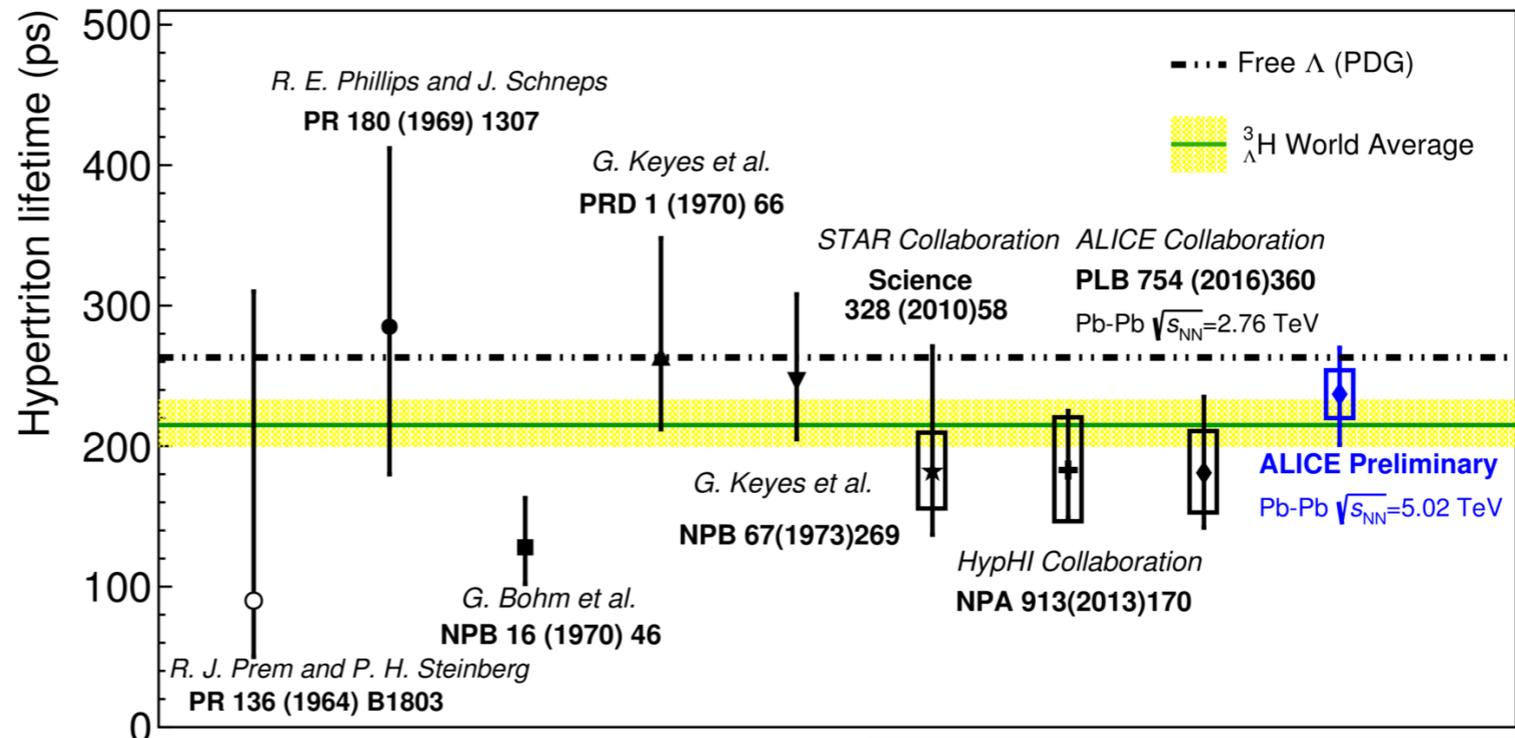


☑ Production of hypertriton measured in Pb-Pb @ 5.02 TeV:  ${}^3_{\Lambda}\text{H} \rightarrow {}^3\text{He} + \pi^{-}$



ALI-PREL-130178

ALI-PREL-130195



$$\tau = 223^{+41}_{-33} (stat.) \pm 20 (syst.) ps$$

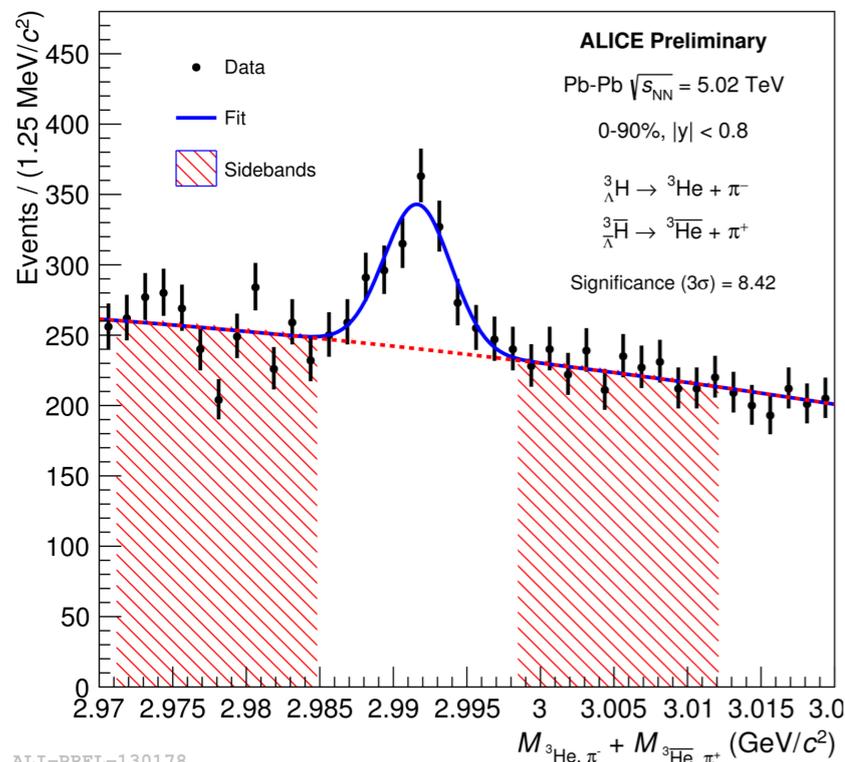
- ☑ There is a full agreement at statistical level with the world average and free  $\Lambda$ .
- ☑ The result largely reduce the systematic uncertainties wrt Run I measurement.

Maximilano Puccio, Fri 5.25 PM

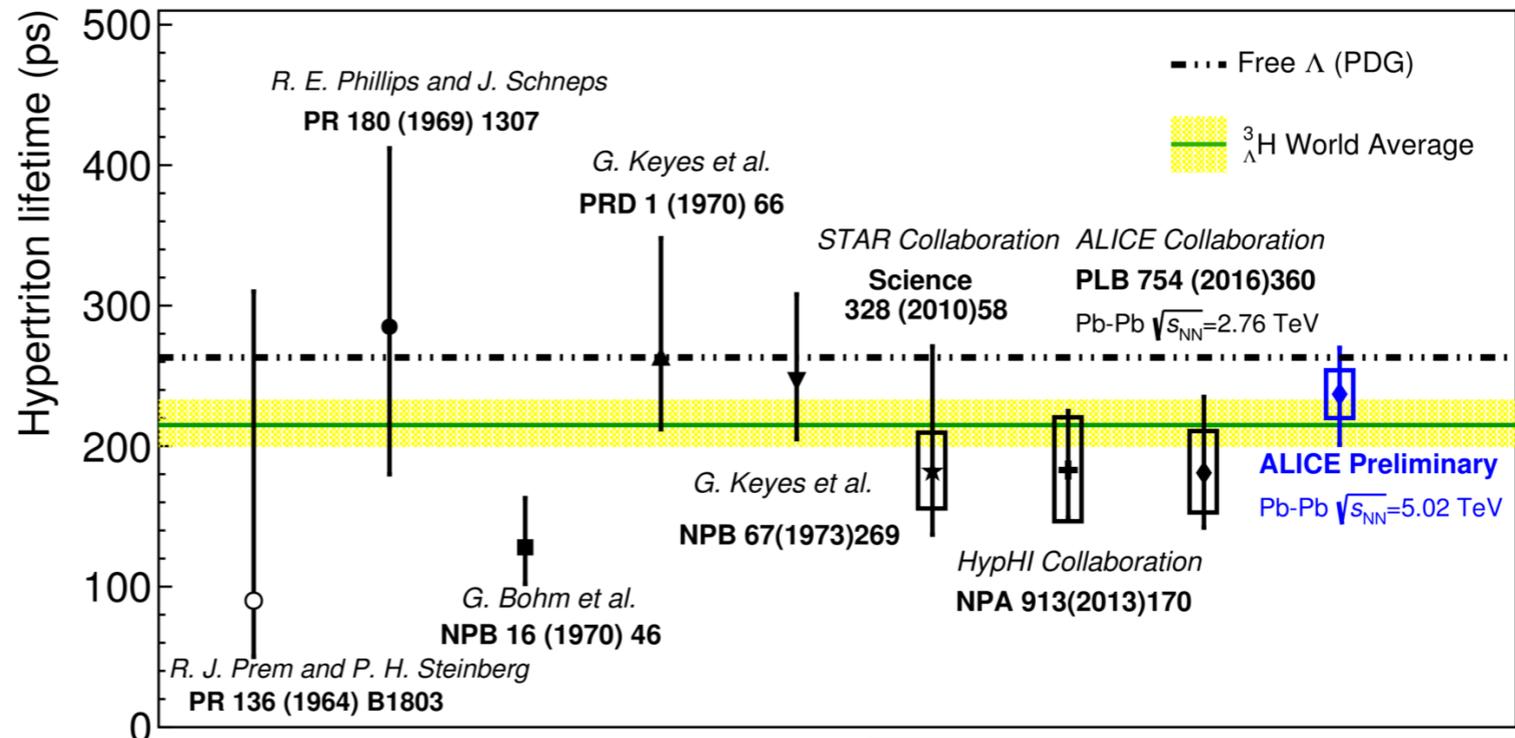
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ALI-PREL-130178



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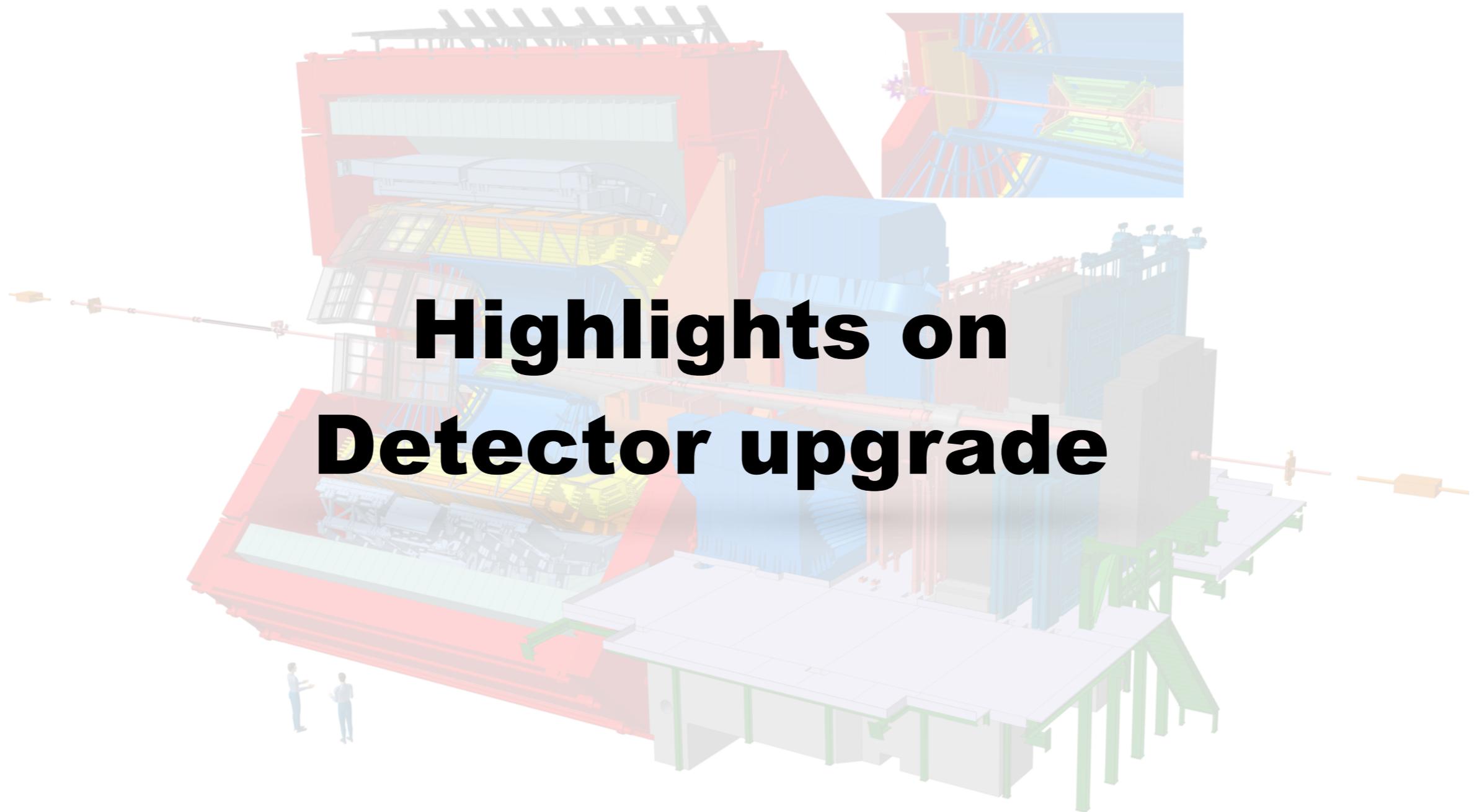
Maximilano Puccio, Fri 5.25 PM

**Most precise measurement of hypertriton lifetime!**



ALICE

# Highlights on Detector upgrade

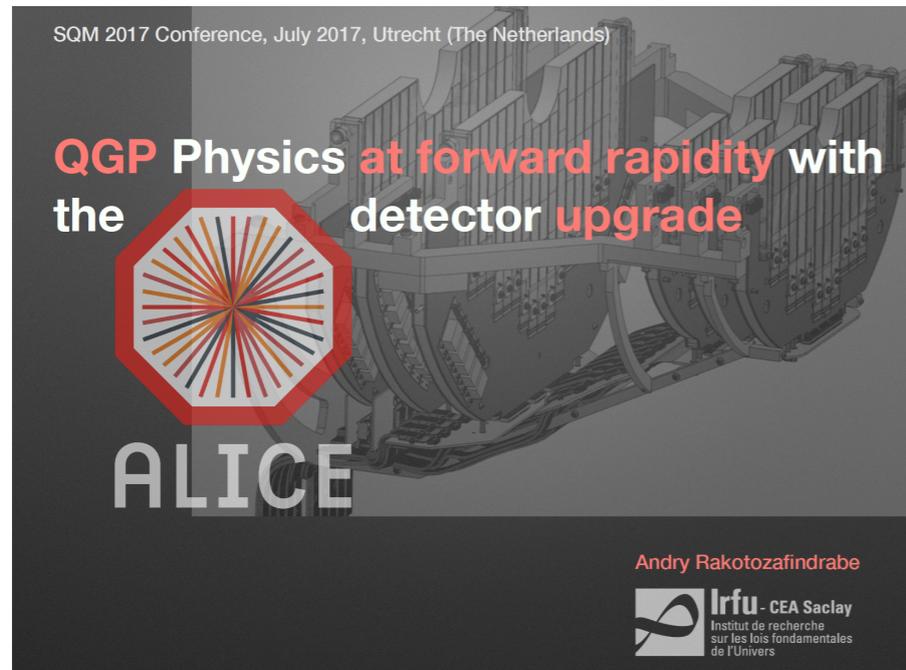


# LHC Run III: ALICE upgrade



ALICE

Andry Rakotozafindrabe, Fri. 4.25 PM

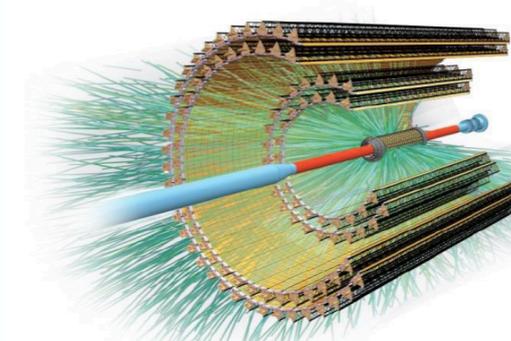


You In-Kwon, Fri. 5.05 PM

ALICE ITS Upgrade

## ALICE ITS Upgrade Status Report

In-Kwon YOO - Pusan National Univ.  
for ALICE collaboration



17<sup>th</sup> International Conference on  
Strangeness in  
Quark Matter  
10-15 July 2017  
Utrecht, the Netherlands

Major upgrade of ALICE apparatus at Long Shutdown 2 :

- Focus on low- $p_T$  and untriggerable probes  $\Rightarrow$  high rate capability of detectors and continuous readout electronic (Time Projection Chamber, Muon arm, FIT detector)
- Improve low- $p_T$  tracking and vertexing (Inner Tracking System upgrade)
- Secondary vertex for measurements at fwd-y (new Muon Forward Tracker)



“ALICE detector upgrade” plenary by Gines Martinez (Fri. 11.10 AM)

# Summary



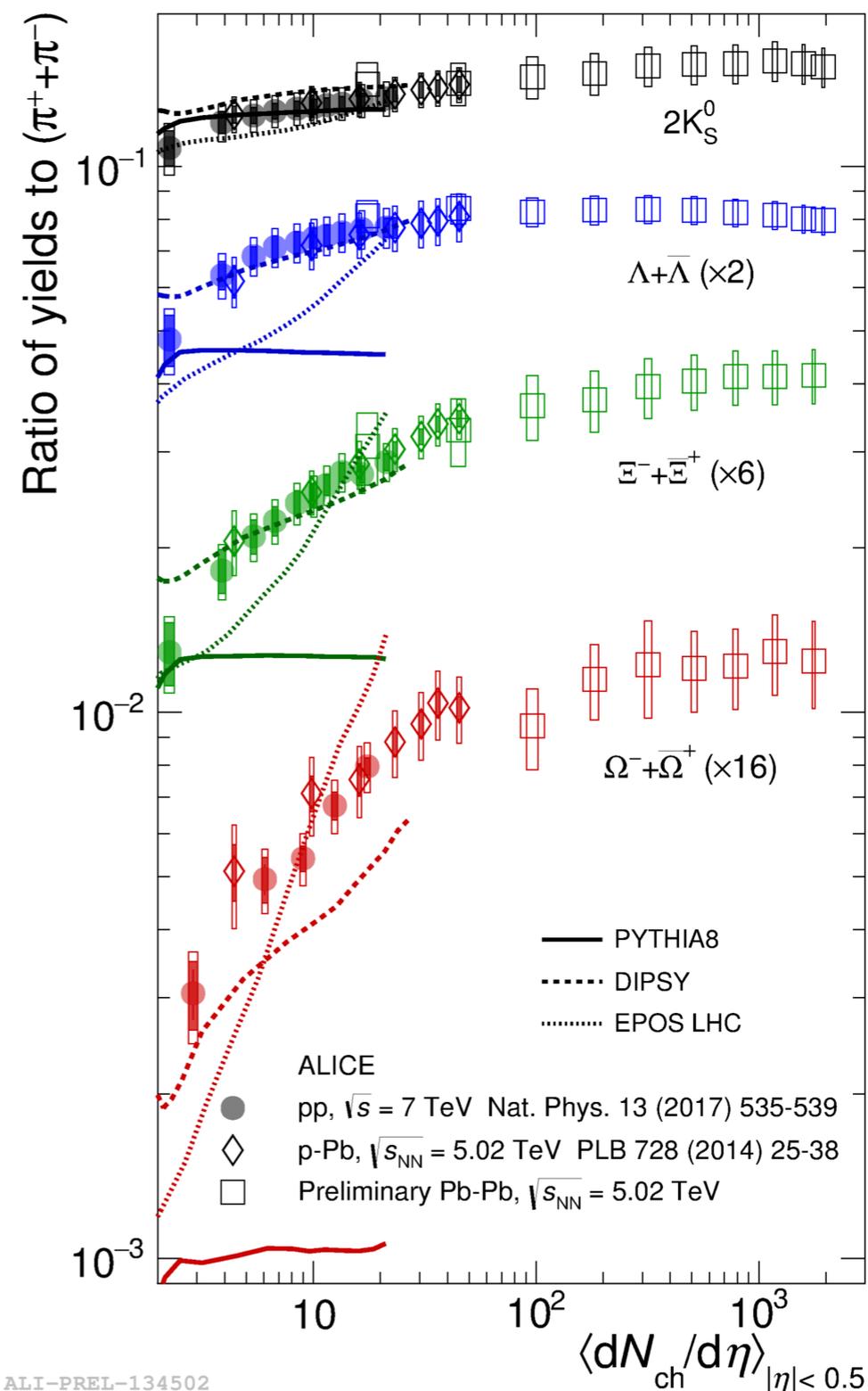
ALICE

## ✓ Toward a precision era .....

- 📌 D measurements
- 📌 (anti-)(hyper-) nuclei
- 📌 Bulk particle production
- 📌 Anisotropic flow

## ✓ New results

- 📌 Heavy flavours:  $\Lambda_c$ ,  $\Xi_c$
- 📌 (anti) deuteron in pp



# Enjoy the talks!



ALICE

## Heavy Flavours

|   |                     |
|---|---------------------|
| Measurement of D-meson nuclear modification factor and elliptic flow in Pb-Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV with ALICE at the LHC      | Fabrizio Grosa      |
| Measurement of heavy-flavour production, correlations and jets with ALICE in Pb-Pb collisions with ALICE  | Shingo Sakai        |
| COSMOS  | 11:50 - 12:10       |
| Low mass dielectrons in pp at 13 TeV, p-Pb at 5.02 TeV and Pb-Pb collisions at 2.76 TeV measured by the ALICE experiment                          | Ivan Vorobyev       |
| Charmed meson and baryon measurements in pp and p-Pb collisions with ALICE at the LHC   | Jaime Norman        |
| COSMOS  | 14:55 - 15:15       |
| Quarkonium production in Pb-Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV with ALICE  | Audrey Francisco    |
| COSMOS  | 15:15 - 15:35       |
| Centrality and transverse momentum dependence of $J/\psi$ production in Pb-Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV at mid-rapidity with ALICE | Dennis Franz Weiser |

## Strangeness

|  |                     |
|--|---------------------|
| $\phi$ meson production at forward rapidity in pp and Pb-Pb collisions with ALICE at the LHC | Alessandro De Falco |
| BBG 169  | 11:30 - 11:50       |
| Strangeness production in Pb-Pb collisions at LHC energies with ALICE                        | Michal Sefcik       |
| BBG 169  | 11:50 - 12:10       |

## Resonances

|   |                 |
|---|-----------------|
| Probing the hadronic phase with resonances of different lifetimes in ALICE at the LHC | Neelima Agrawal |
| BBG 161   | 16:45 - 17:05   |

## Small Systems

|   |                       |
|---|-----------------------|
| Quarkonium production in pp and p-A collisions with ALICE at the LHC  | Astrid Morreale       |
| BBG 161   | 09:40 - 10:00         |
| $J/\psi$ production as a function of event multiplicity in pp and p-Pb collisions with ALICE  | Ionut Cristian Arsene |
| BBG 161   | 10:00 - 10:20         |
| Insight into particle production mechanisms via angular correlations of identified particles measured with ALICE in pp collisions at $\sqrt{s} = 7$ TeV | Malgorzata Anna Janik |
| Energy and multiplicity dependence of strange and non-strange particle production in pp collisions at the LHC with ALICE                                | Fiorella Fiorda       |

## Hydrodynamics

|   |                          |
|---|--------------------------|
| Anisotropic flow of identified hadrons in $\sqrt{s_{NN}} = 5.02$ -TeV Pb-Pb collisions at ALICE | Redmer Alexander Bertens |
|---|--------------------------|

## BES

|   |                    |
|---|--------------------|
| Measurements of spin alignment of vector mesons and global polarization of hyperons with ALICE at the LHC | Bedangadas Mohanty |
|---|--------------------|

## Freeze-out

|   |                    |
|---|--------------------|
| Production of (anti-)(hyper-)nuclei production at LHC energies with ALICE | Maximiliano Puccio |
| BBG 165   | 17:25 - 17:45      |

## Upgrade

|   |                            |
|---|----------------------------|
| QGP physics at forward rapidity with the ALICE detector upgrade | Dr. Andry Rakotozafindrabe |
| BBG 169   | 16:25 - 16:45              |
| Status Report on Inner Tracking System Upgrade of ALICE         | Yoo In-Kwon                |
| BBG 169   | 17:05 - 17:25              |
| ALICE detector upgrades   | Dr. Gines Martinez-Garcia  |
| Room: Cosmos, Victor J. Koningsberger building                  | 11:10 - 11:35              |

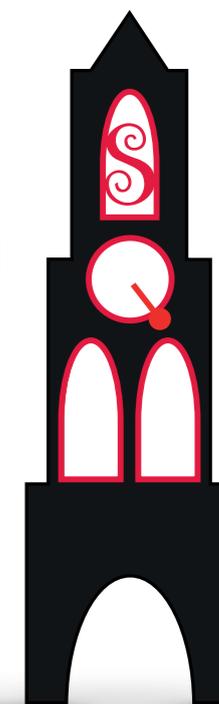


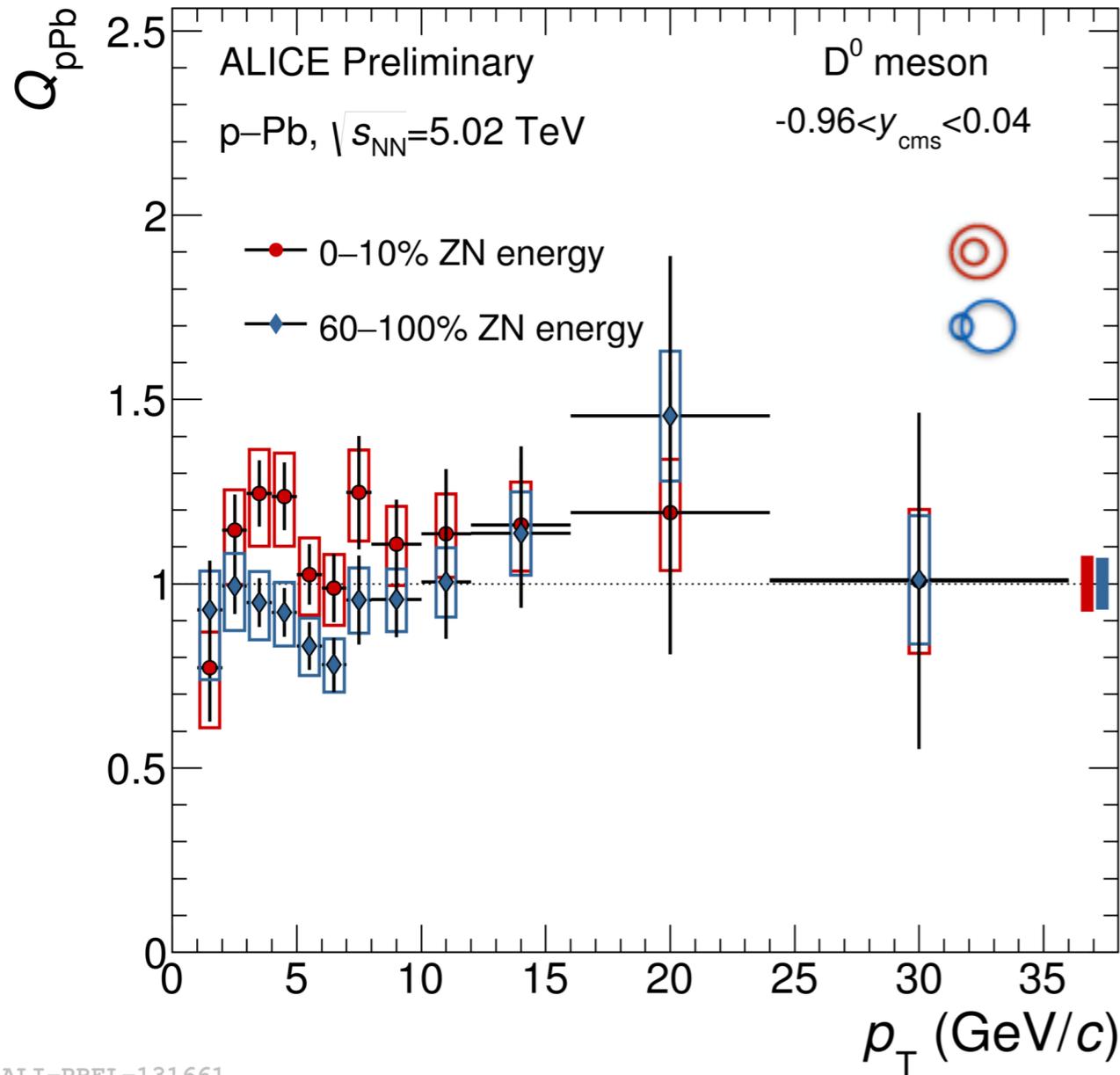
## Extra Slides

[a.grelli@uu.nl](mailto:a.grelli@uu.nl)



Utrecht 2017



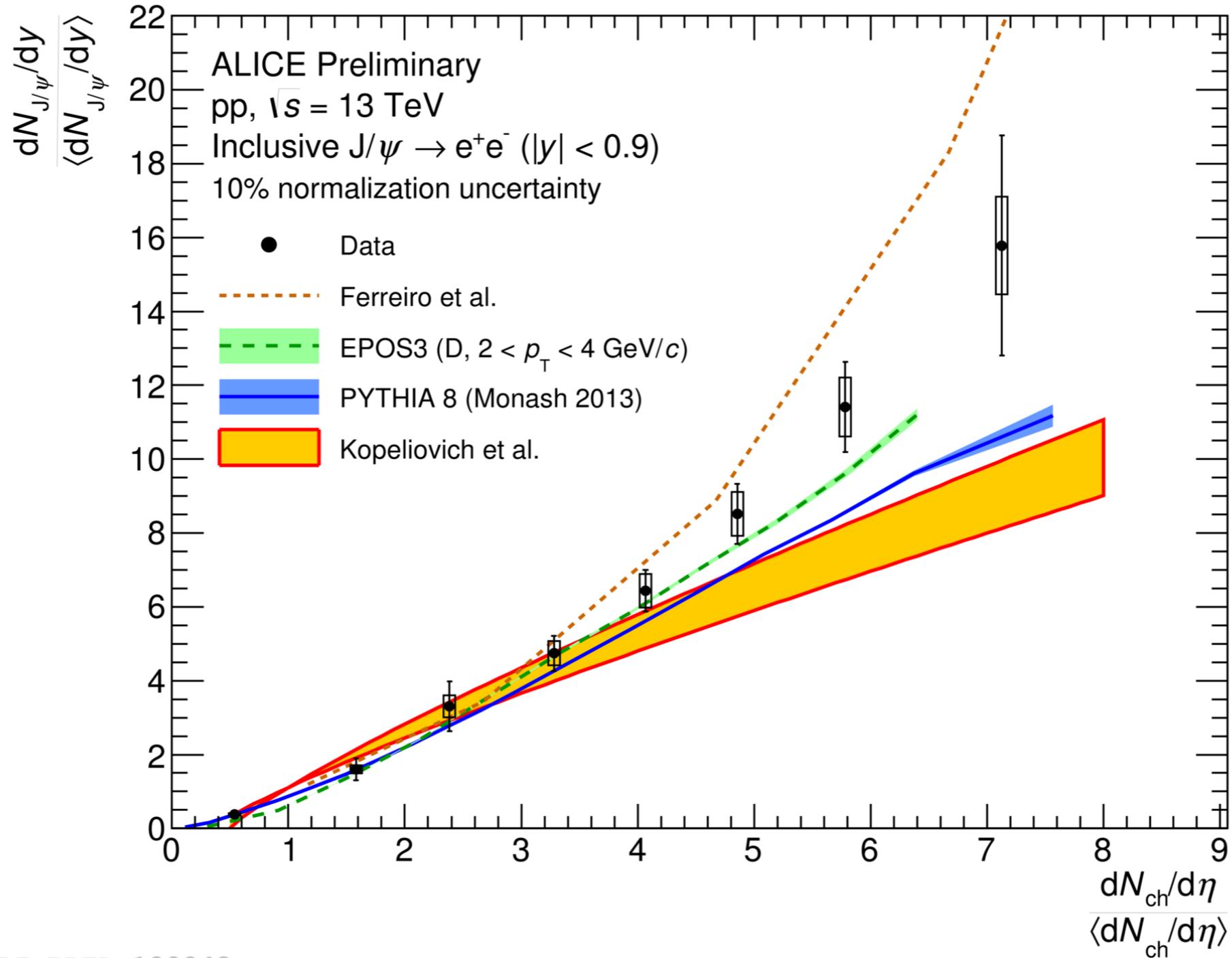


$$Q_{pPb} = \frac{(dN^D/dp_T)_{pPb}}{\langle T_{pPb} \rangle \times (d\sigma^D/dp_T)_{pp}} \quad \langle T_{pPb} \rangle = \frac{\langle N_{coll} \rangle_i}{\sigma_{NN}}$$

- Q<sub>pPb</sub> in most central (0-10%) and peripheral (60-100%) centrality ranges are compatible within uncertainties and compatible with unity

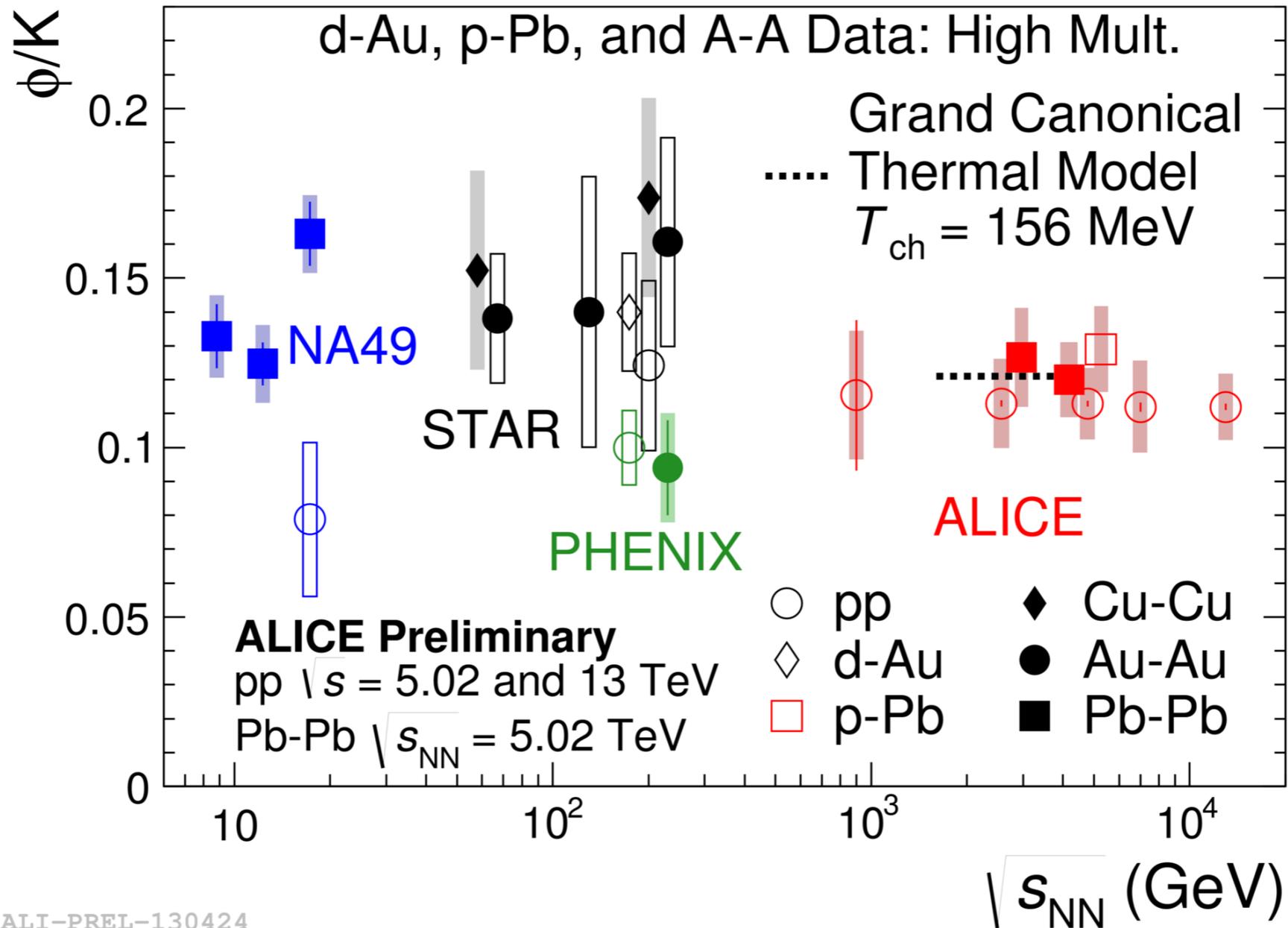
ALI-PREL-131661

# J/ψ

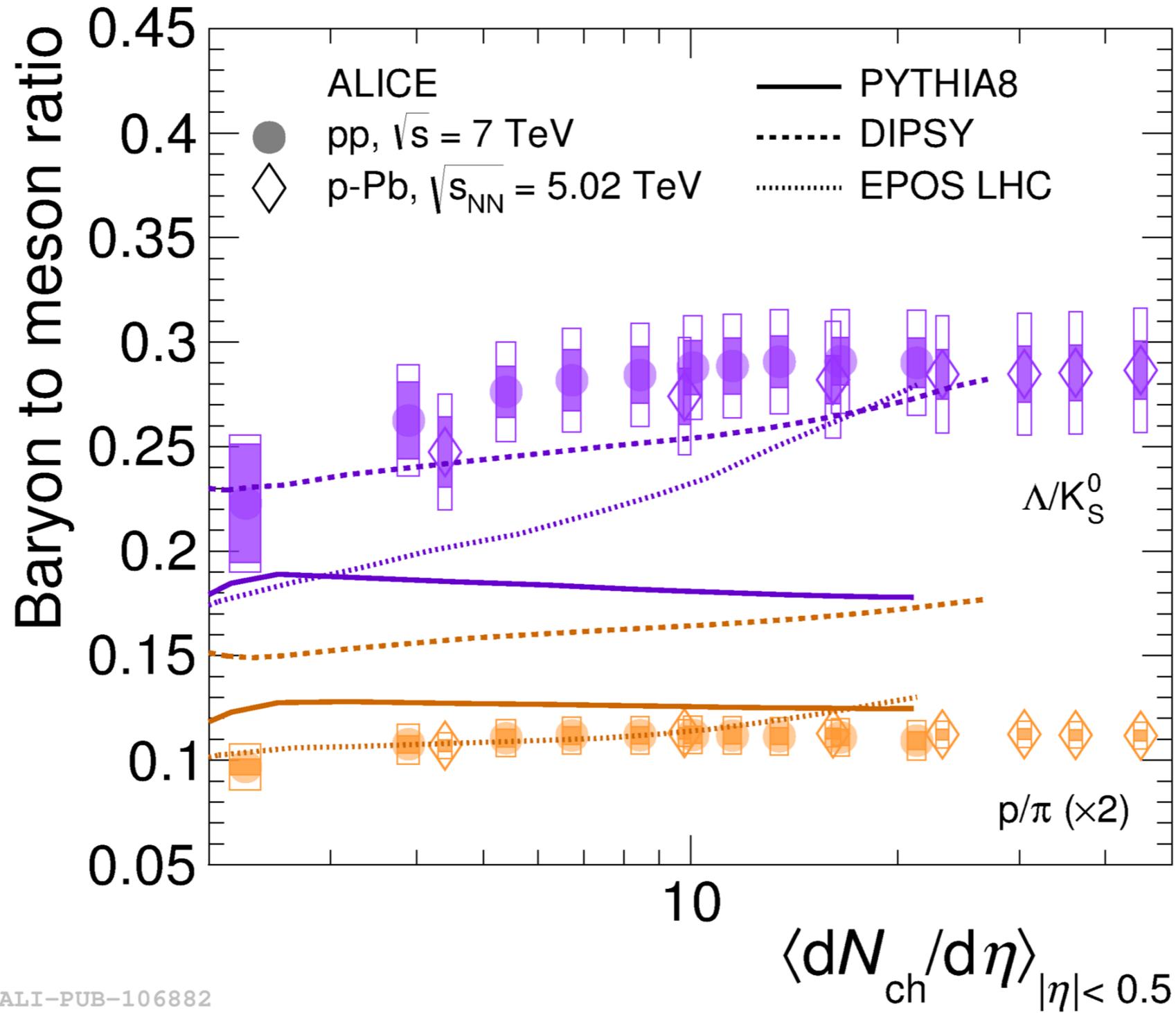


ALI-PREL-128843

# $\Phi/K$ ratios



ALI-PREL-130424



ALI-PUB-106882

# (anti-)Nuclei: coalescence parameters

