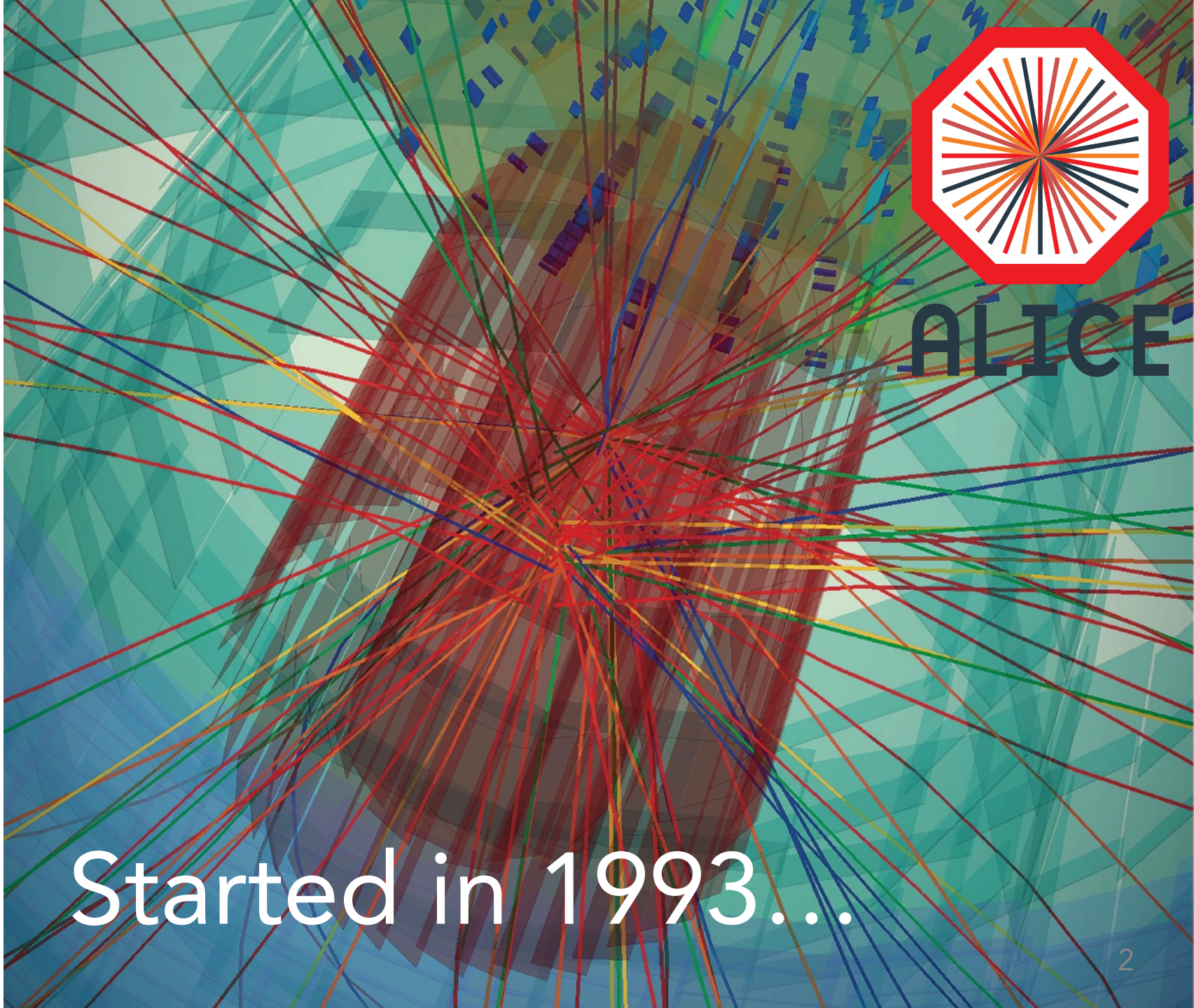
Highlights from ALICE

Quark Matter Venice, 14th May 2018

A selection of results out of 35 talks, 99 posters, and 16 new papers

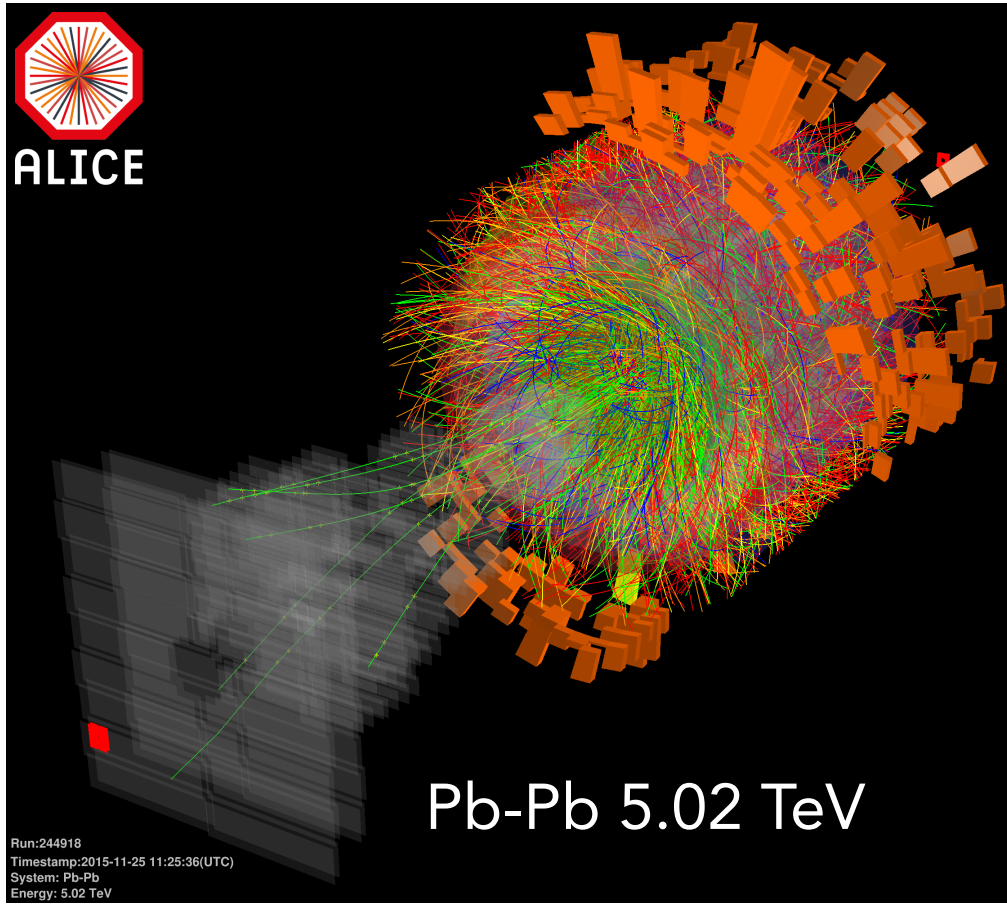
Alexander Kalweit (CERN), *on behalf of the ALICE collaboration*

25 years of ALICE experiment



…and already eight years of data taking

System	Year(s)	$\sqrt{s_{NN}}$ (TeV)	L_{int}
Pb-Pb	2010-2011	2.76	~75 μb^{-1}
	2015	5.02	~250 μb^{-1}
	by end of 2018	*5.02*	*~1 nb^{-1}*
Xe-Xe	2017	5.44	~0.3 μb^{-1}
p-Pb	2013	5.02	~15 nb^{-1}
	2016	5.02, 8.16	~3 nb^{-1}, ~25 nb^{-1}
pp	2009-2013	0.9, 2.76, 7, 8	~200 μb^{-1}, ~100 nb^{-1}, ~1.5 pb^{-1}, ~2.5 pb^{-1}
	2015,2017	5.02	~1.3 pb^{-1}
	2015-2017	13	~25 pb^{-1}



- LHC Run 2 data analysis is in full swing.
- Significant increase in integrated luminosity in pp, p-Pb, and Pb-Pb collisions allows more and more precise investigation of statistics hungry probes.

1. Bulk particle production and particle chemistry

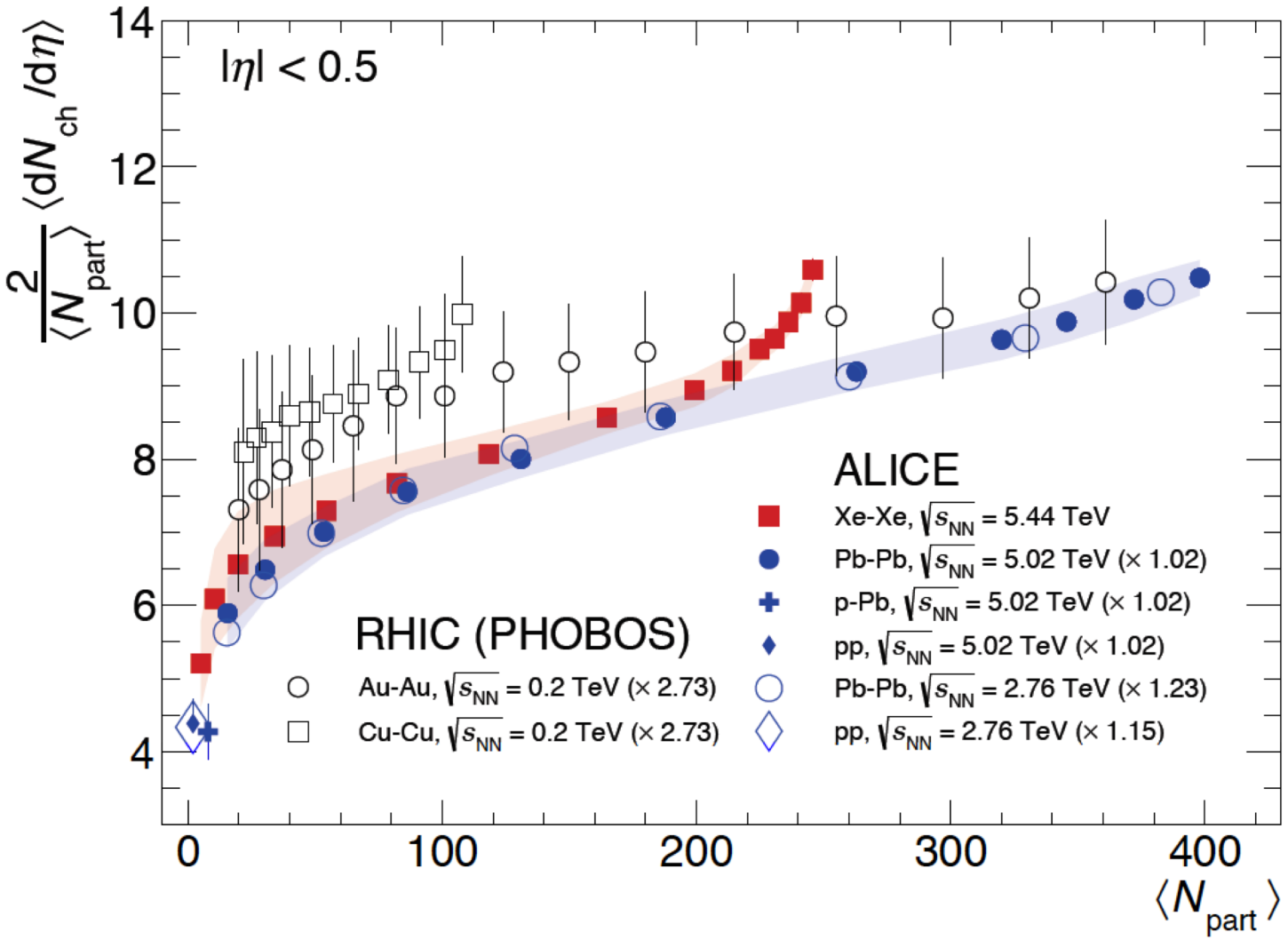
2. Jet-medium interactions

3. Electromagnetic probes

4. Heavy flavor and quarkonia

⟨d*N*/d*η*⟩ in Xe-Xe (1)

[arXiv:1805.04432]
B. Kim, Wed 17:10

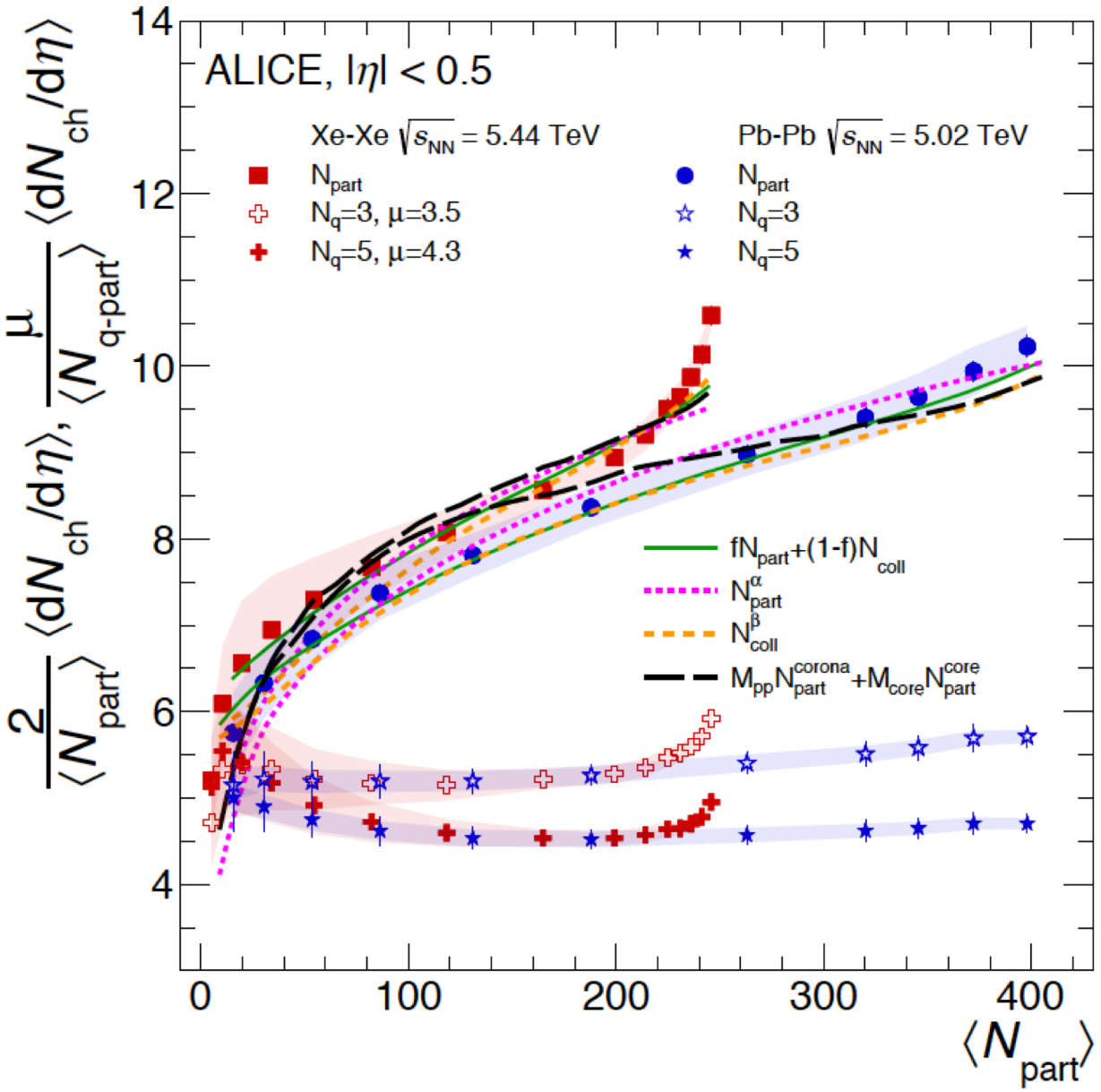


Two scaling violations observed:

(1.) N_{part} scaling violated
→ known since a long time, confirmed by new Xe-Xe data

⟨d*N*/d*η*⟩ in Xe-Xe (2)

[arXiv:1805.04432]
B. Kim, Wed 17:10



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→ well described by **participant quark scaling $N_{q\text{-part}}$** and many theoretical models

⟨d*N*/d*η*⟩ in Xe-Xe (3)

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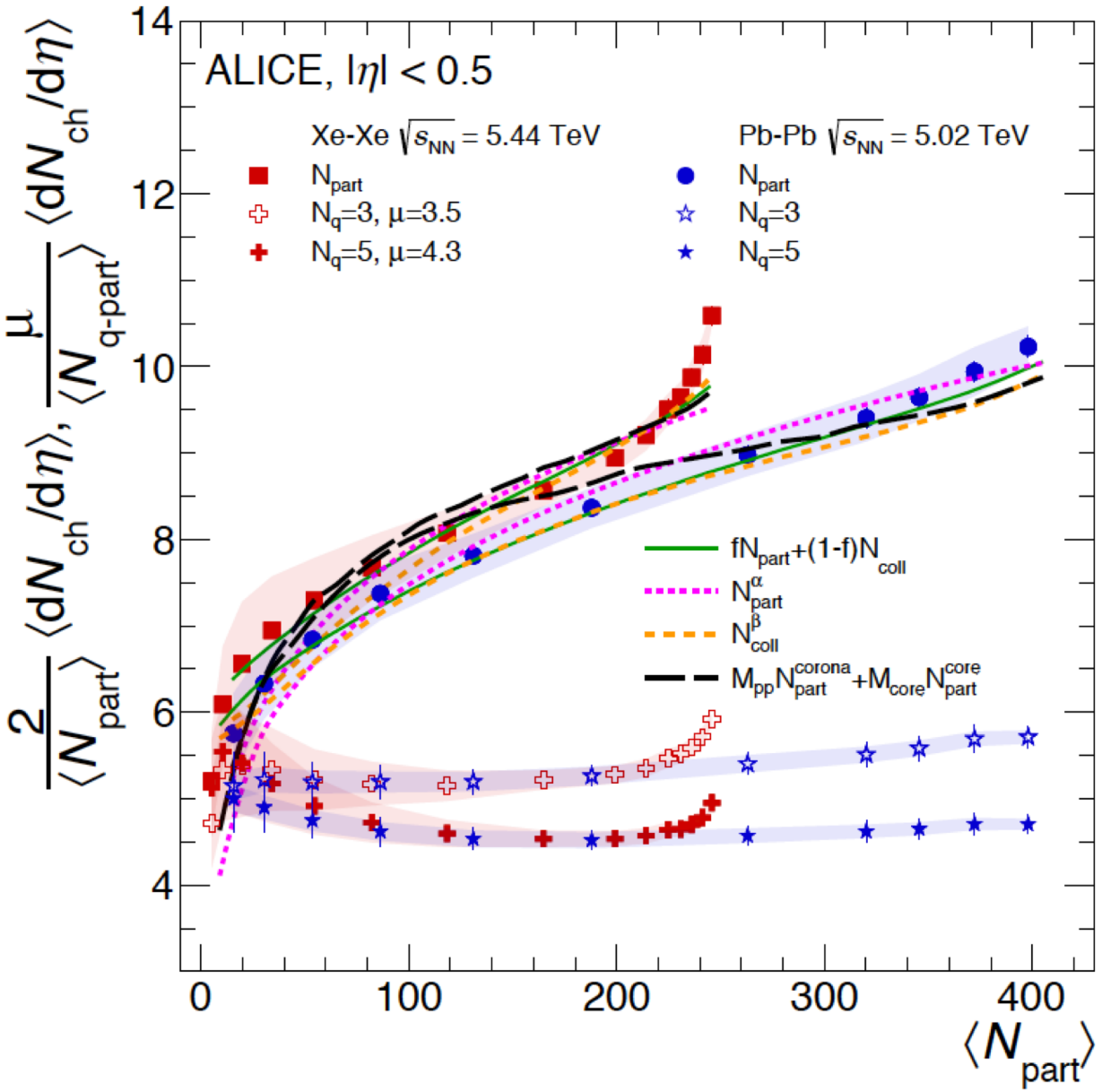


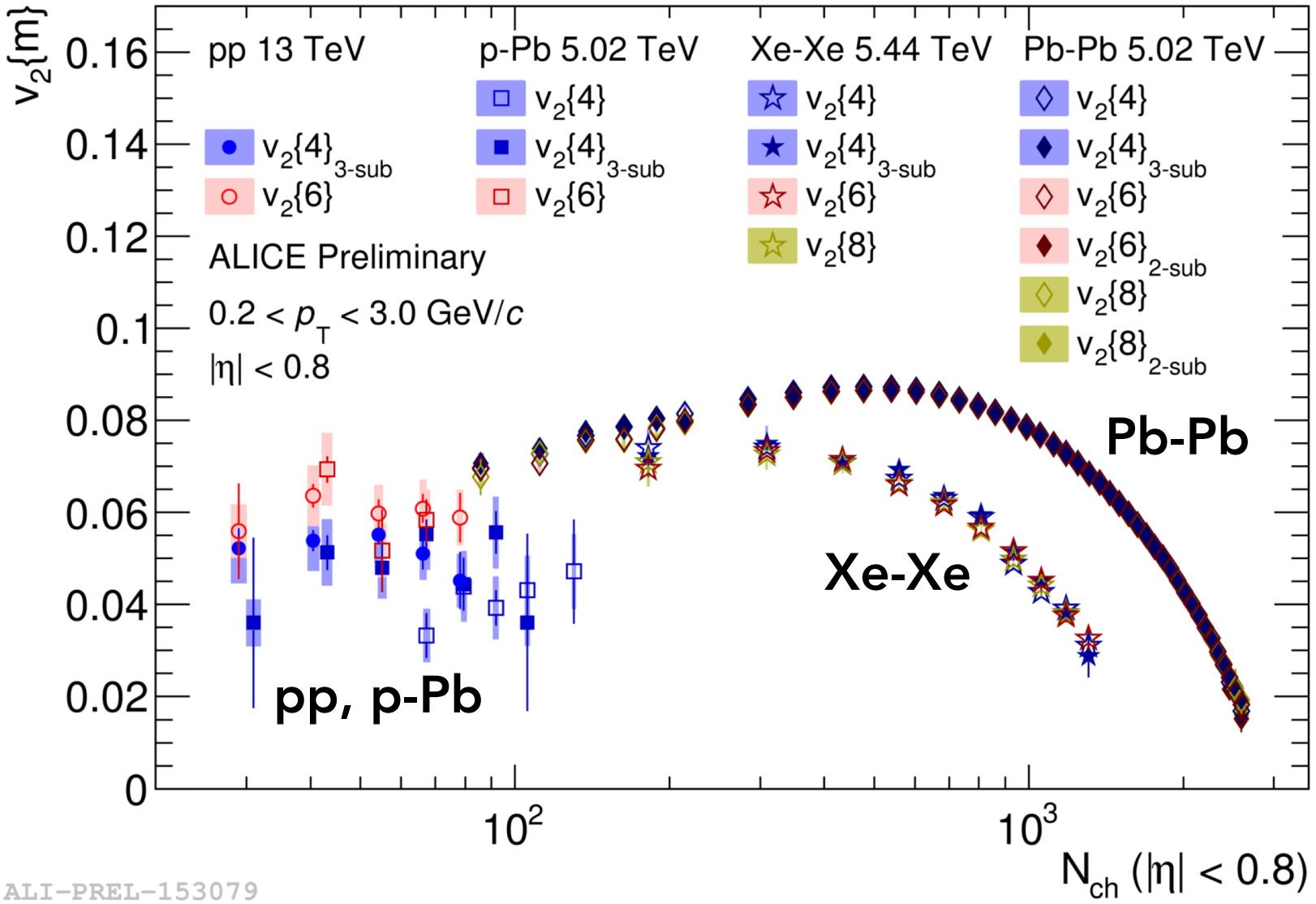
Two scaling violations observed:

(1.) N_{part} scaling violated
→ known since a long time, confirmed by new Xe-Xe data
→ well described by **participant quark scaling $N_{q\text{-part}}$** and many theoretical models

(2.) Central collisions of medium-size nuclei produce more particles per N_{part} than mid-central collisions of large nuclei at the same N_{part}
→ not explained by participant quark scaling and not fully reproduced by models

Elliptic flow in different collision systems (1)

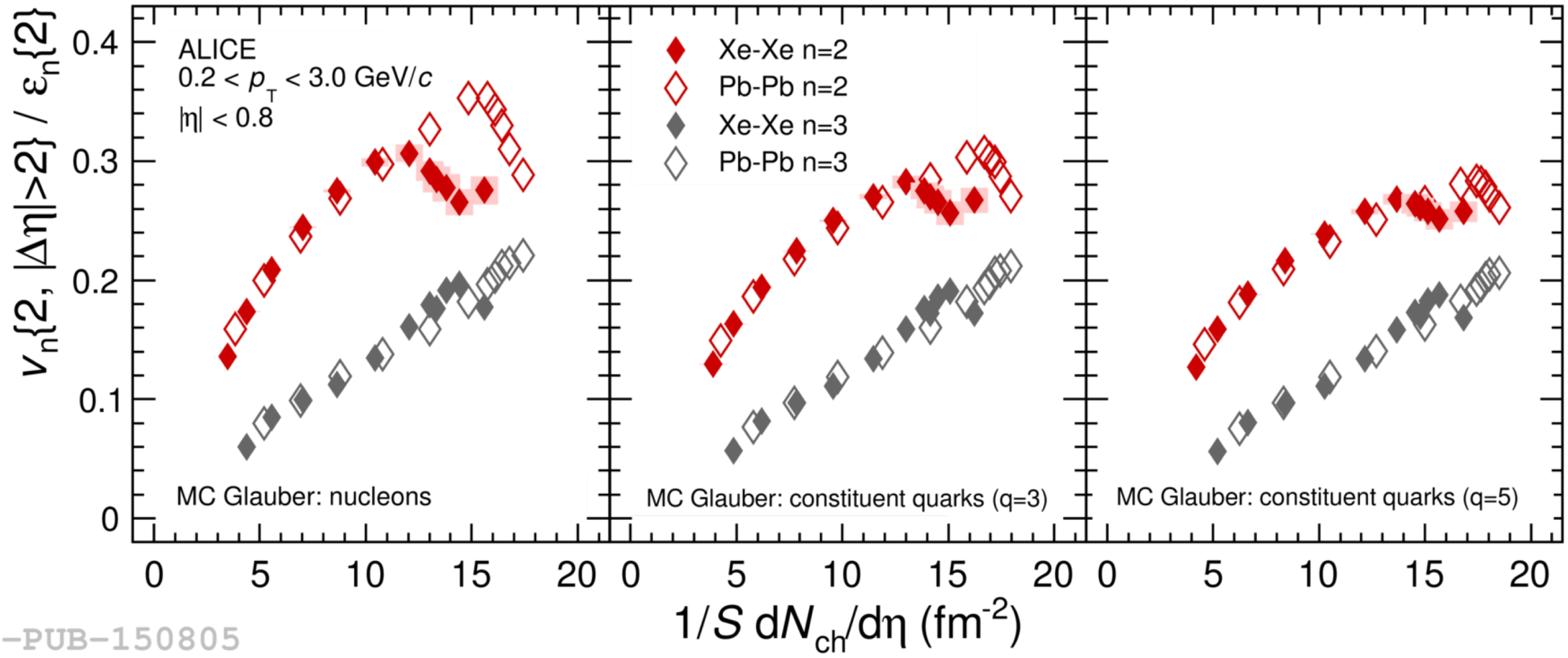
K. Gajdosova, Tue 12:50
J. Margutti, Tue 09:00



→ Detailed measurement of $v_2\{m\}$ as a function of charged particle density for **different geometries**.

Elliptic flow in different collision systems (2)

[arXiv:1805.01832]

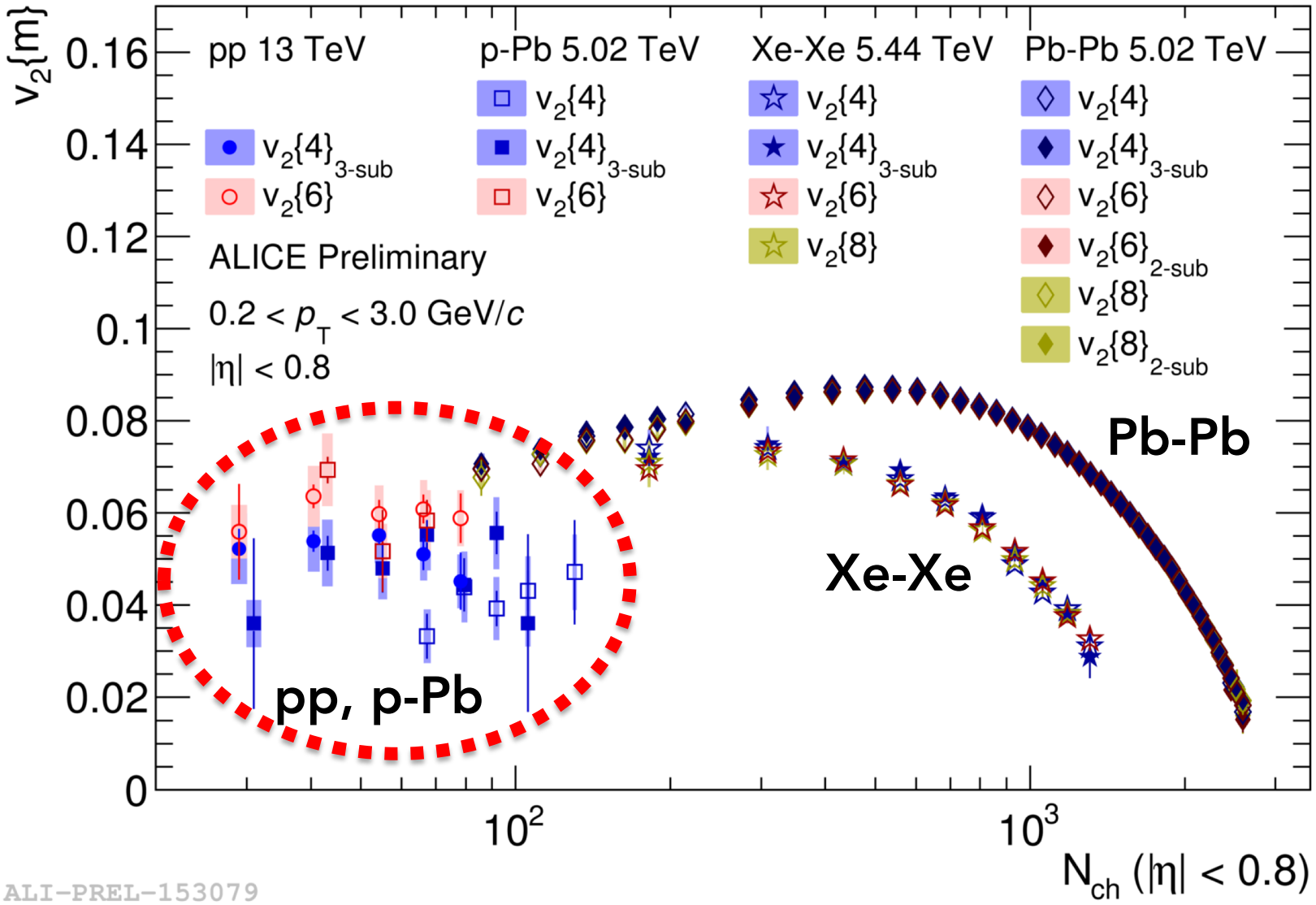


ALI-PUB-150805

→ Scaling with transverse density and eccentricity (expected from hydro) is restored for **initial conditions** modeled with **constituent quark Glauber** including **Xe deformation**.

Elliptic flow in different collision systems (3)

K. Gajdosova, Tue 12:50



ALI-PREL-153079

→ Detailed measurement of $v_2\{m\}$ as a function of charged particle density for **different geometries**.

→ Collective behavior is observed in multi-particle cumulants (where non-flow contributions are suppressed) even in the smallest systems.

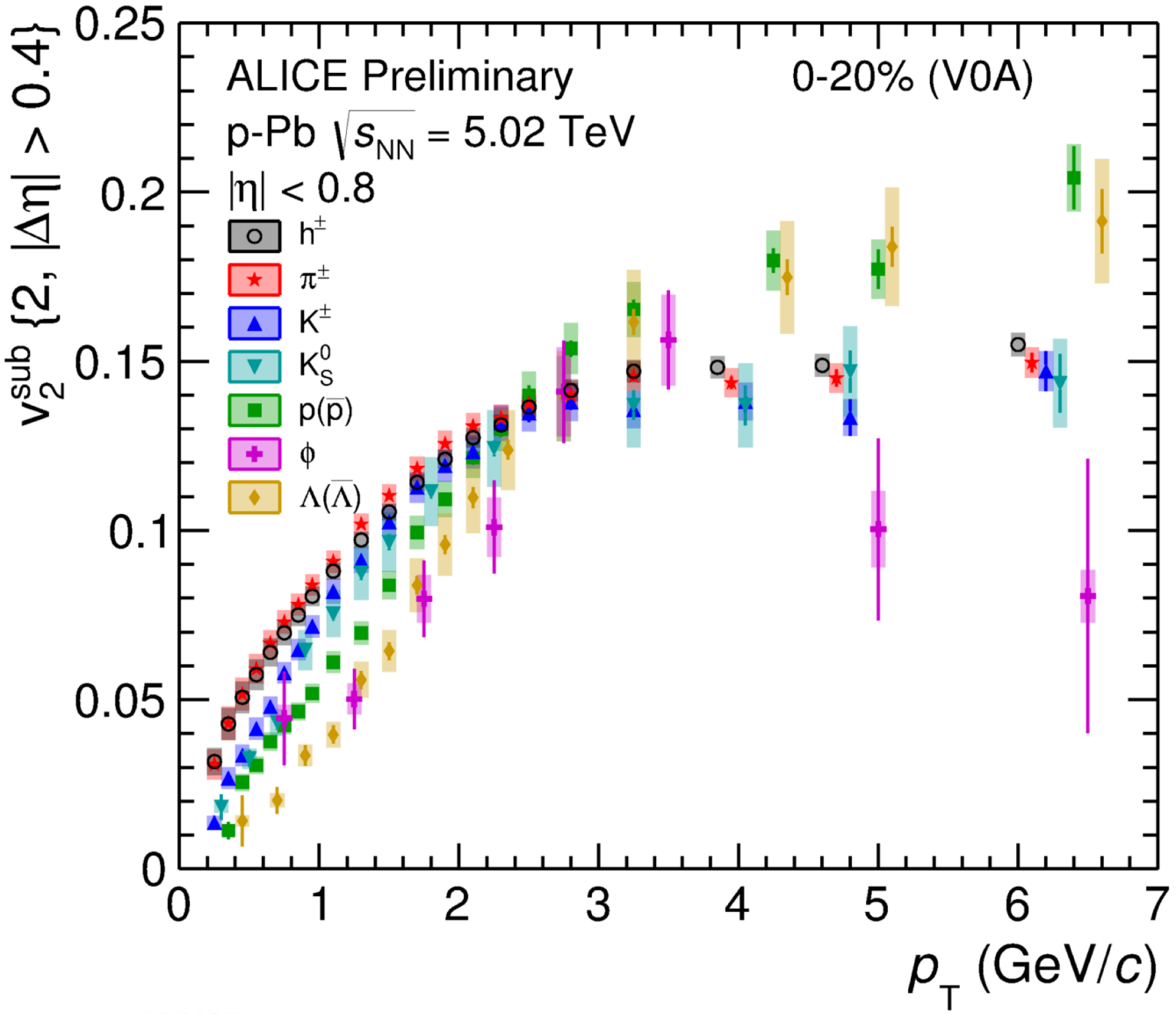
v_2 in p-Pb collisions for identified particles

V. Pacik, Mon 16:30

→ **New results on identified particle v_2^{sub} show a clear mass ordering in small collision systems.**

→ Consistent with hydrodynamic expansion, but can also be mimicked by other effects such as initial stage effects (PYTHIA+Lund string), parton escape (AMPT), or hadronic re-scattering (UrQMD).

→ Baryon/meson grouping observed at intermediate p_T as in AA collisions.



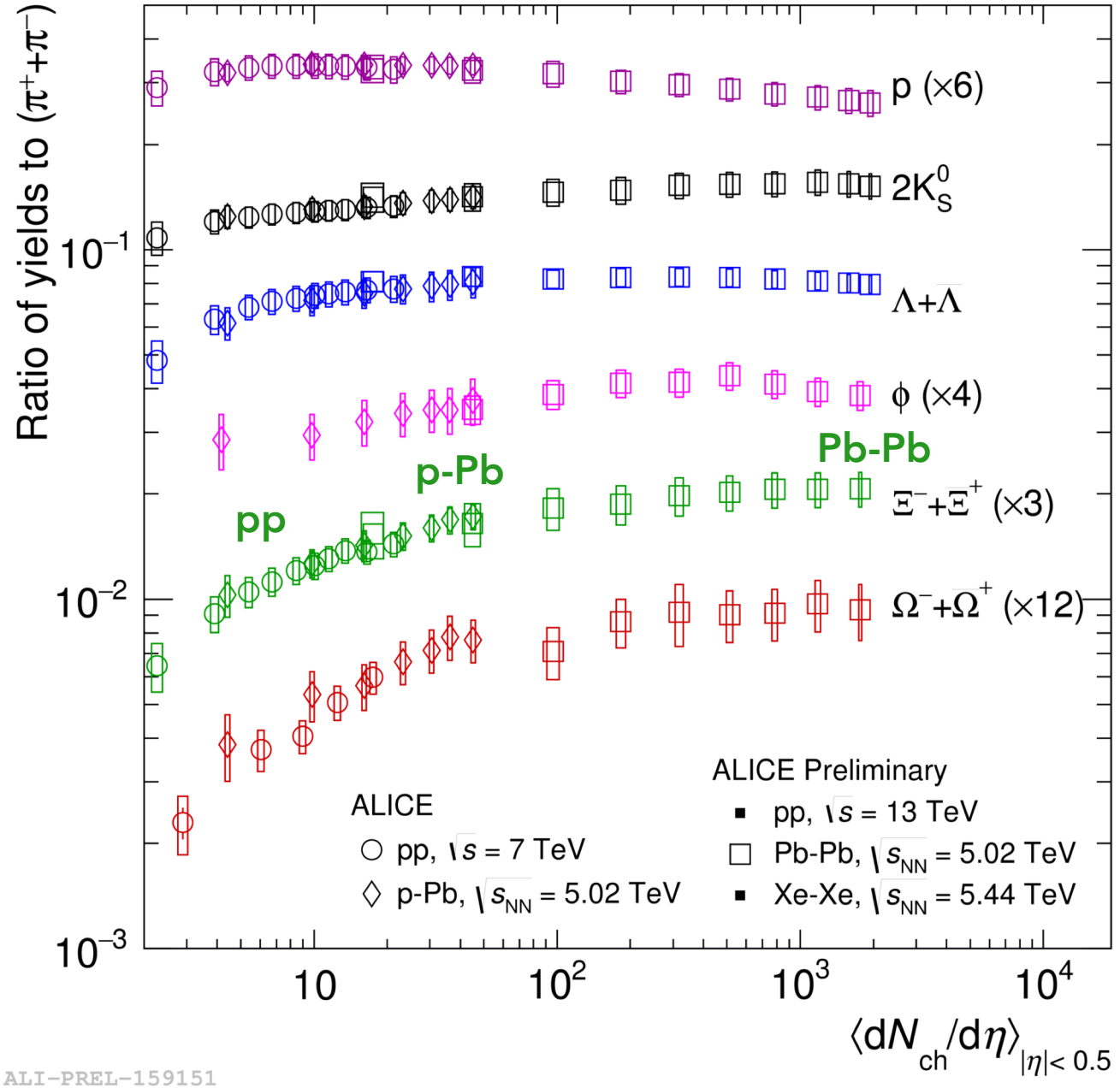
ALI-PREL-156487

Particle chemistry across system size (1)

D. Silva de Albuquerque, Tue 16:40

→ Smooth evolution of particle chemistry from small to large systems as function of charged particle multiplicity
⇒ common origin in all systems?

→ Increasing strangeness production with increasing multiplicity until saturation (grand-canonical plateau) is reached.



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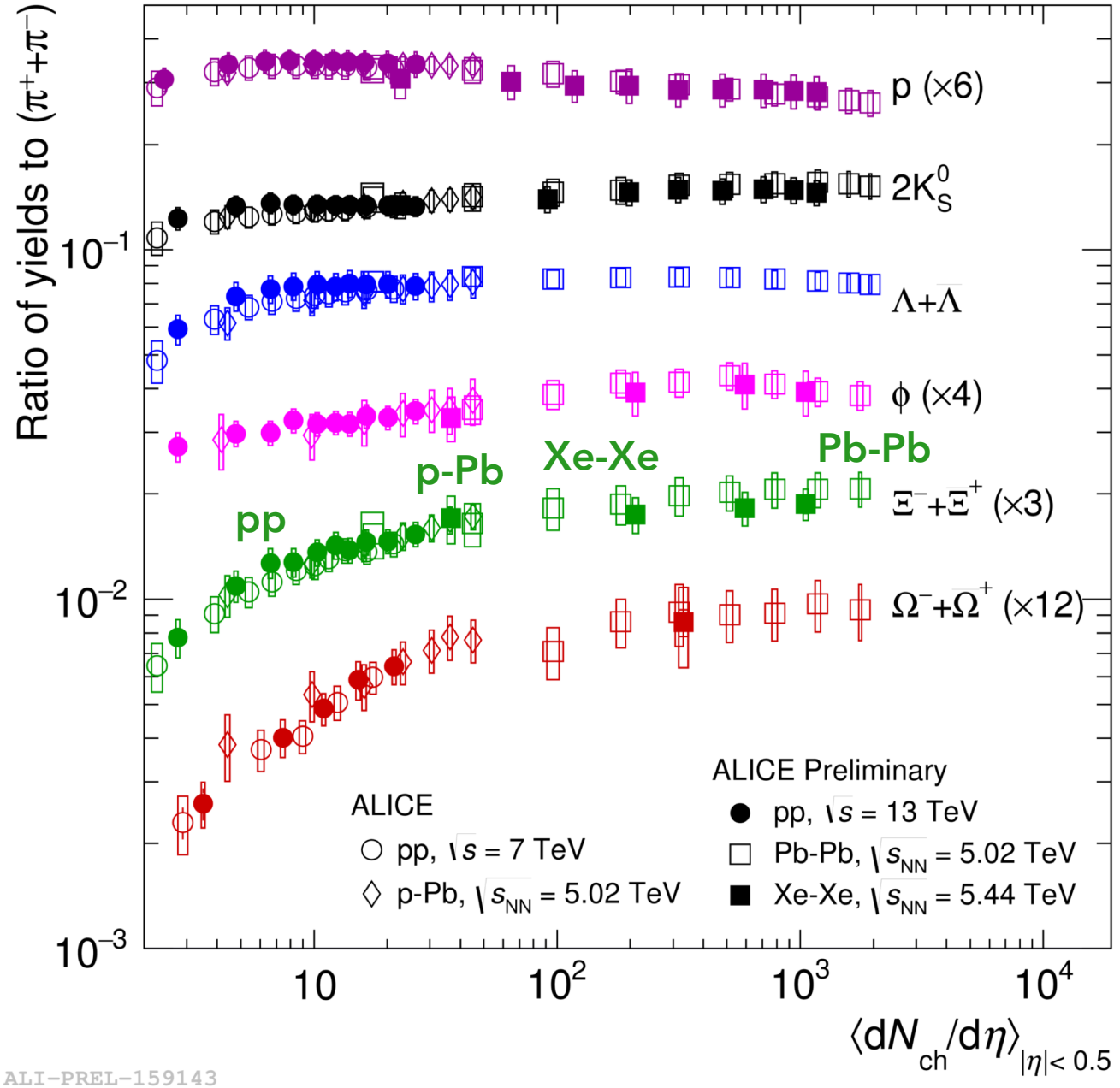
→ Increasing strangeness production with increasing multiplicity until saturation (grand-canonical plateau) is reached.

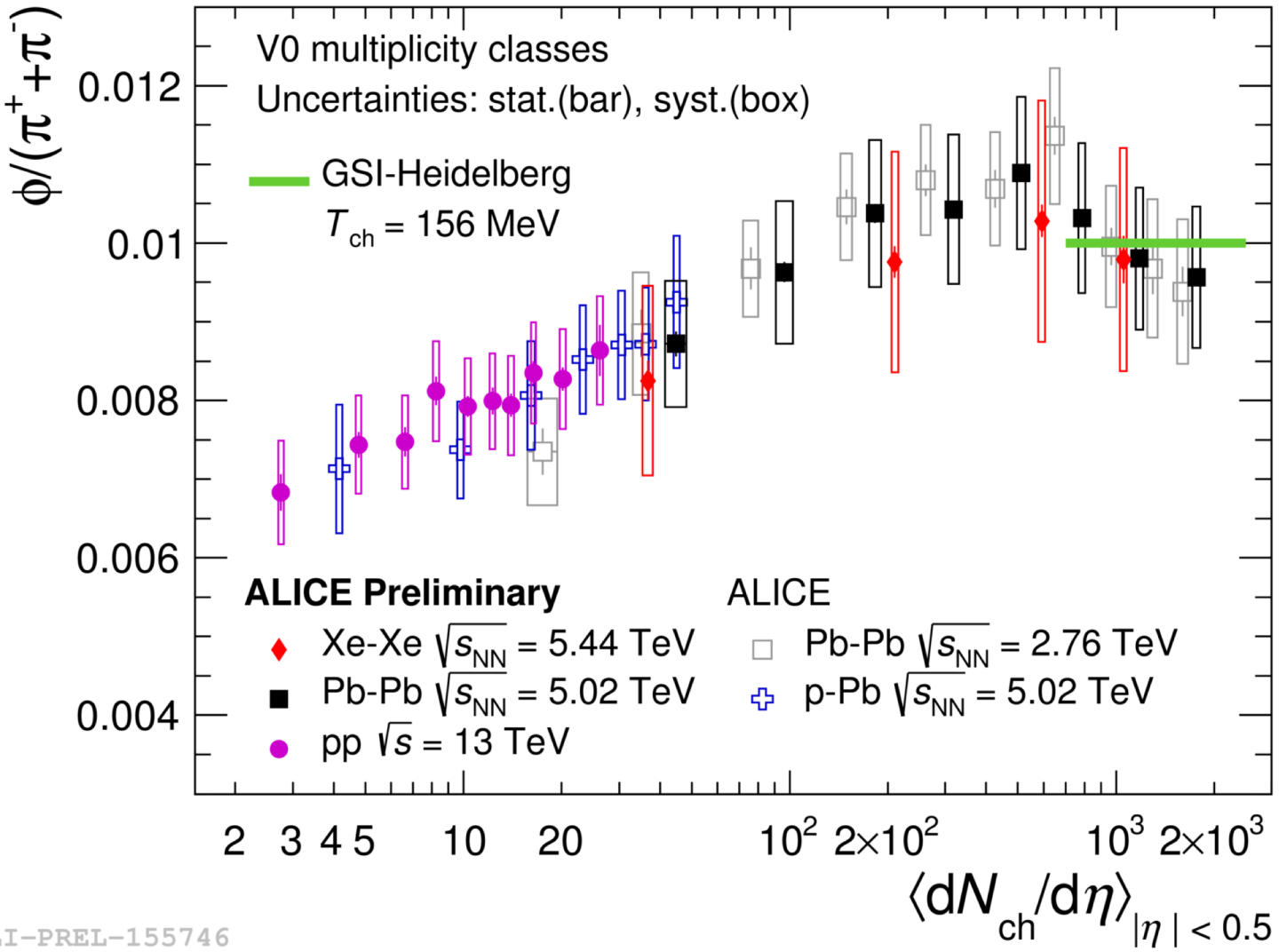
→ **Confirmed with new pp √s=13 TeV and Xe-Xe data!**



ALI-PREL-159143

Particle chemistry across system size (3)

G. Bencedi, Tue 16:40
A. Dash, Mon 18:10
F. Bellini, Wed 12:50



ALI-PREL-155746

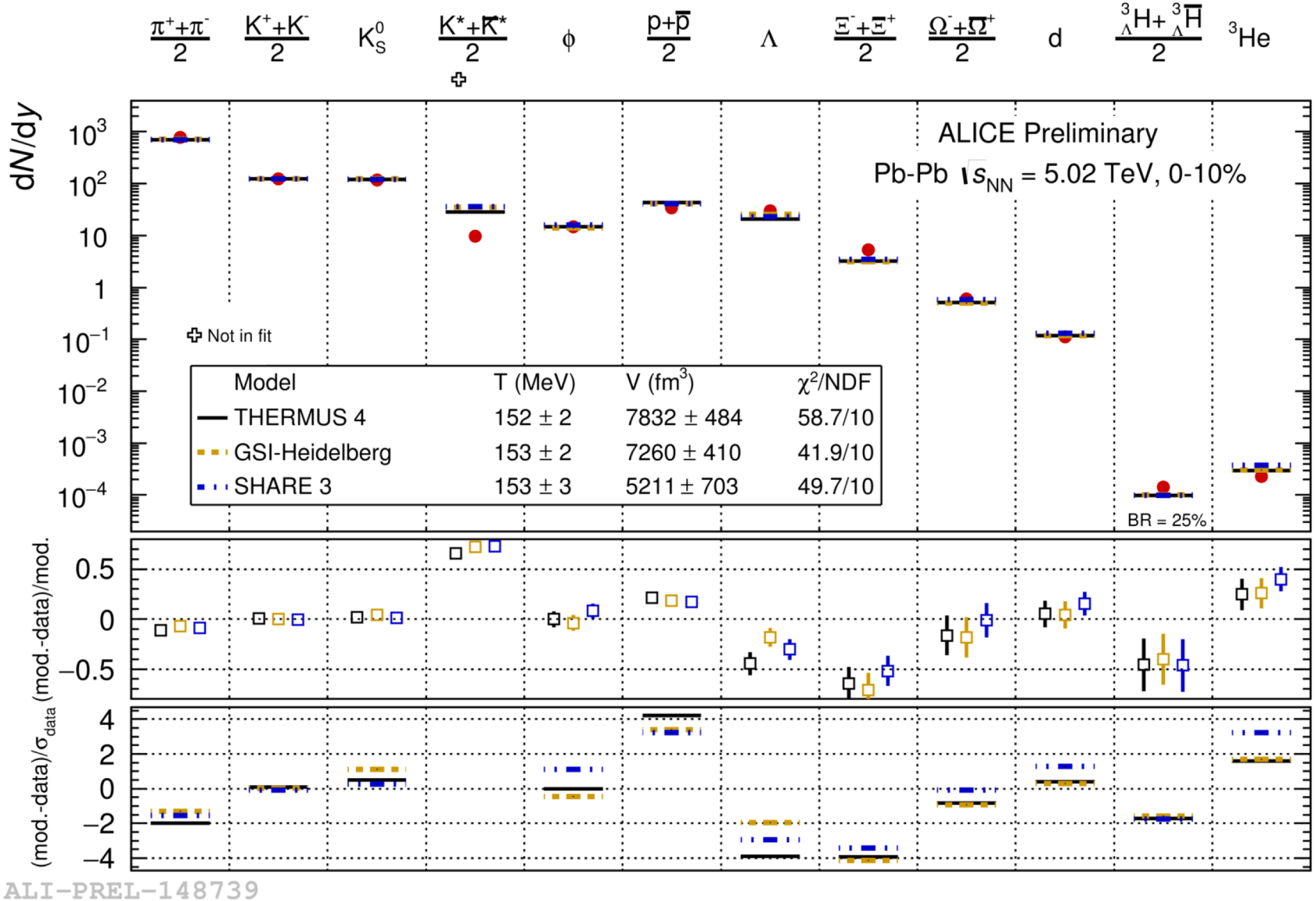
Significantly increasing trend of ϕ-meson ($s\bar{s}$) to pion ratio with increasing multiplicity

→ In contrast to expectation from simple strangeness canonical suppression: favors non-equilibrium production of either only the ϕ or of all strange particles (γ_s)

→ Pivotal role of the ϕ-meson in the understanding of strangeness production with thermal-statistical, core-corona, and MC models.

Thermal statistical model fits Pb-Pb 5.02 TeV

F. Bellini, Wed 12:50



→ Also at 5.02 TeV, yields of light flavor hadrons are qualitatively well described by equilibrium thermal models over 7 orders of magnitude.

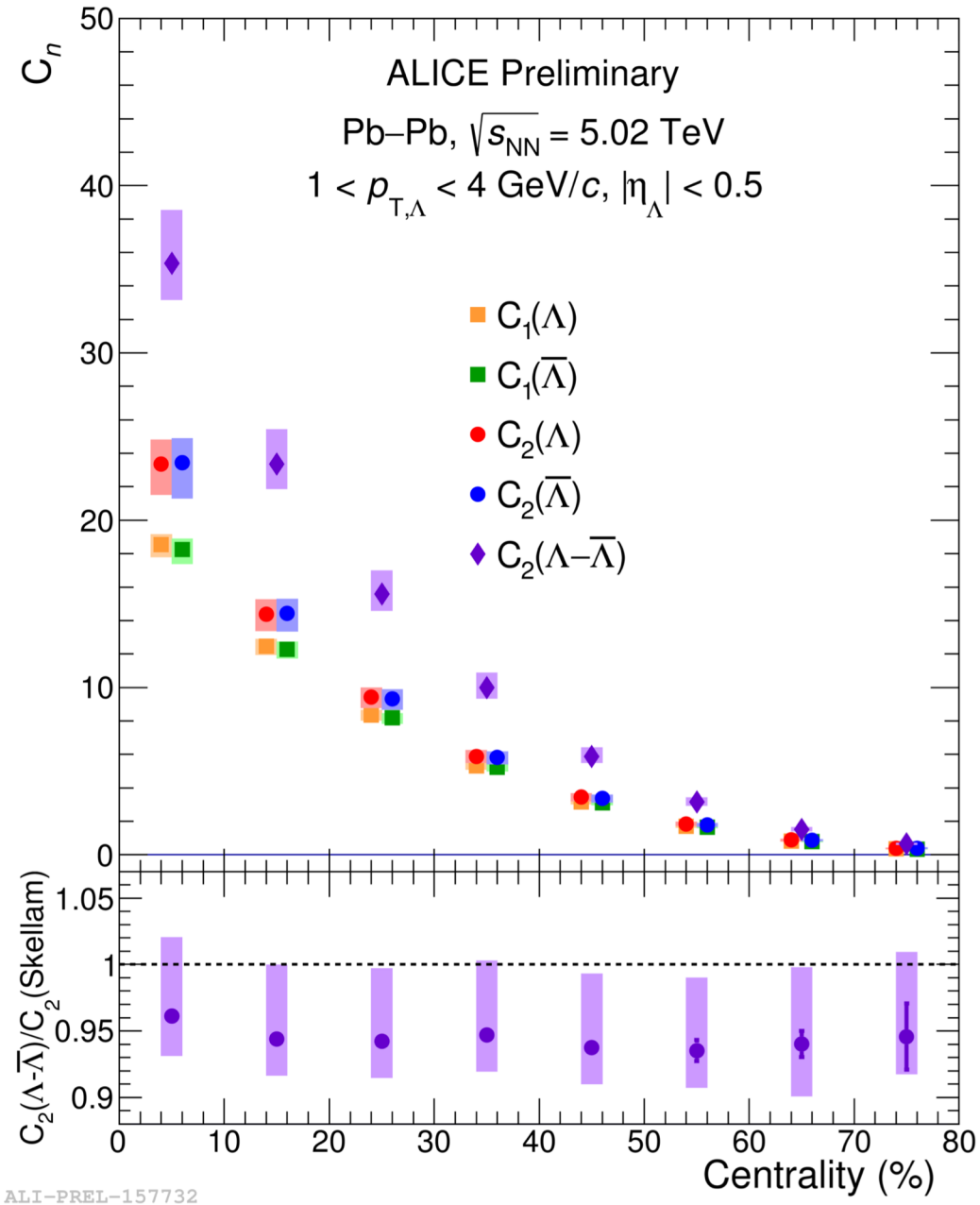
→ Fit at 5.02 TeV converges to slightly lower T_{ch} than at 2.76 TeV (153 w.r.t to 156 MeV) due to proton yield.

A. Ohlson, Mon 16:50

Fluctuations of conserved quantities in QCD (1)

Lower order cumulants of net-proton (~net-baryon) and net-Lambda (~net-baryon and net-strangeness) are in agreement with Skellam (Poisson) expectation

→ No observation of non-thermal fluctuations in lower orders as expected, fluctuations seem to be only driven by conservation laws.



N. Behera, Wed 11:50

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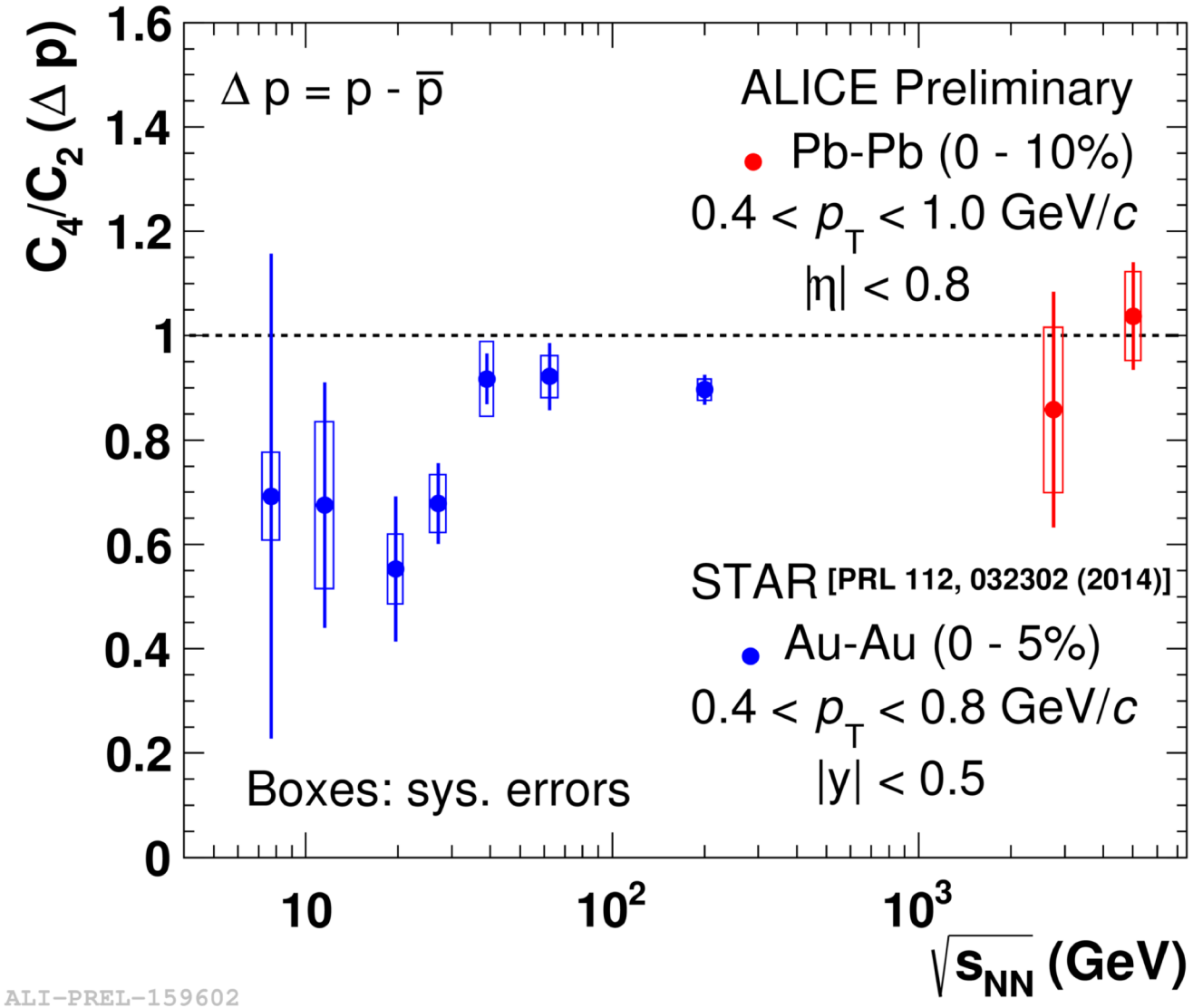

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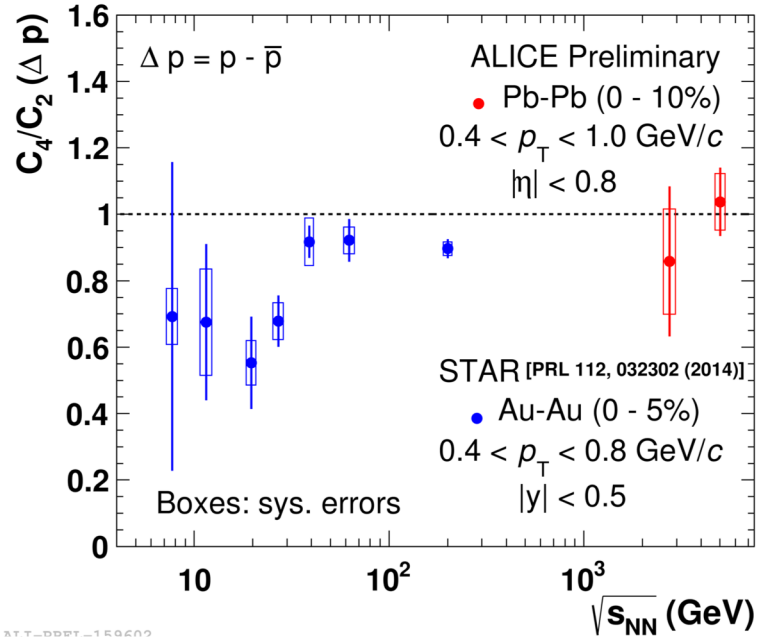
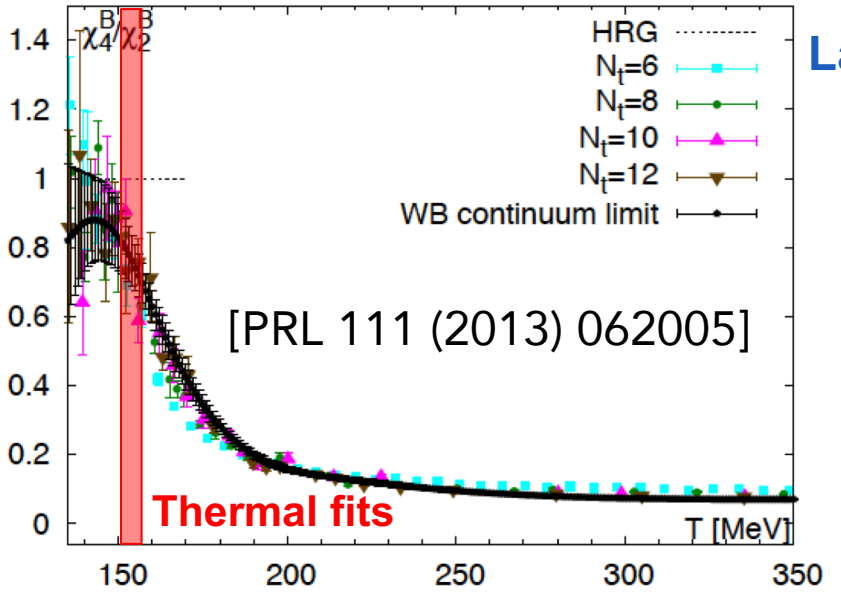
→ Consistent with Lattice QCD expectation (at $\mu_B \approx 0$!).

→ Solid baseline for search for critical chiral fluctuations at higher orders.





Lattice QCD

N. Behera, Wed 11:50

Fluctuations of conserved quantities in QCD (4)

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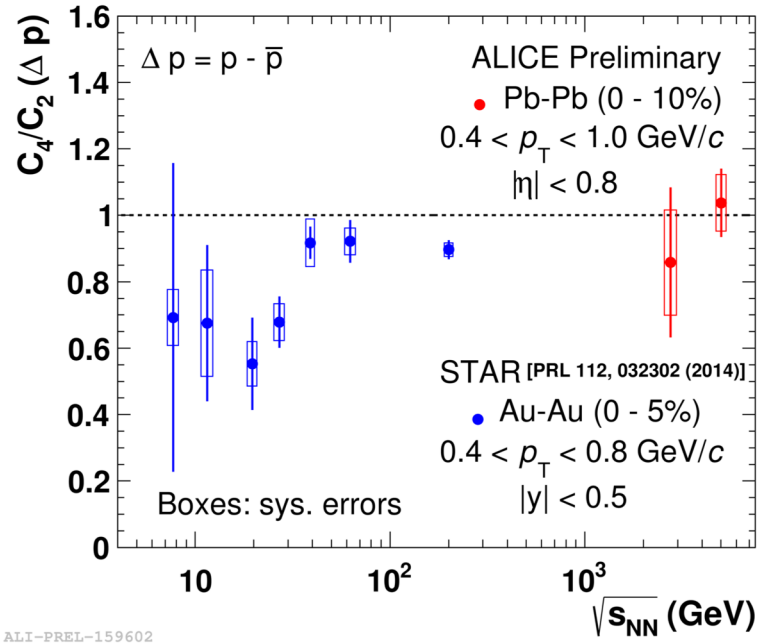
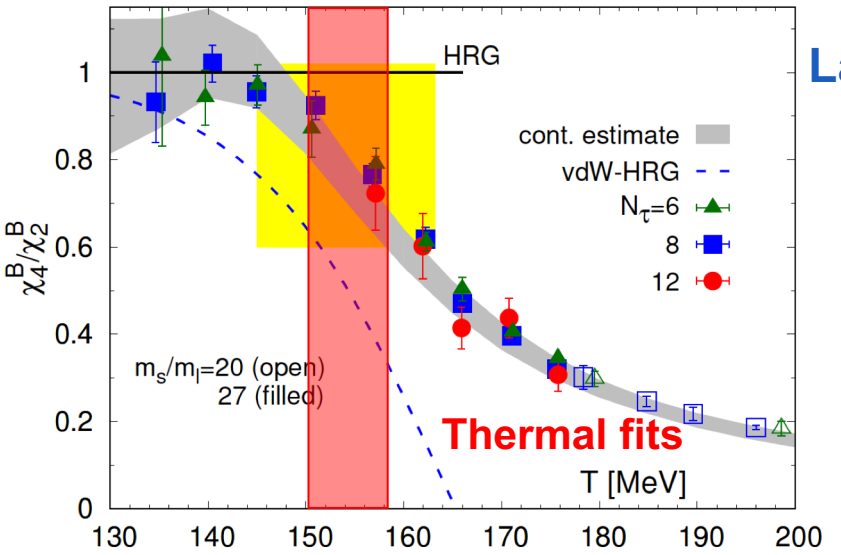
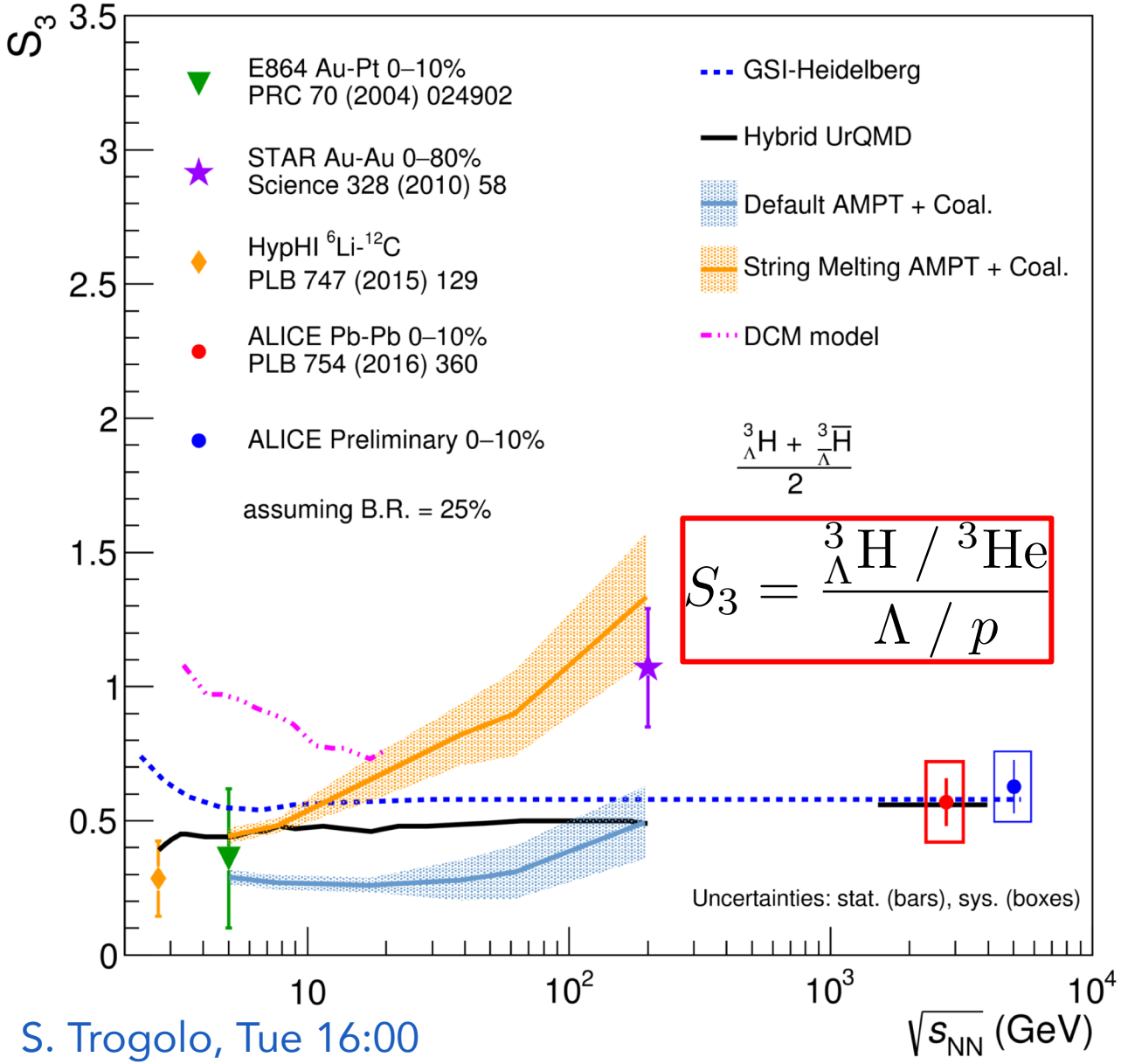


[NPA 967 (2017) 461]



Lattice QCD

(anti-)hyper-triton in Pb-Pb collisions at 5.02 TeV



S. Trogolo, Tue 16:00

$\bar{n}\,\bar{\Lambda}\,\bar{p}$ anti-hyper-triton

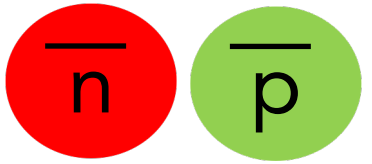
$\bar{n}\,\bar{p}\,\bar{p}$ anti-^{3}He

→ Yields of heavy and fragile objects such as (anti-)(hyper-)nuclei in agreement with thermal-statistical model predictions at *chemical* freeze-out.

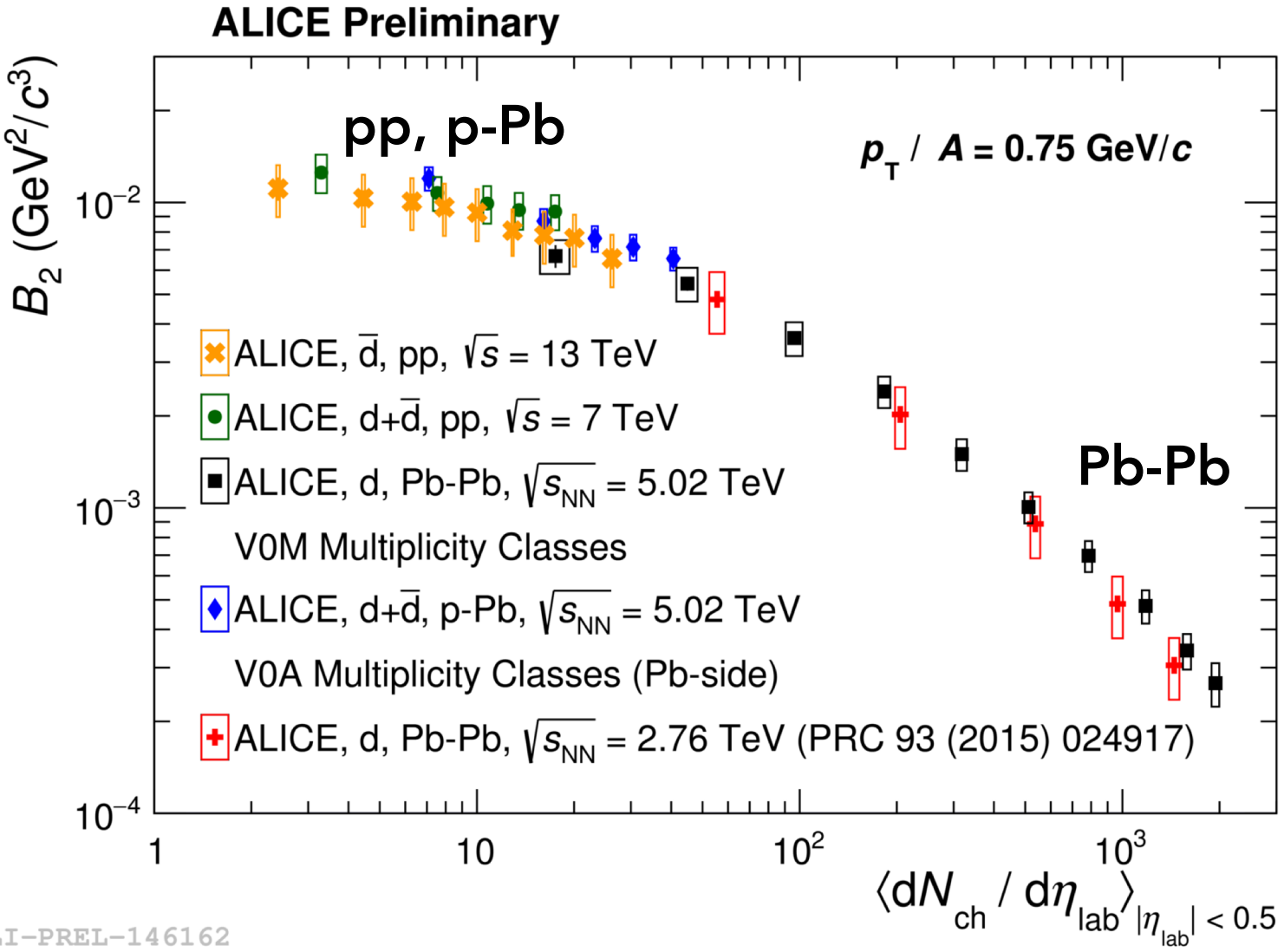
→ No re-scattering of anti-nuclei in hadronic phase despite large dissociation cross-section.

→ Final-state coalescence after kinetic freeze-out requires more detailed modeling: *naive coalescence* ($S_3 \approx 1$) does not describe data.

(anti-)deuteron production (1)



anti-deuteron



LI-PREL-146162

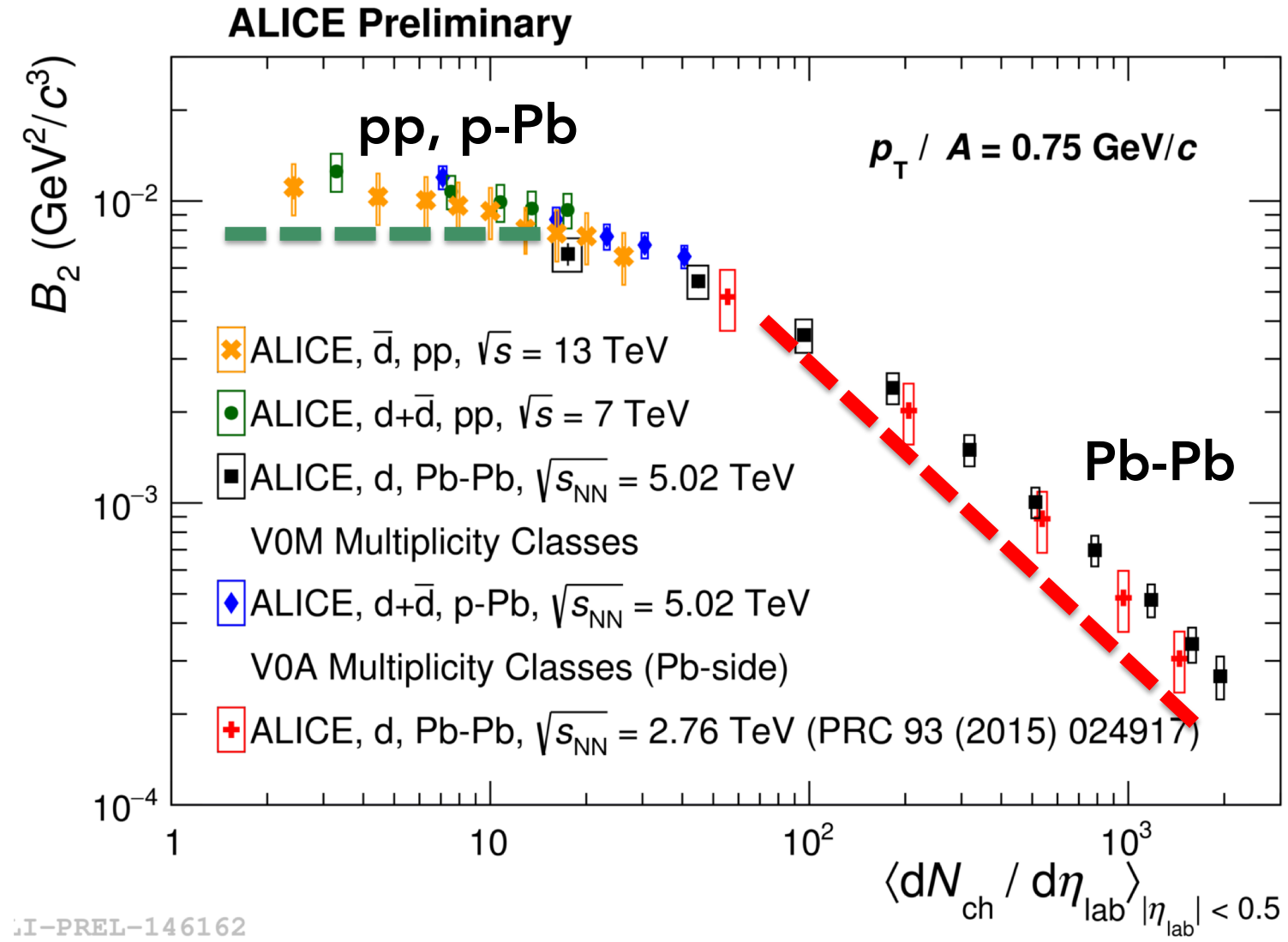
Deuteron production in simple coalescence:

deuteron ∝ proton x neutron

deuteron = B_2 x proton^2

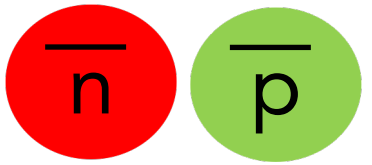
M. Colocci, Tue 15:40

(anti-)deuteron production (2)



LI-PREL-146162

M. Puccio, Wed 18:30



anti-deuteron

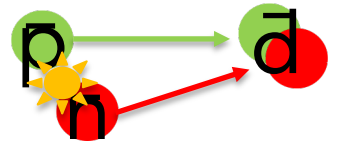
Deuteron production in simple coalescence:

deuteron ∝ proton x neutron

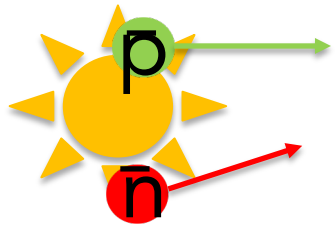
deuteron = B_2 x proton^2

→ Two production regimes observed:

(a.) system size < deuteron size



(b.) system size > deuteron size



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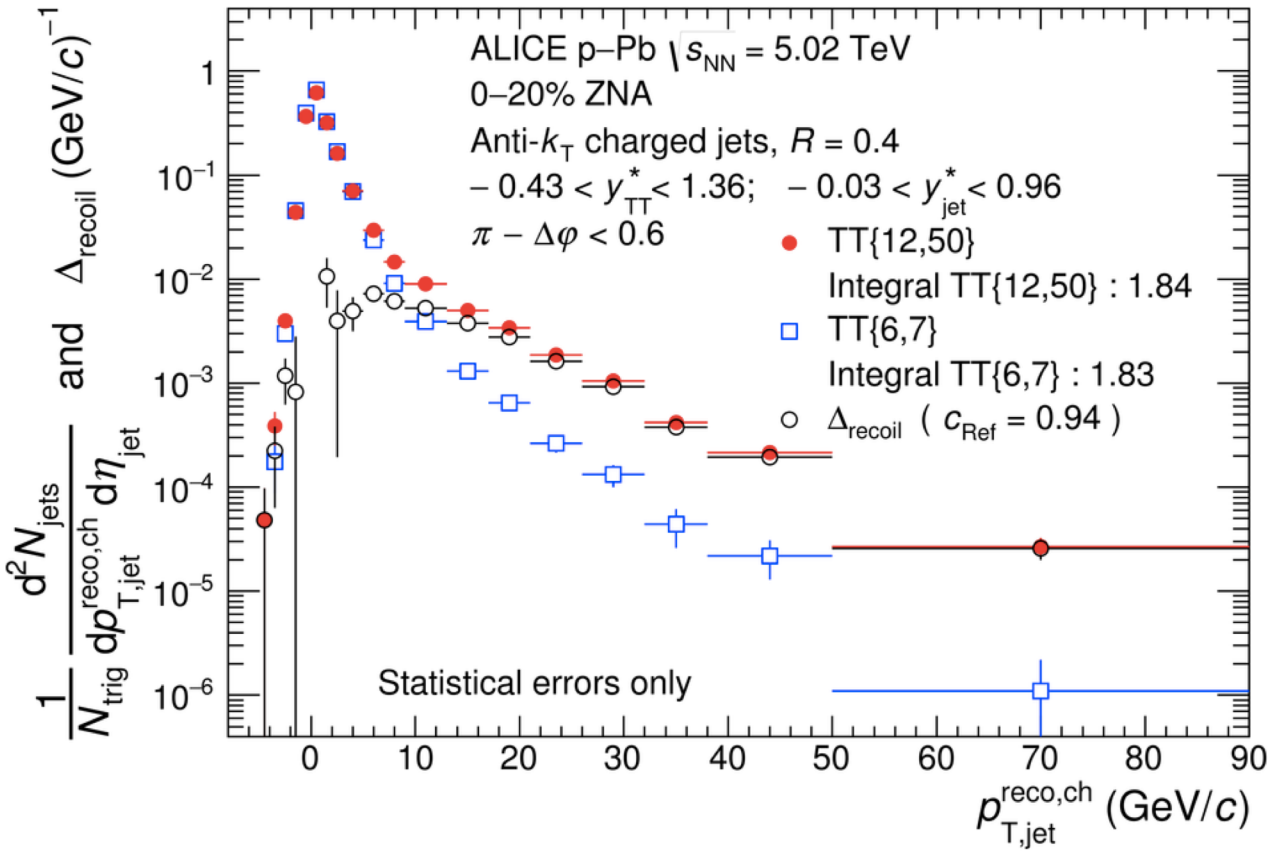
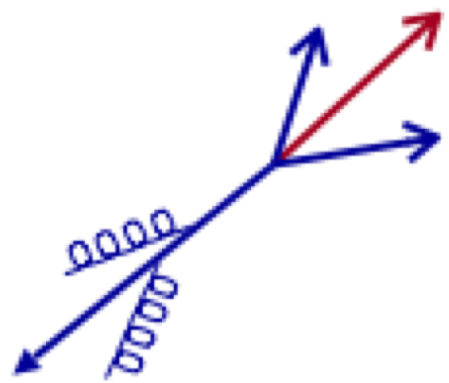
Constraints on jet-quenching in p-Pb collisions (1)





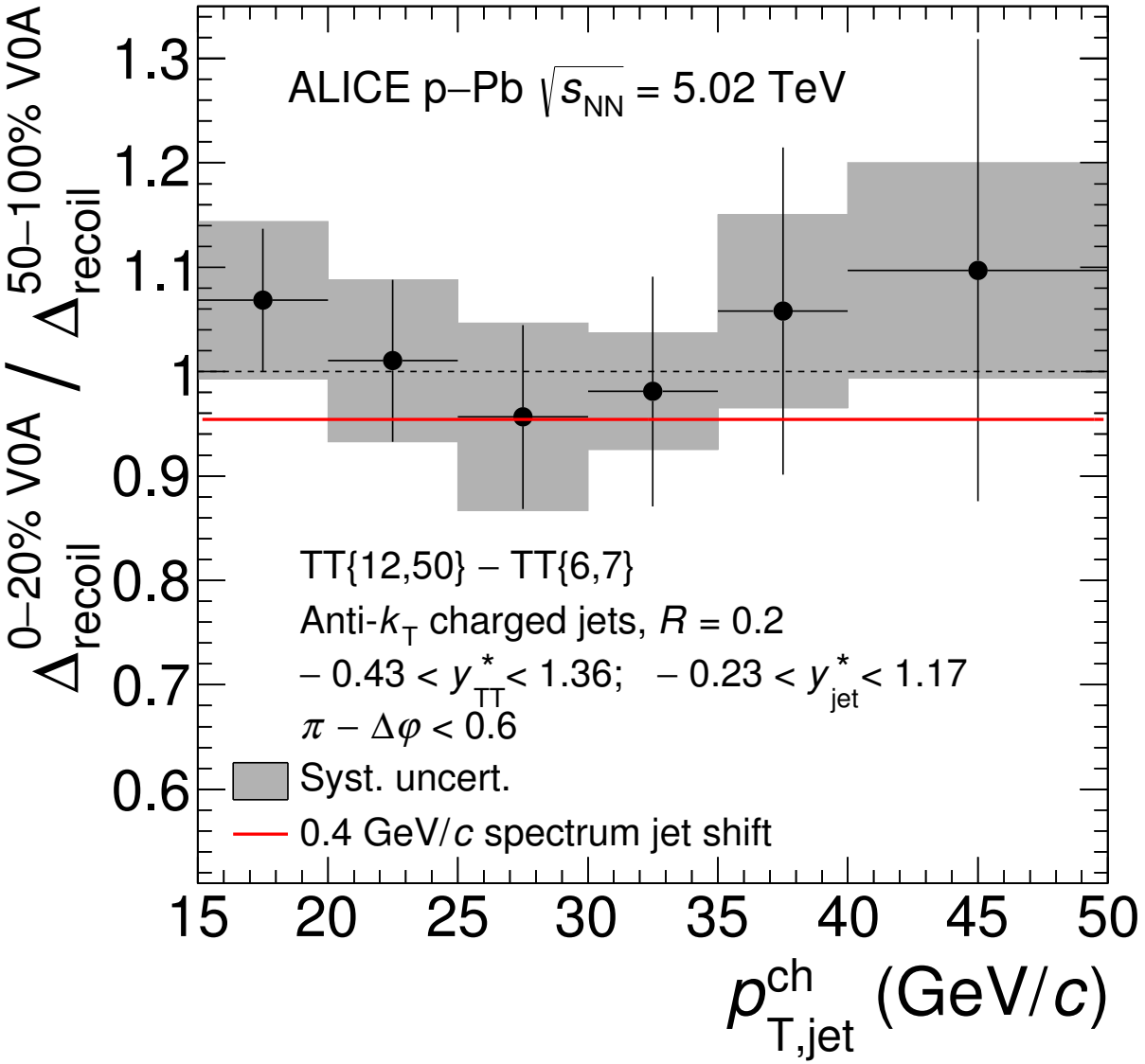
→ Semi-inclusive recoil-jet distribution: jets recoiling against high-p_T trigger hadrons.

→ Uncorrelated combinations are subtracted:

Δ_{recoil} = high-p_T trigger (12 – 50 GeV) – low-p_T trigger (6-7 GeV/c)

[arXiv:1712.05603] R. Hosokawa, Wed 18:10

Constraints on jet-quenching in p-Pb collisions (2)



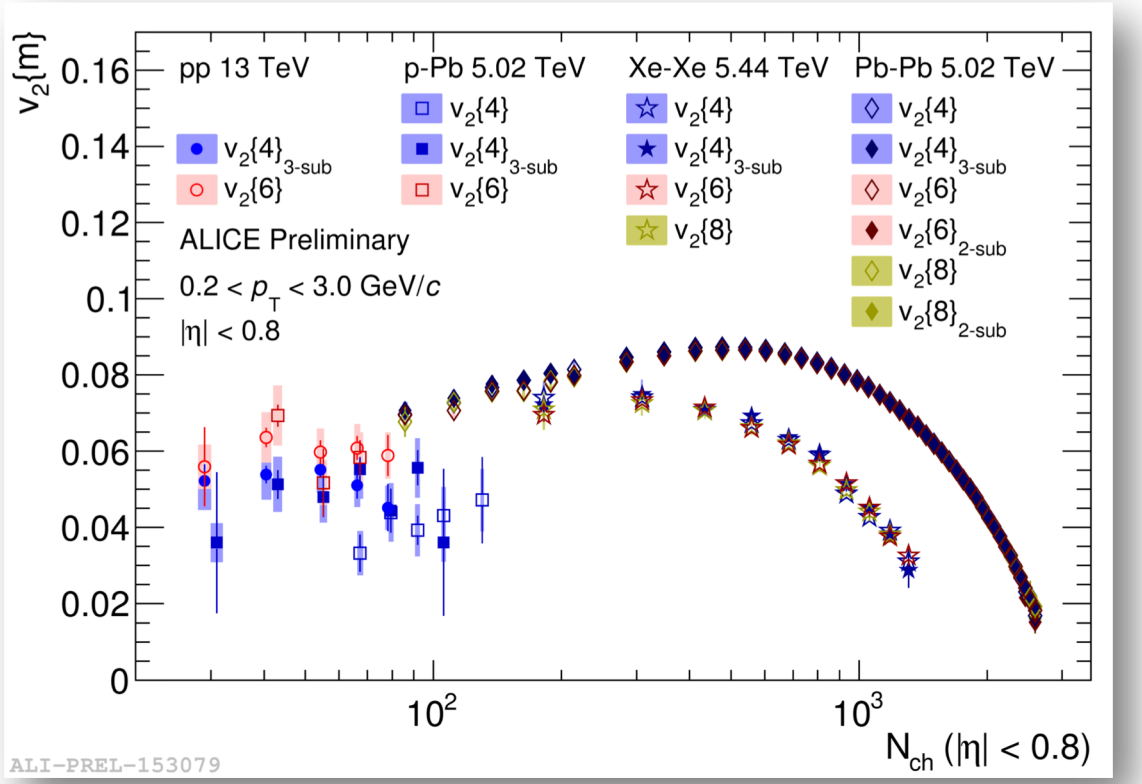
→ Jet-hadron correlations show no significant evolution from low to high multiplicity p-Pb collisions.

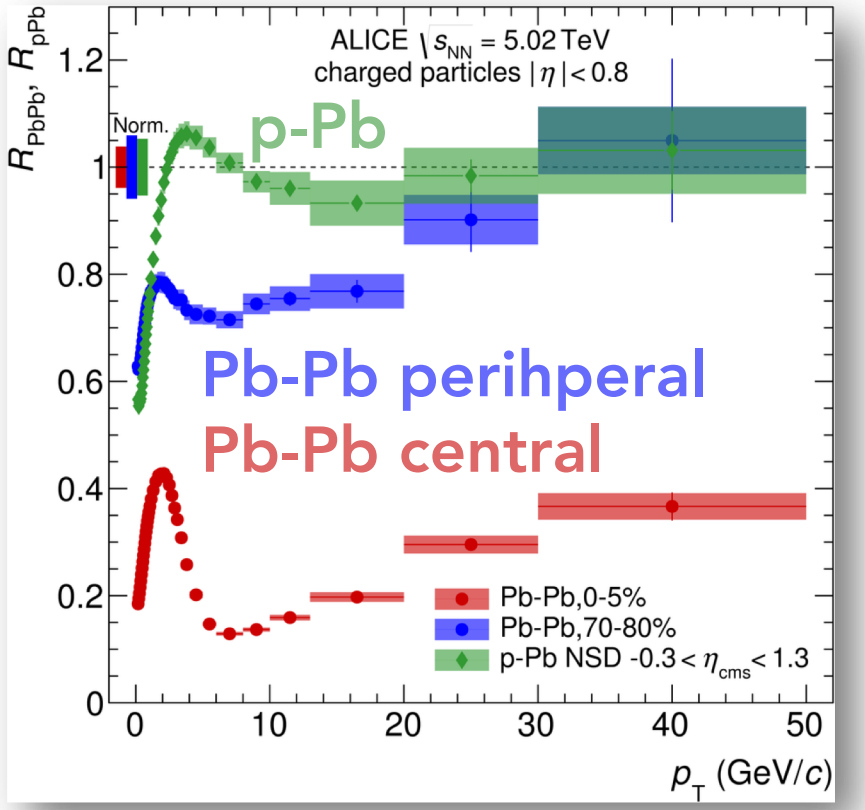
→ Jet quenching in p-Pb collision (if existing at all) is very small: out-of-cone energy transport due to jet quenching is less than 0.4 GeV/c.

[arXiv:1712.05603] R. Hosokawa, Wed 18:10

R_{AA} and v_2 in peripheral Pb-Pb and p-Pb

[arXiv:1802.09145]





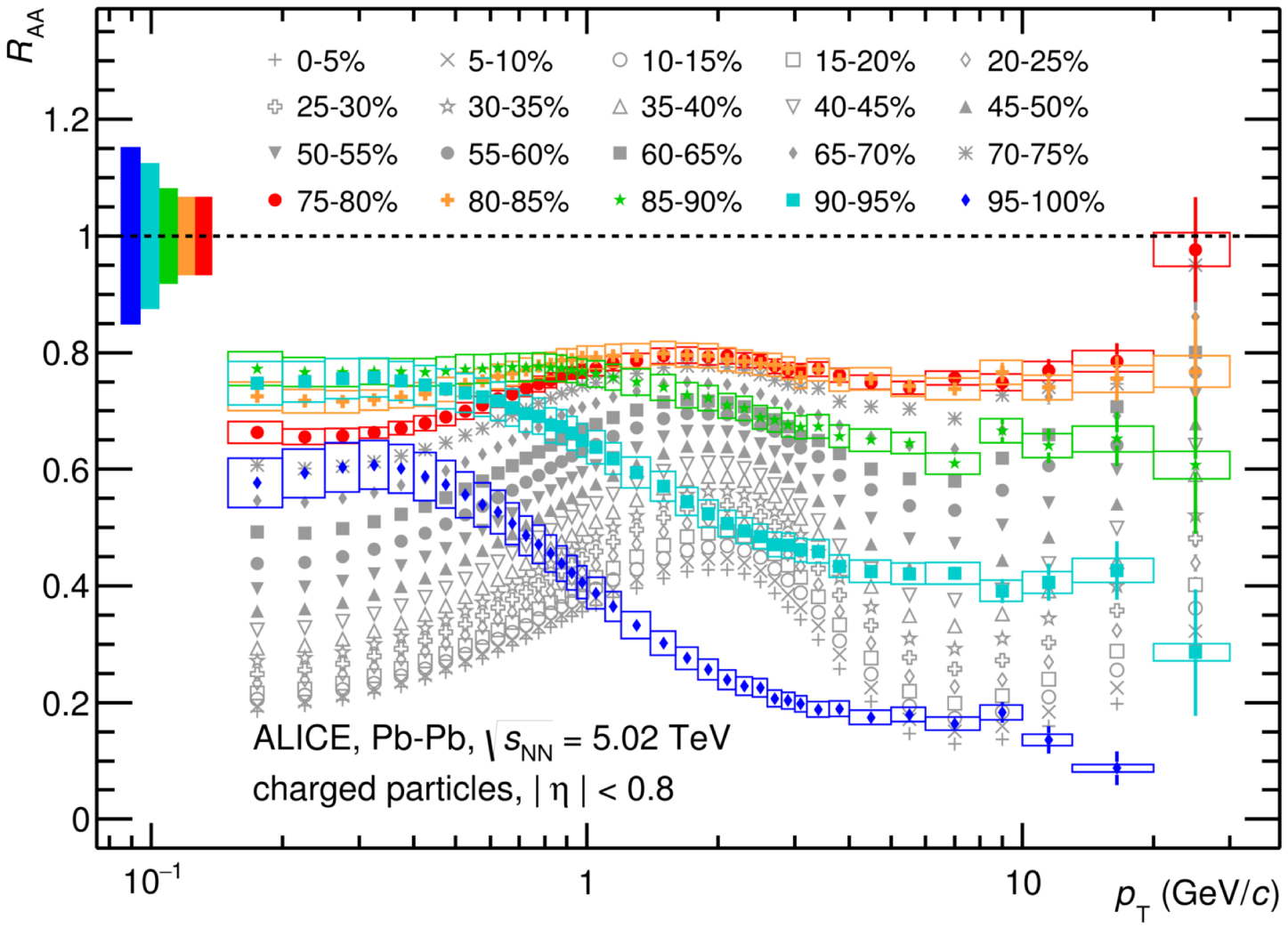
→ v_2 is very pronounced in peripheral Pb-Pb and at similar multiplicities in p-Pb.

→ However, while no significant nuclear modification is observed in p-Pb, it is still significant in peripheral Pb-Pb. Is there a contradiction? Not necessarily!

→ In the current understanding, both phenomena arise from the same QCD interaction kernel.

R_{AA} in very peripheral collisions (1)

M. Knichel, Tue 10:20



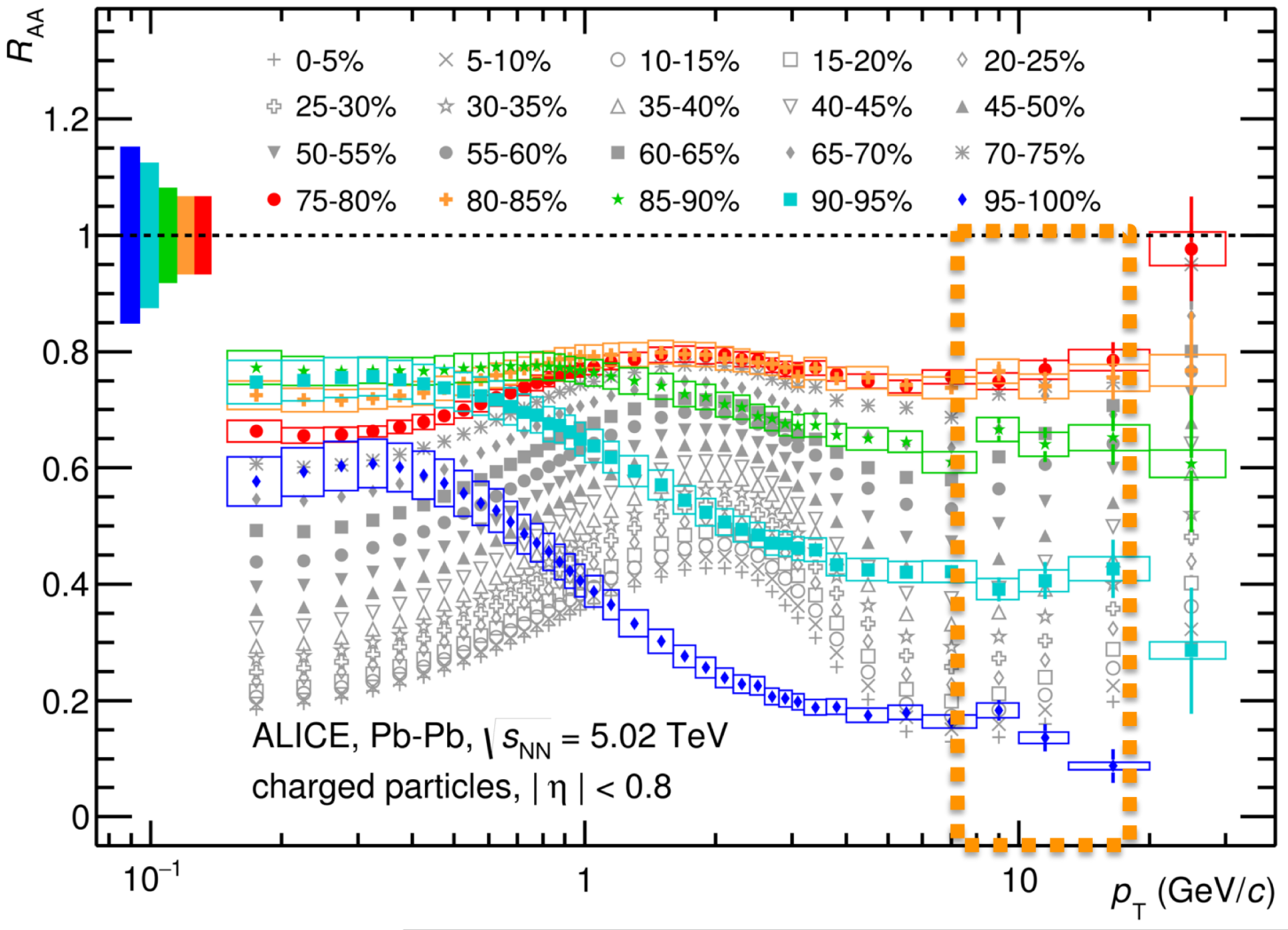
→ R_{AA} measured in very fine centrality bins up to very peripheral.

→ Significant change of behavior found beyond 80% centrality.

→ Can be explained by biases induced by event selection and collision geometry.

R_{AA} in very peripheral collisions (2)

M. Knichel, Tue 10:20



→ R_{AA} measured in very fine centrality bins up to very peripheral.

→ Significant change of behavior found beyond 80% centrality.

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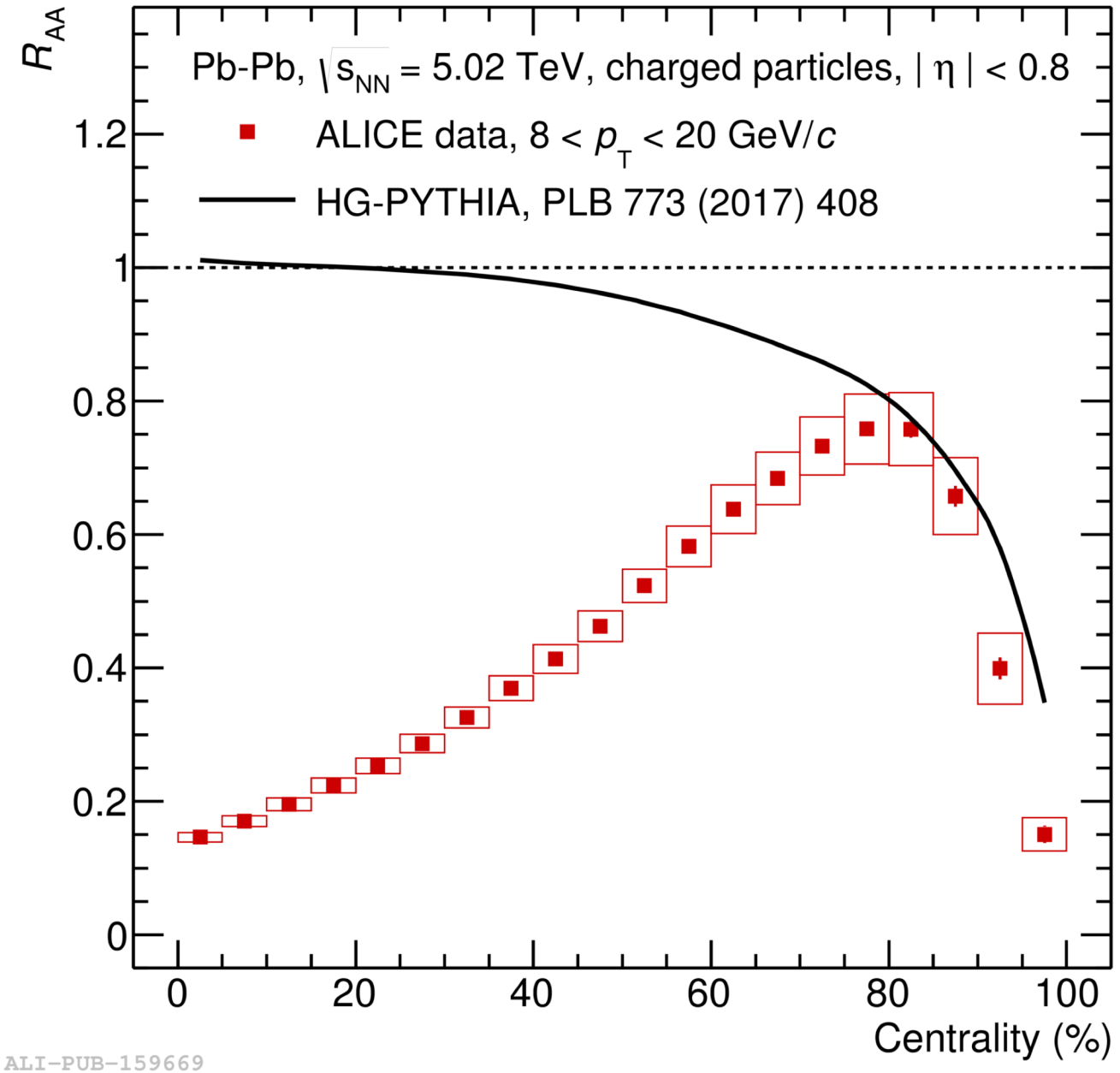
R_{AA} in very peripheral collisions (3)

M. Knichel, Tue 10:20



→ **R_{AA} in very peripheral collisions can be described with a simple PYTHIA based model without nuclear modification just by event selection and geometry biases.**

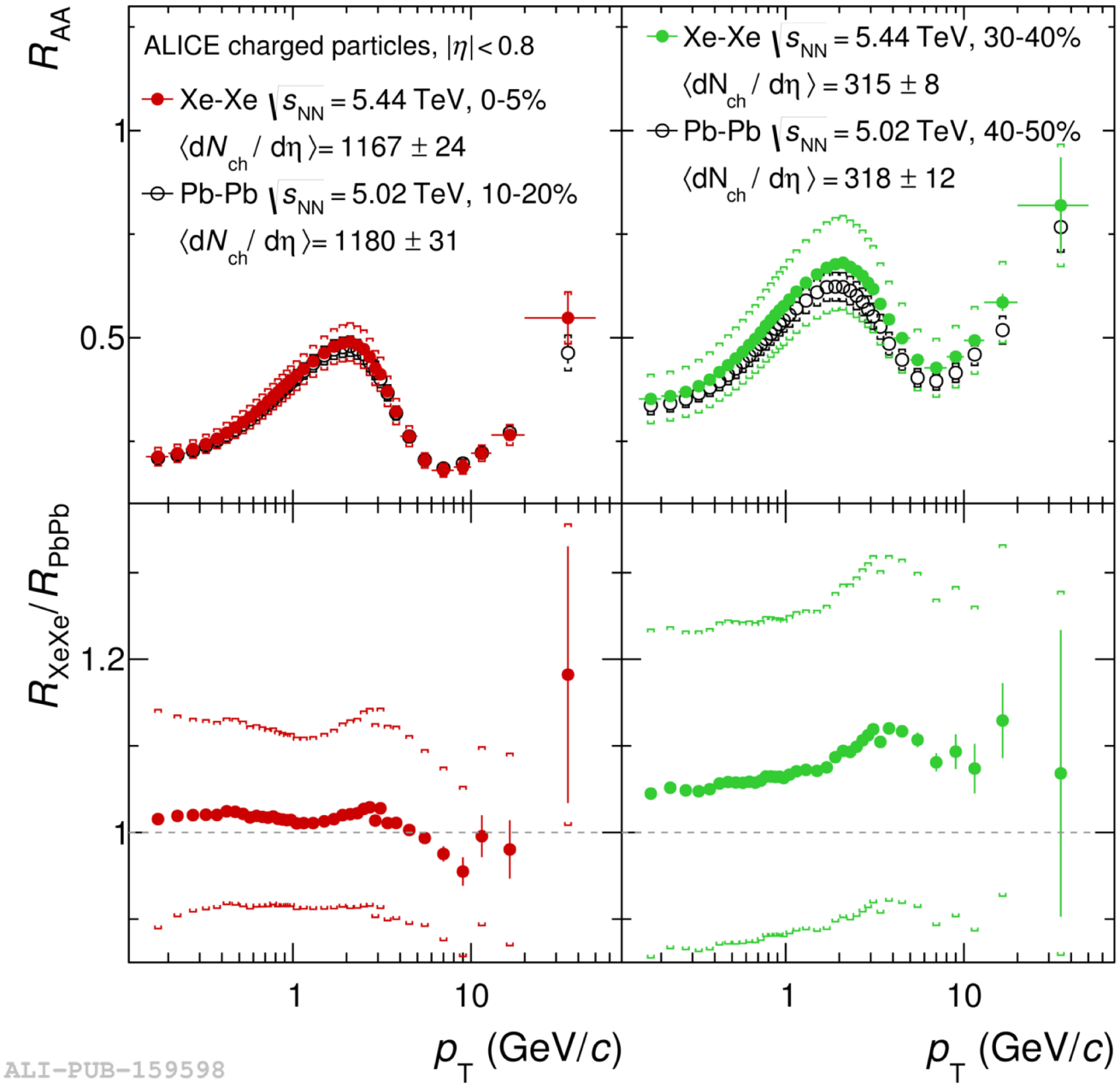
→ Jet quenching signal smaller than typical systematics above ~80% centrality **consistent with R_{pPb} results at similar multiplicities**.

R_{AA} in Xe-Xe collisions

D. Sekihata, Tue 09:00 [arXiv:1805.04399]

R_{AA} in central Xe-Xe collisions is similar to R_{AA} in Pb-Pb collisions at similar multiplicity.

→ Possibly the result of a non-trivial interplay of geometry and path length dependence.



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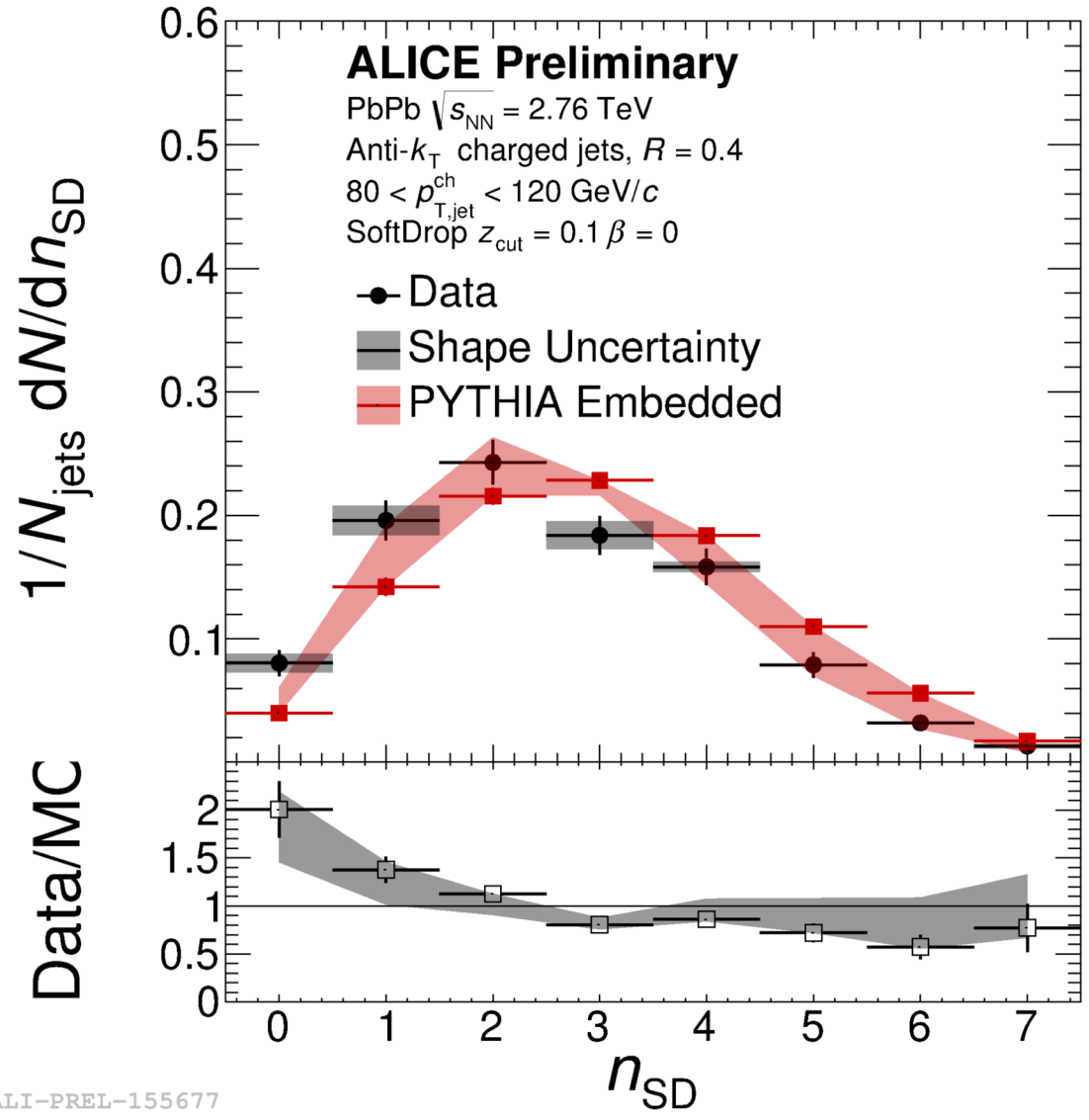
Jet substructure

H. Andrews, Tue 11:50



→ Detailed investigation of energy loss mechanism in medium by studying jet substructure.

→ Example: number of soft-drop splittings.

→ Re-cluster a jet found with anti-k_T with Cambridge-Aachen.

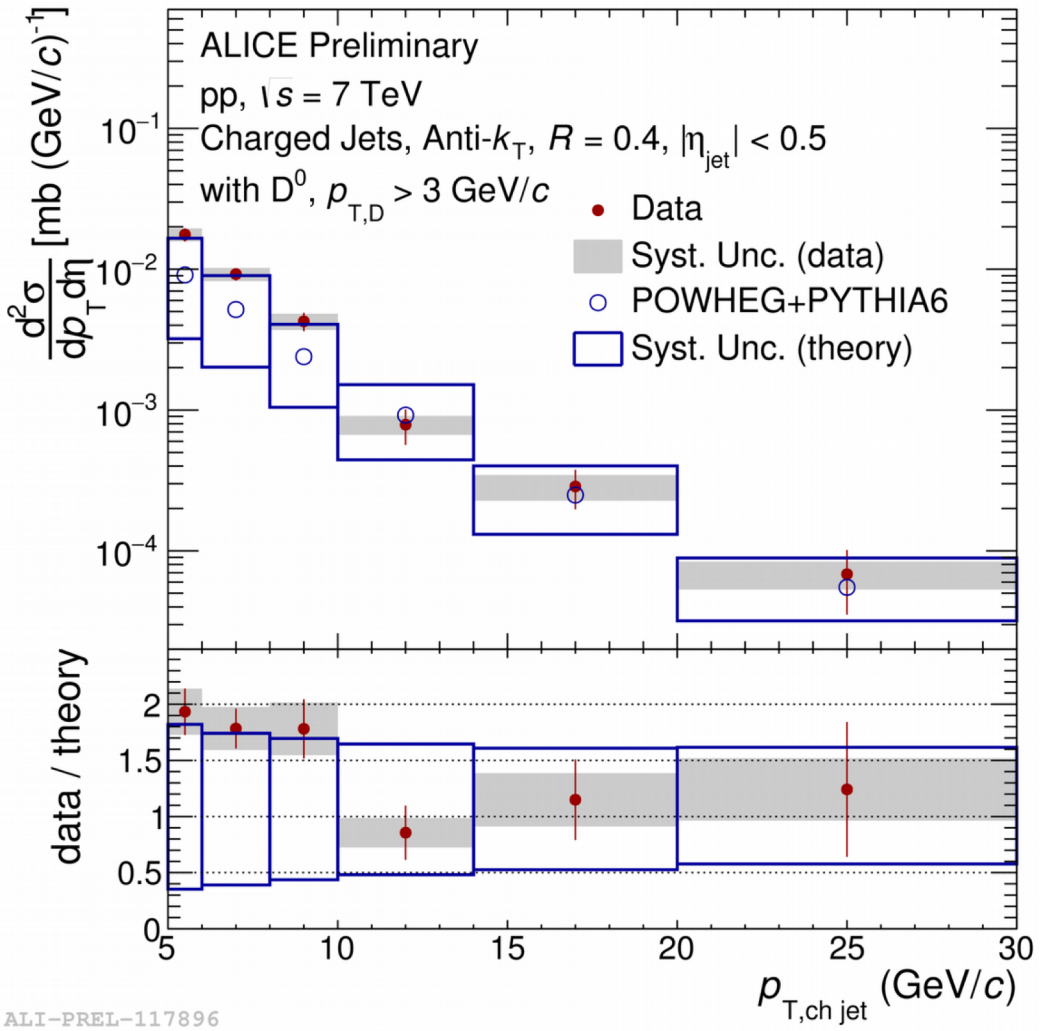
→ Check for each splitting if it fulfills the soft-drop condition.

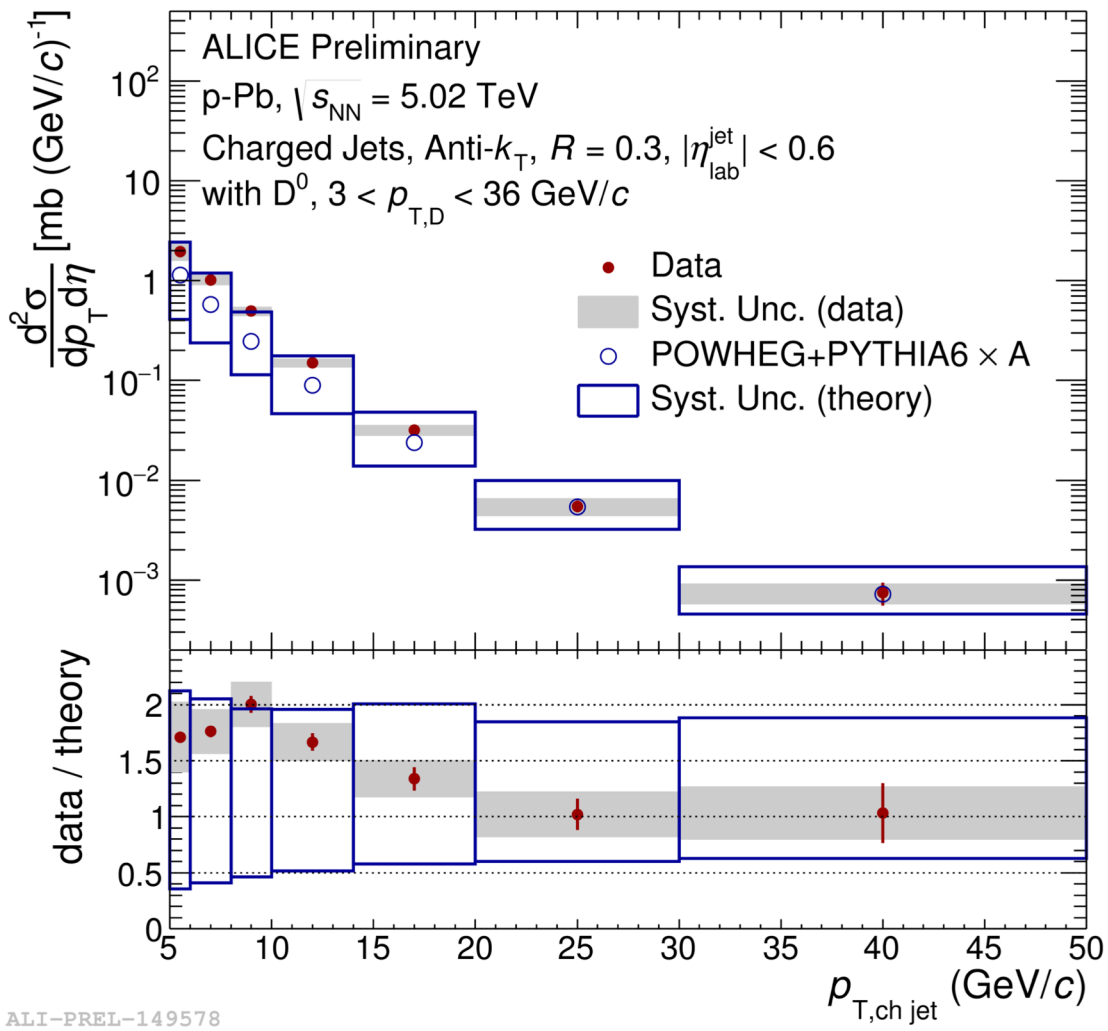
→ Number of soft drop splittings in medium is only slightly shifted *to lower values* in contrast to expectation (medium response would shift splittings above the cut by adding momentum).

→ Jet substructure in first order unmodified despite large energy loss in the medium.

D-meson tagged jets (pp and p-Pb)

B. Trzeciak, Tue 11:30

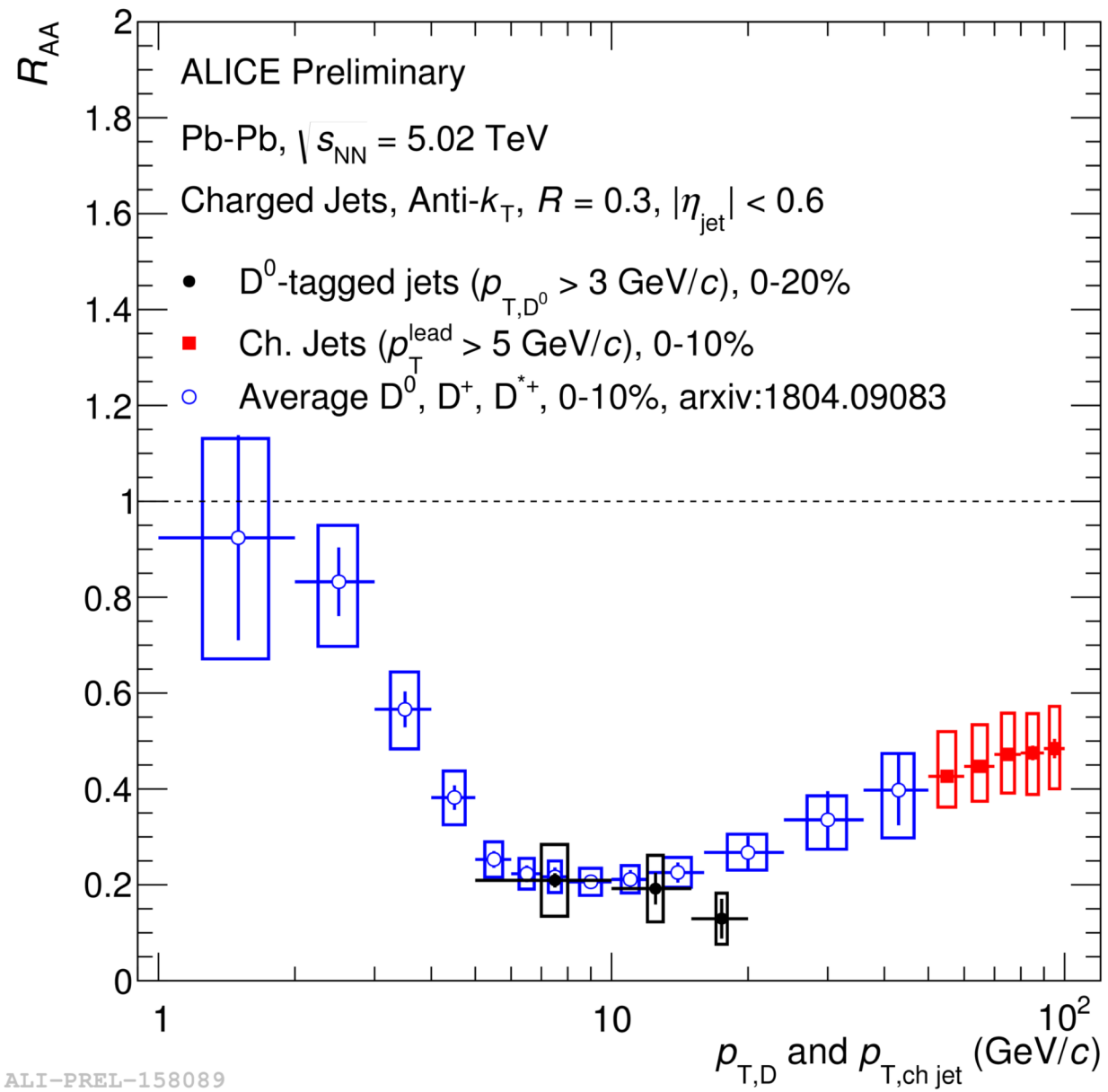




→D-meson tagged jets agree with pQCD predictions in both systems ⇒ well understood baseline for Pb-Pb collisions.

D-meson tagged jets vs inclusive full jets (Pb-Pb)

B. Trzeciak, Tue 11:30



→ Suppression of full jets observed up to 130 GeV/c.

→ **Similar suppression found for D^0-tagged jets as for D^0-mesons at lower p_T.**

ALI-PREL-158089

1. Bulk particle production and particle chemistry

2. Jet-medium interactions

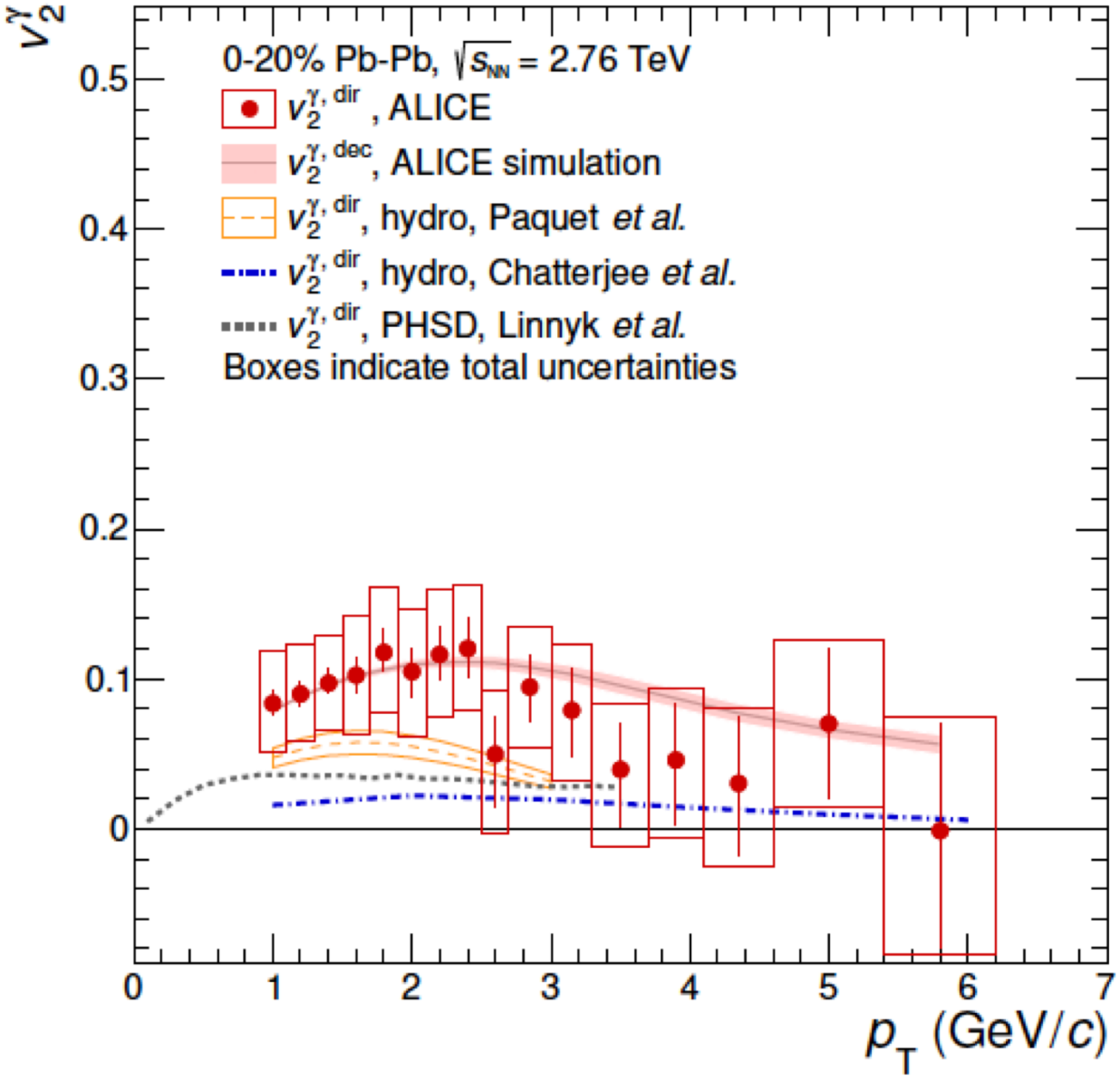
3. Electromagnetic probes

4. Heavy flavor and quarkonia

Direct photon elliptic flow

[arXiv:1805.04403]

F. Bock, Mon 16:30



→ Non-zero $v_2^{\gamma,dir}$ observed for low momenta direct photons and of similar magnitude as at RHIC.

→ Flow signal is close to the expected flow for decay photons.

→ 1.4σ significance for hypothesis $v_2^{\gamma,dir} = 0$ for $0.9 < p_T < 2.1$ GeV/c.

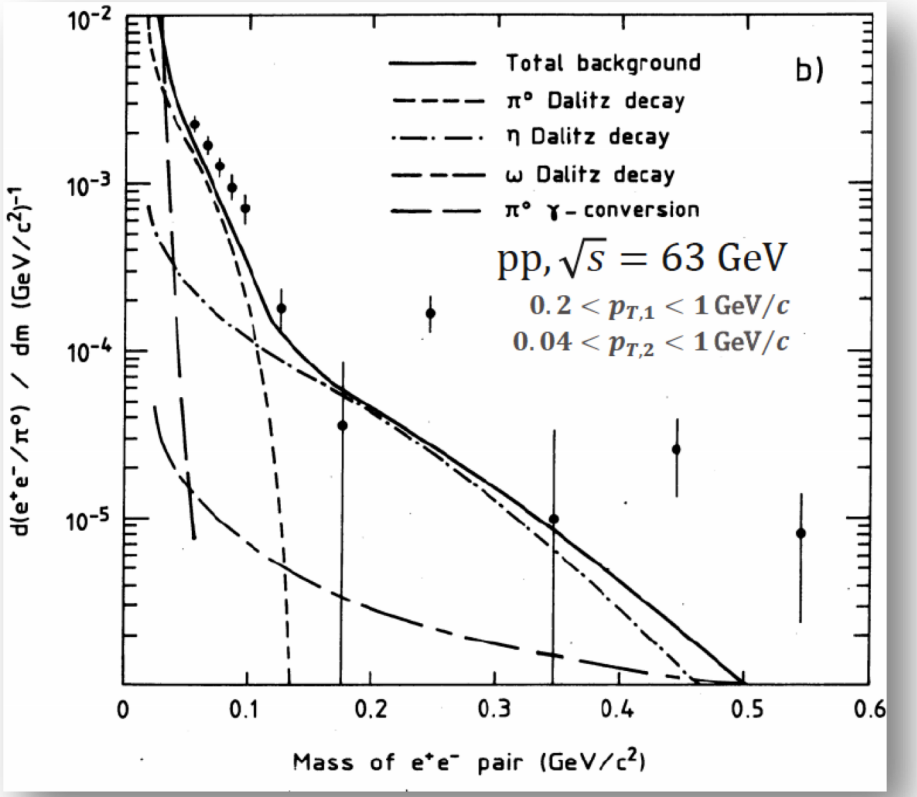
→ Transport and hydrodynamic models predict a smaller direct photon flow, but are consistent with the data.

Low mass di-leptons in pp collisions

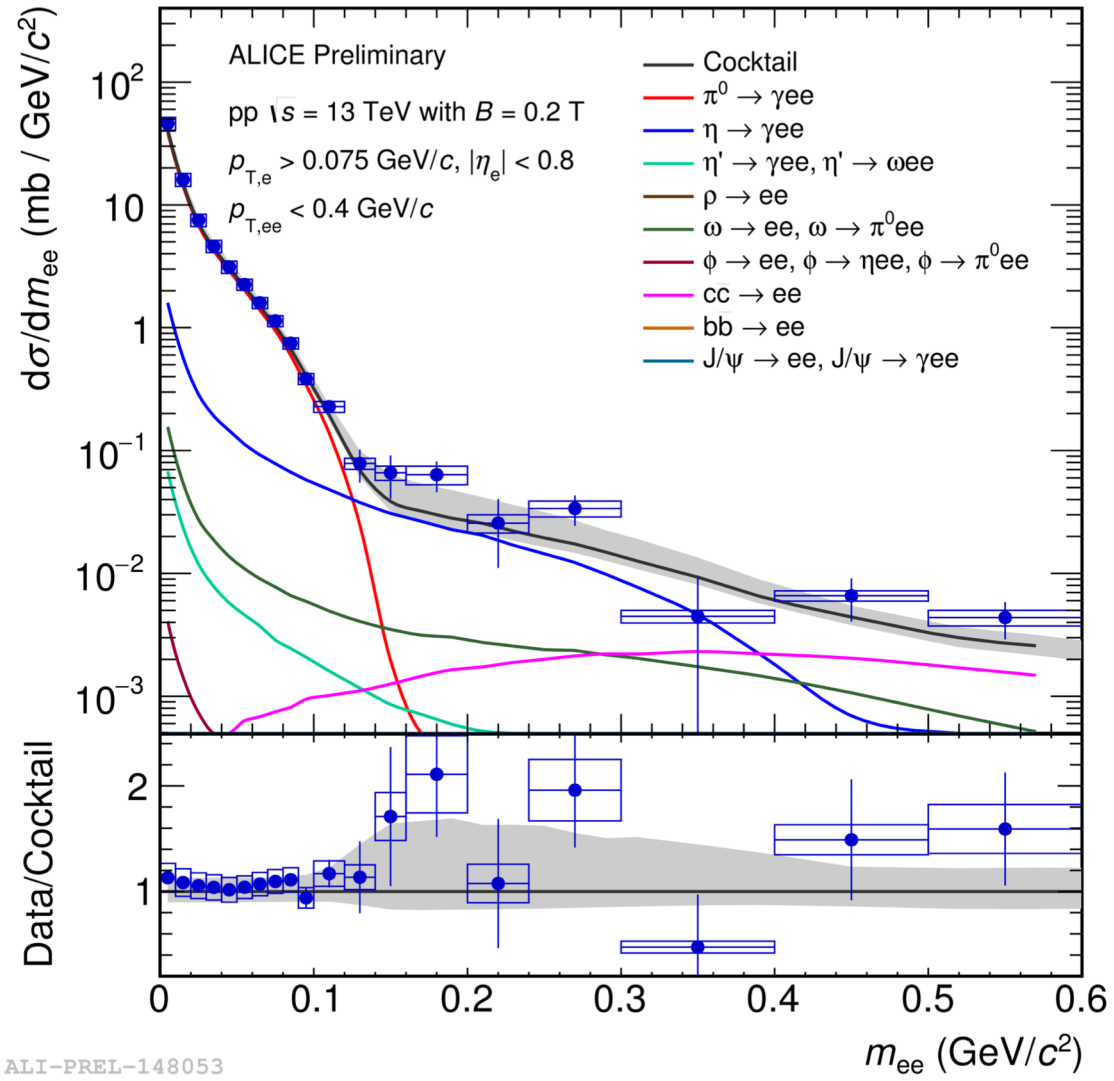
R. Bailhache, Mon 18:10

CERN ISR -- AFS (1987)

Excess above the cocktail was observed for $0.05 < m_{ee} < 0.6$ GeV/c^2.



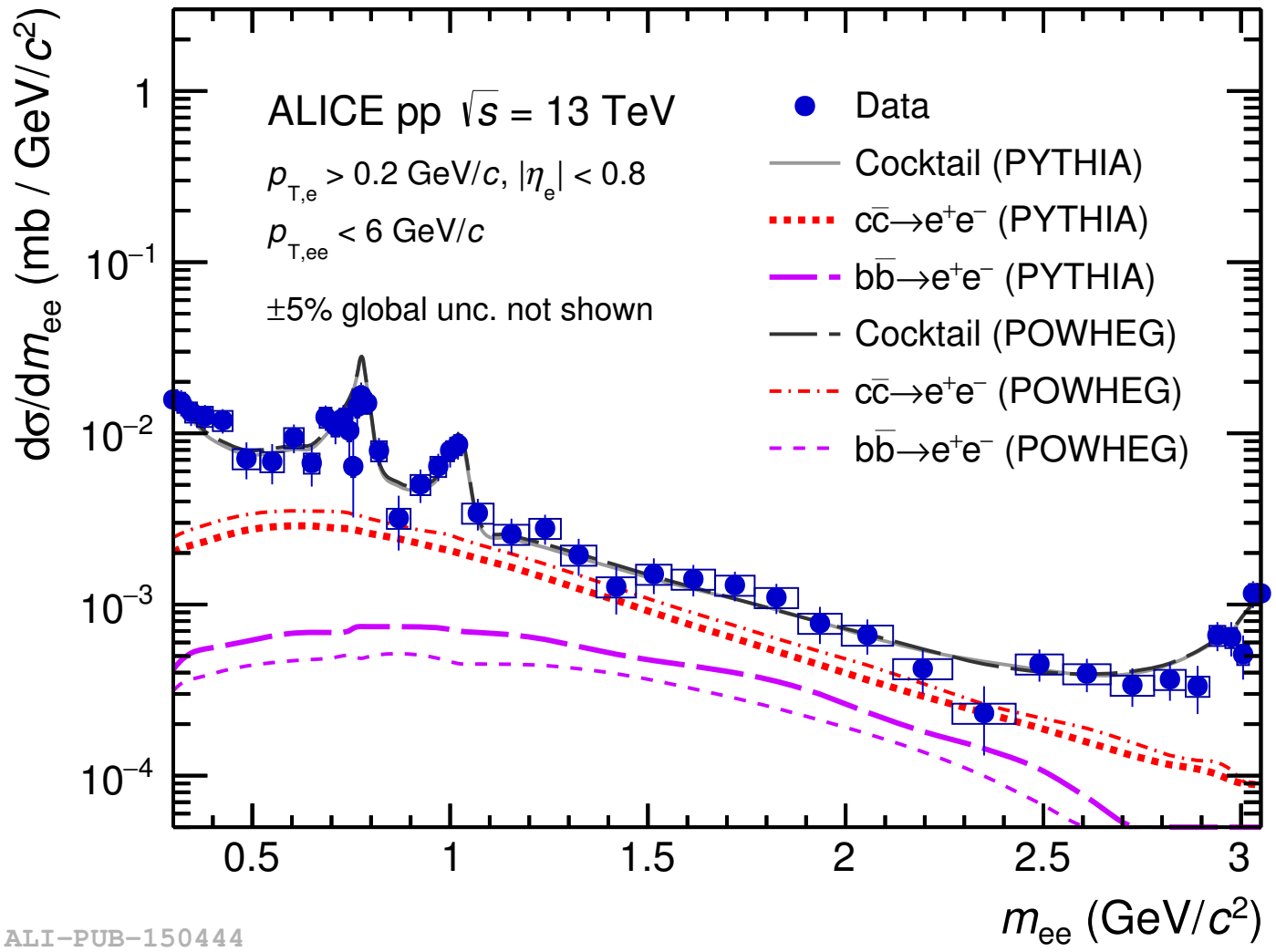
ALICE (2018)



→ ALICE pp 13 TeV does not rule out an excess.

→ More data at lower magnetic field (being collected) and more precise measurements of the η-meson are needed.

HF measurements with di-leptons in pp collisions (1)



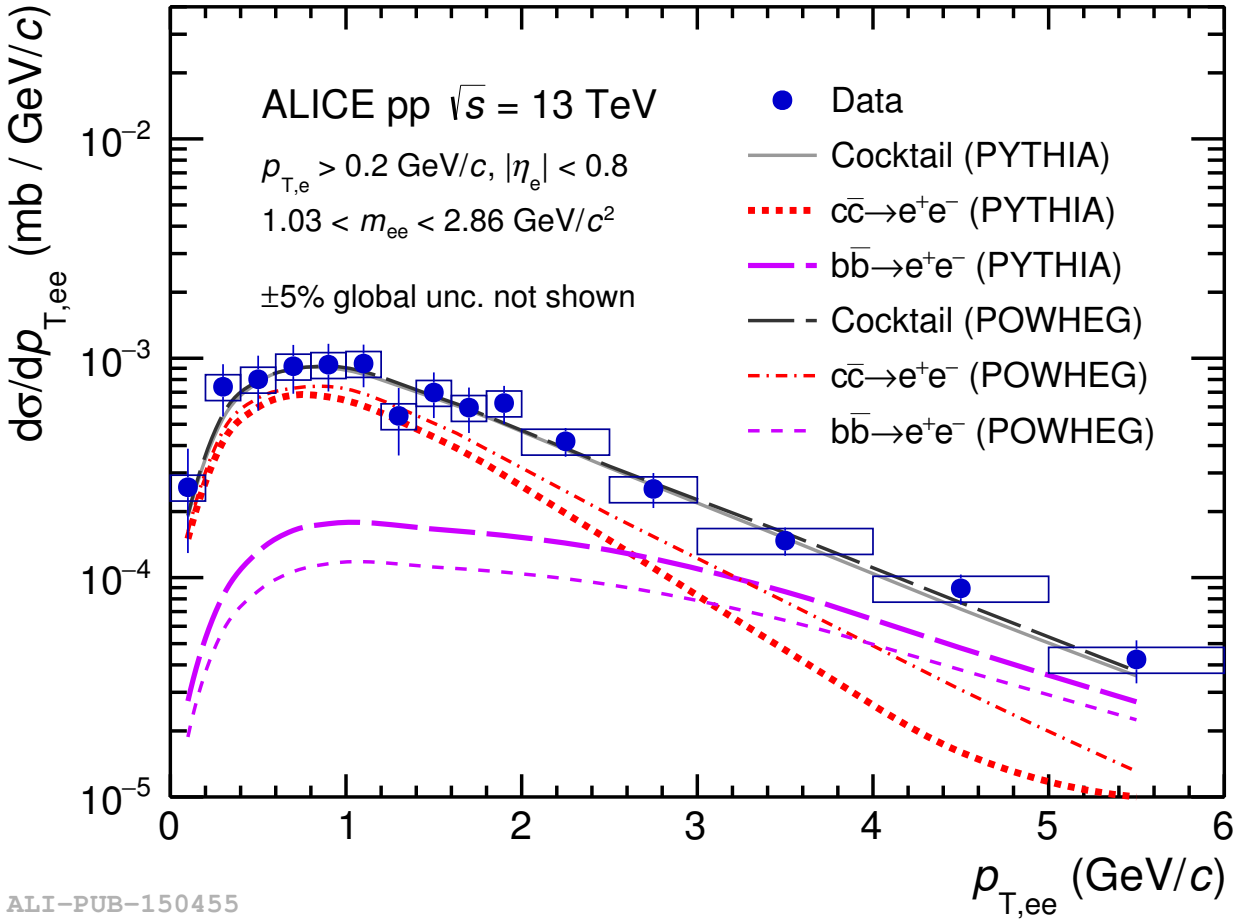
→ Di-electron continuum provides complementary information on heavy-flavor production cross-sections in pp.

→ Di-electrons are sensitive to kinematic correlation of $c\bar{c}$ pair ⇒ obtain different charm cross sections for PYTHIA and POWHEG.

R. Bailhache, Mon 18:10

[arXiv:1805.04407,arXiv:1805.04391]

HF measurements with di-leptons in pp collisions (2)



→ Di-electron continuum provides complementary information on heavy-flavor production cross-sections in pp.

→ Di-electrons are sensitive to kinematic correlation of $c\bar{c}$ pair ⇒ obtain different charm cross sections for PYTHIA and POWHEG.

First HF cross-sections at midrapidity √s = 13 TeV

	PYTHIA	POWHEG
$d\sigma_{c\bar{c}}/dy\|_{y=0}$	$974 \pm 138\,(\text{stat.}) \pm 140\,(\text{syst.})$ µb	$1417 \pm 184\,(\text{stat.}) \pm 204\,(\text{syst.})$ µb
$d\sigma_{b\bar{b}}/dy\|_{y=0}$	$79 \pm 14\,(\text{stat.}) \pm 11\,(\text{syst.})$ µb	$48 \pm 14\,(\text{stat.}) \pm 7\,(\text{syst.})$ µb

R. Bailhache, Mon 18:10
[arXiv:1805.04407,arXiv:1805.04391]

1. Bulk particle production and particle chemistry

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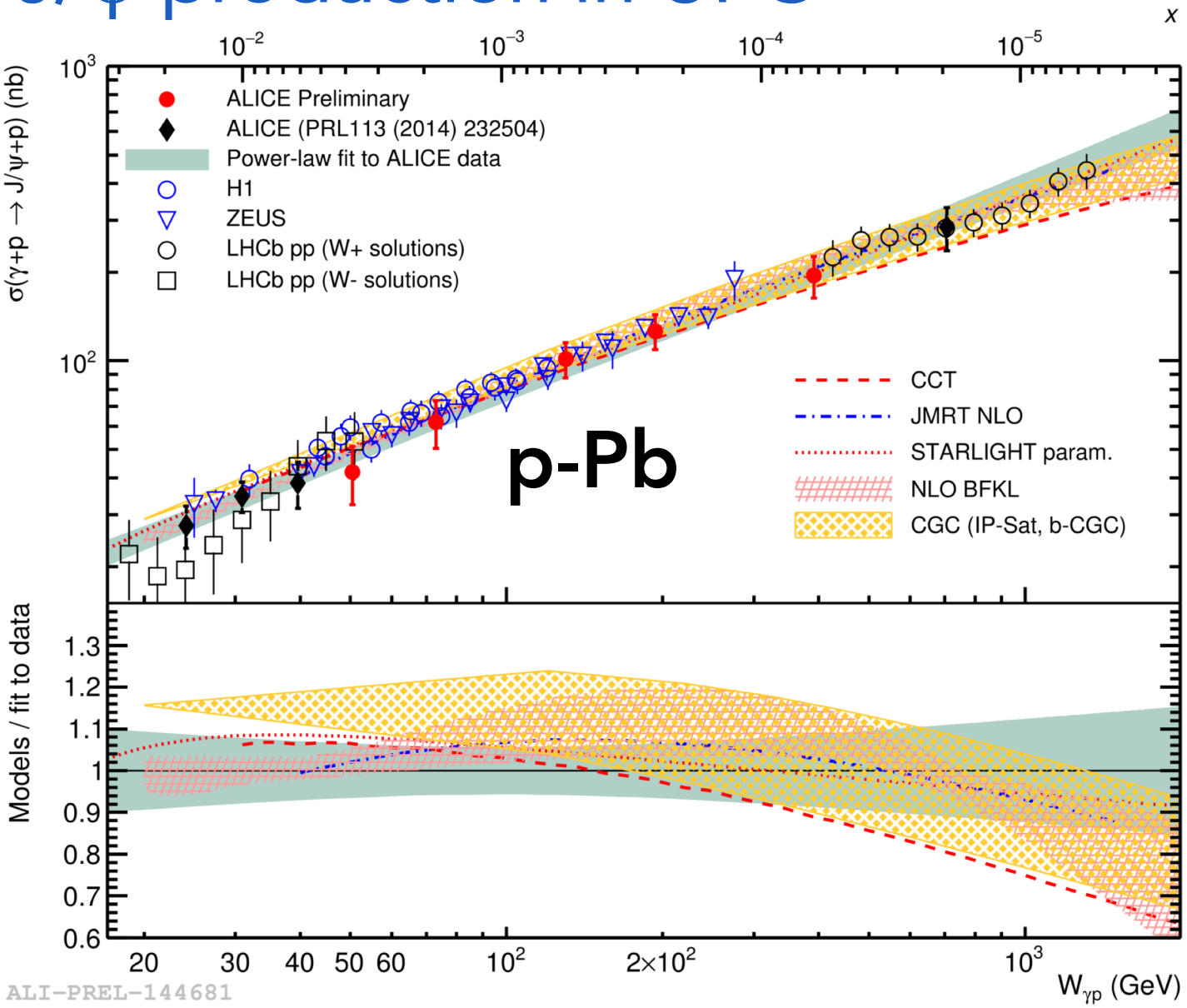
J/ψ production in UPC

C. Mayer, Mon 18:10

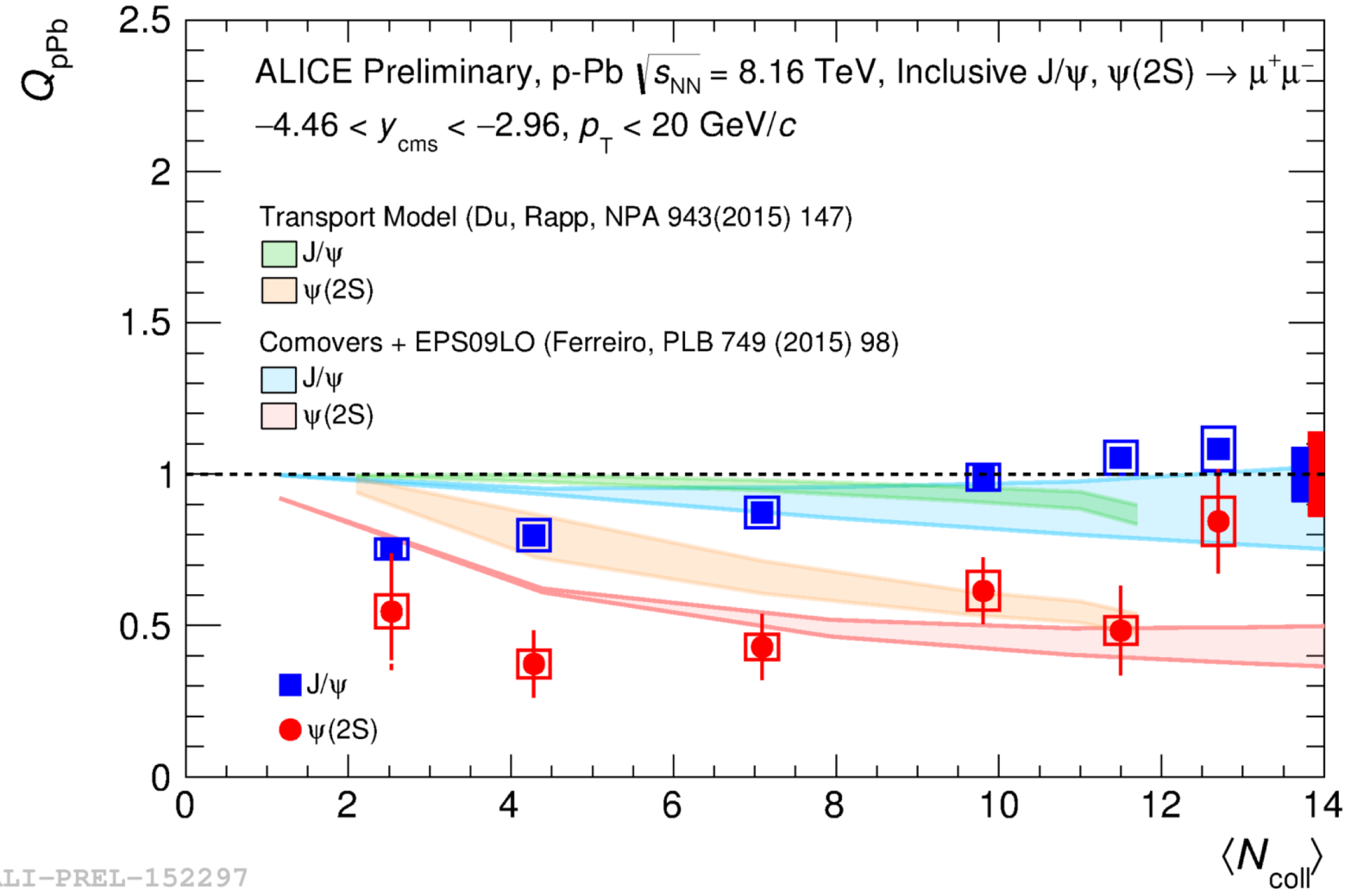


→ New measurements of J/ψ production in p-Pb at 5.02 TeV

→ Provides more and more stringent constraints on nPDF and saturation models

ψ(2S) production in p-Pb

B. Paul, Wed 16:50



→New results on ψ(2S) confirm stronger suppression w.r.t. to J/ψ in the Pb-going direction.

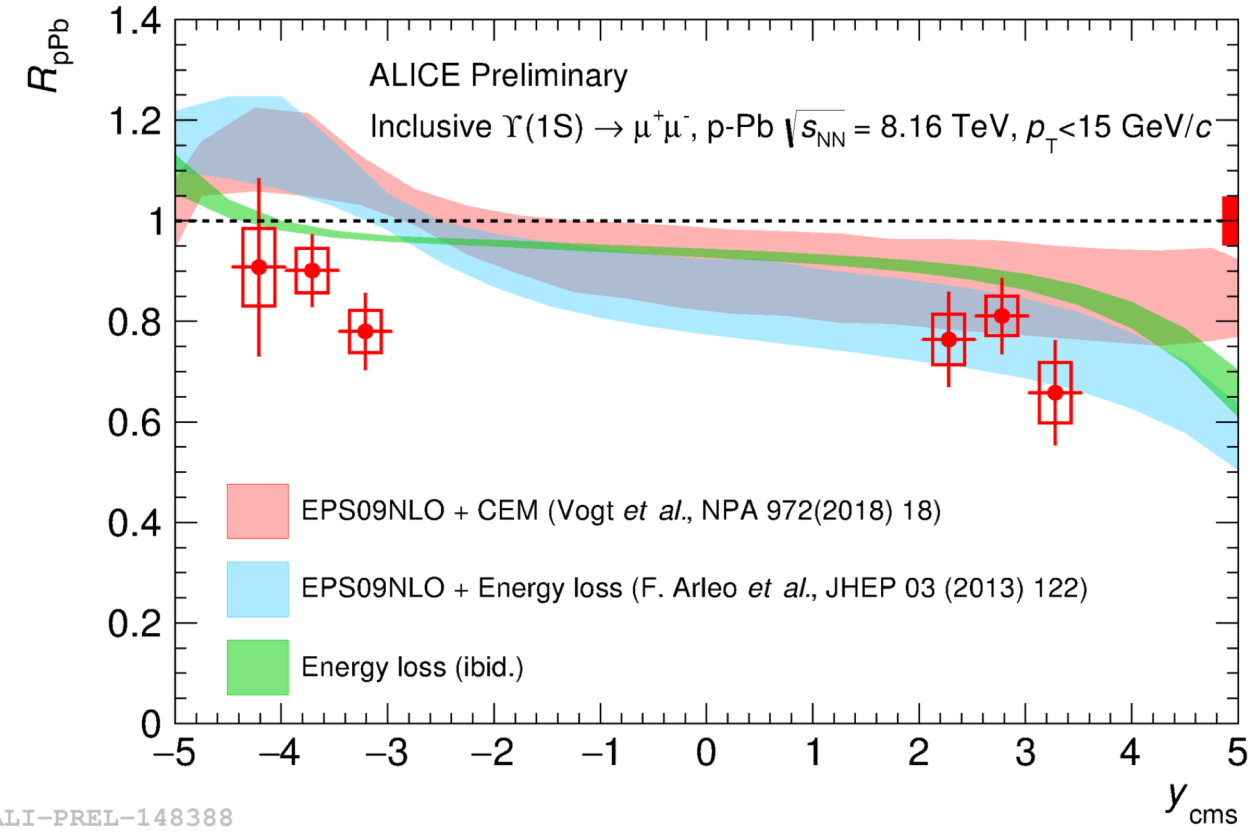
→Final state effects are needed to reproduce the ψ(2S) suppression.

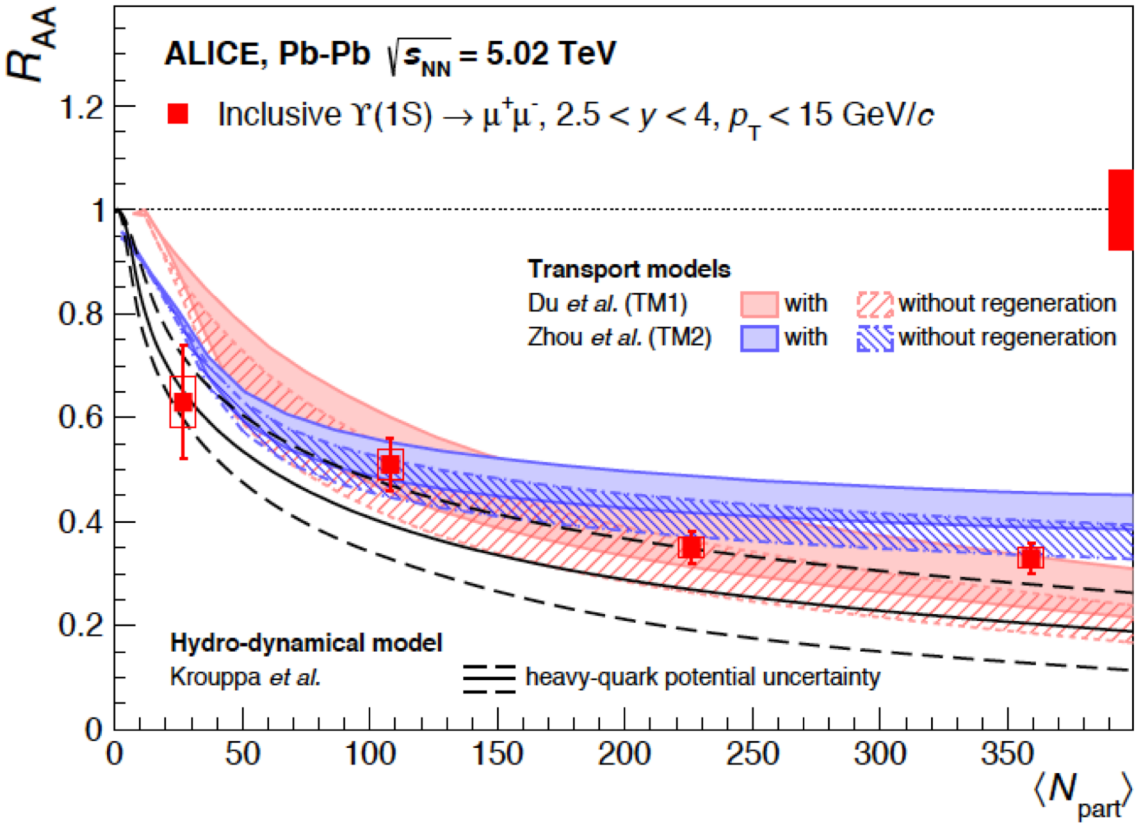
→Still problems for a quantitative description of the data.

Upsilon in p-Pb collisions

ALICE_PUBLIC-2018-008

P. Dillenseger, Mon 16:30





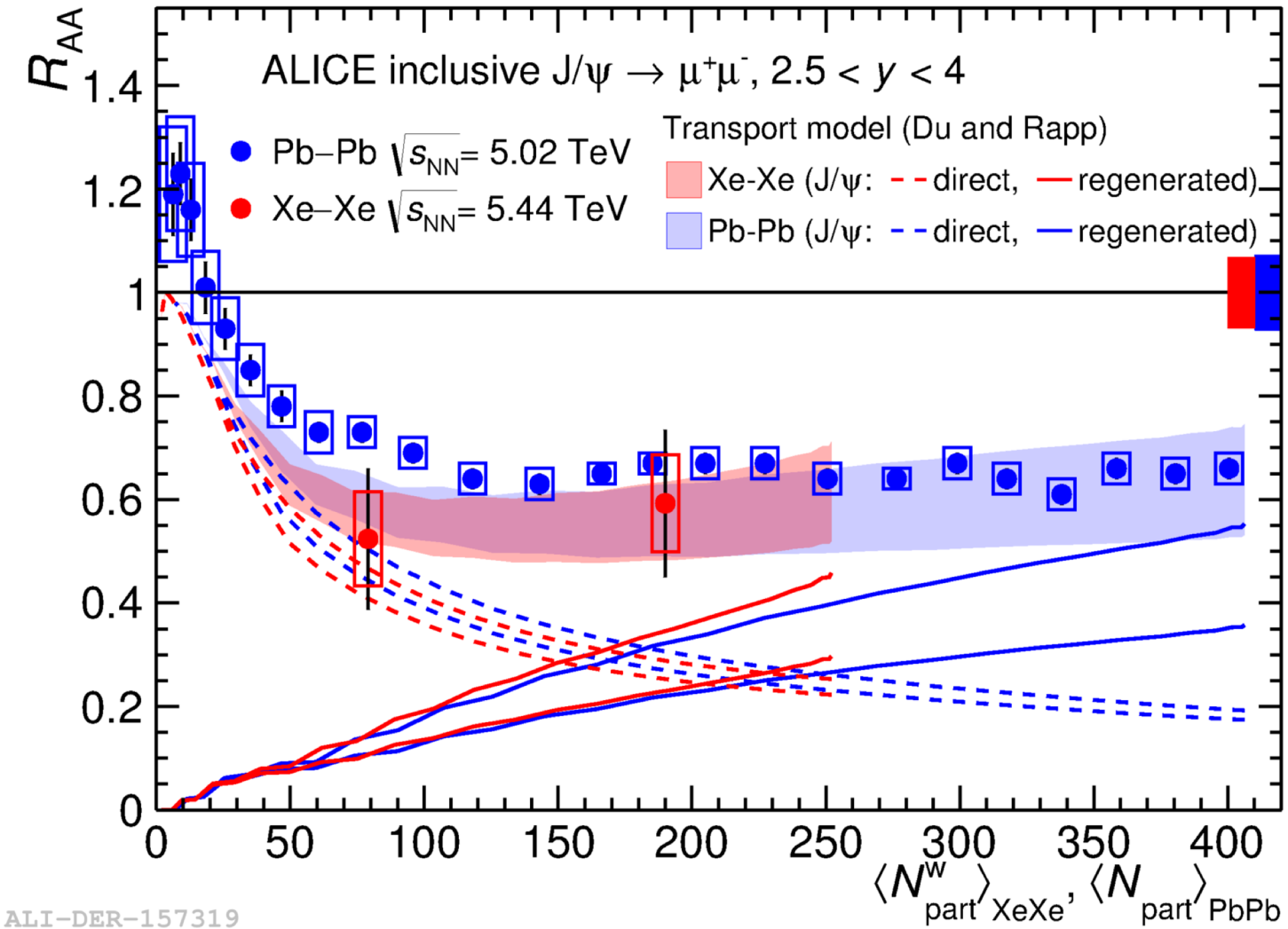
→Provides further constraints on nPDFs, in particular in anti-shadowing region.

→Essential ingredient to understand Upsilon suppression in AA.

J/ψ in Xe-Xe and Pb-Pb (1)

[arXiv:1805.04383]

P. Dillenseger, Mon 16:30



→ Xe-Xe measurement confirms large value of R_{AA} w.r.t. to RHIC energies seen in Pb-Pb collisions.

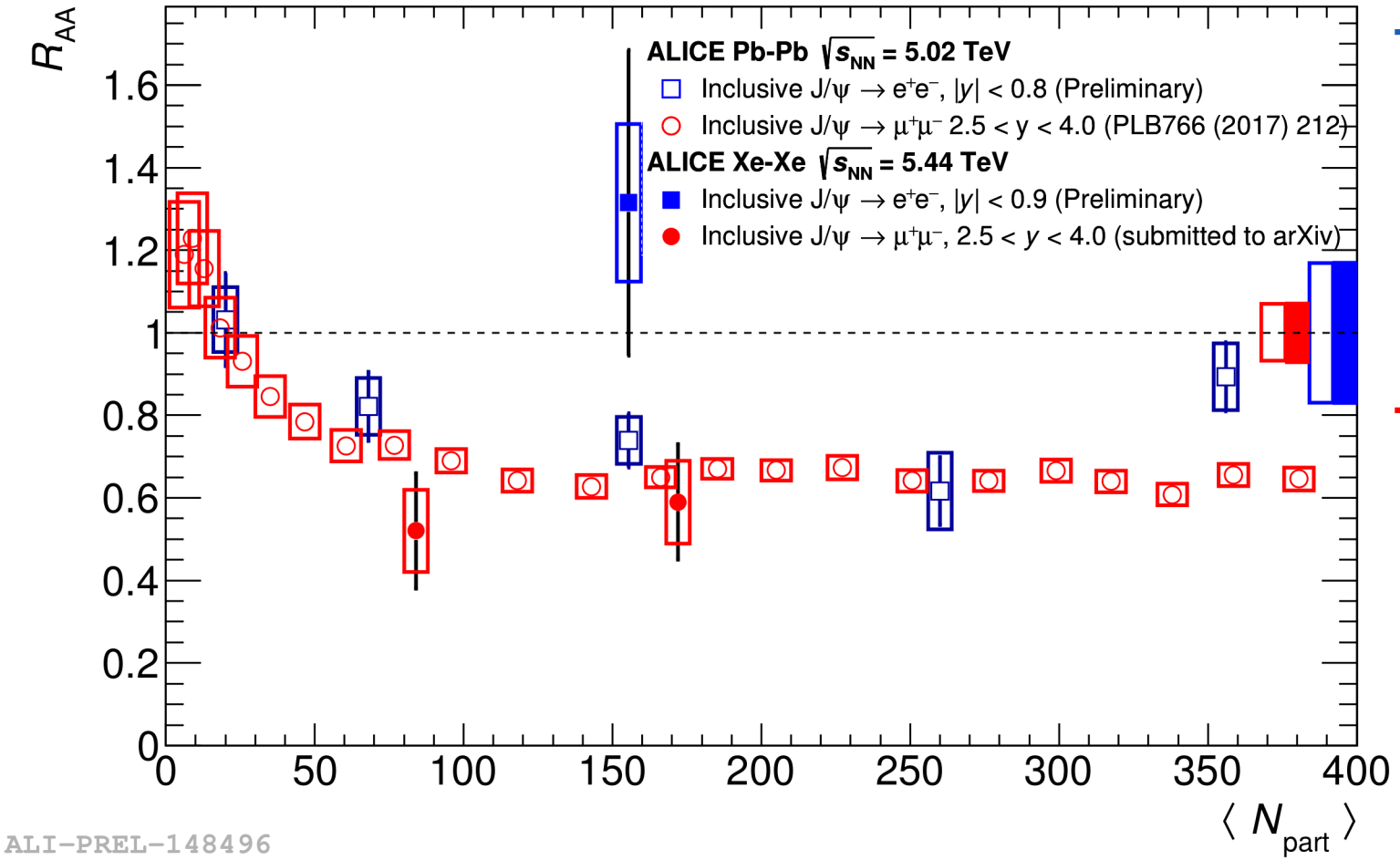
→ For a given N_{part}, a slightly larger N_{coll} is obtained in Xe-Xe w.r.t. Pb-Pb.

⇒ Transport models predict a slightly stronger suppression in Xe-Xe, counterbalanced by a larger recombination effect.

J/ψ in Xe-Xe and Pb-Pb (2)

[arXiv:1805.04383]

P. Dillenseger, Mon 16:30

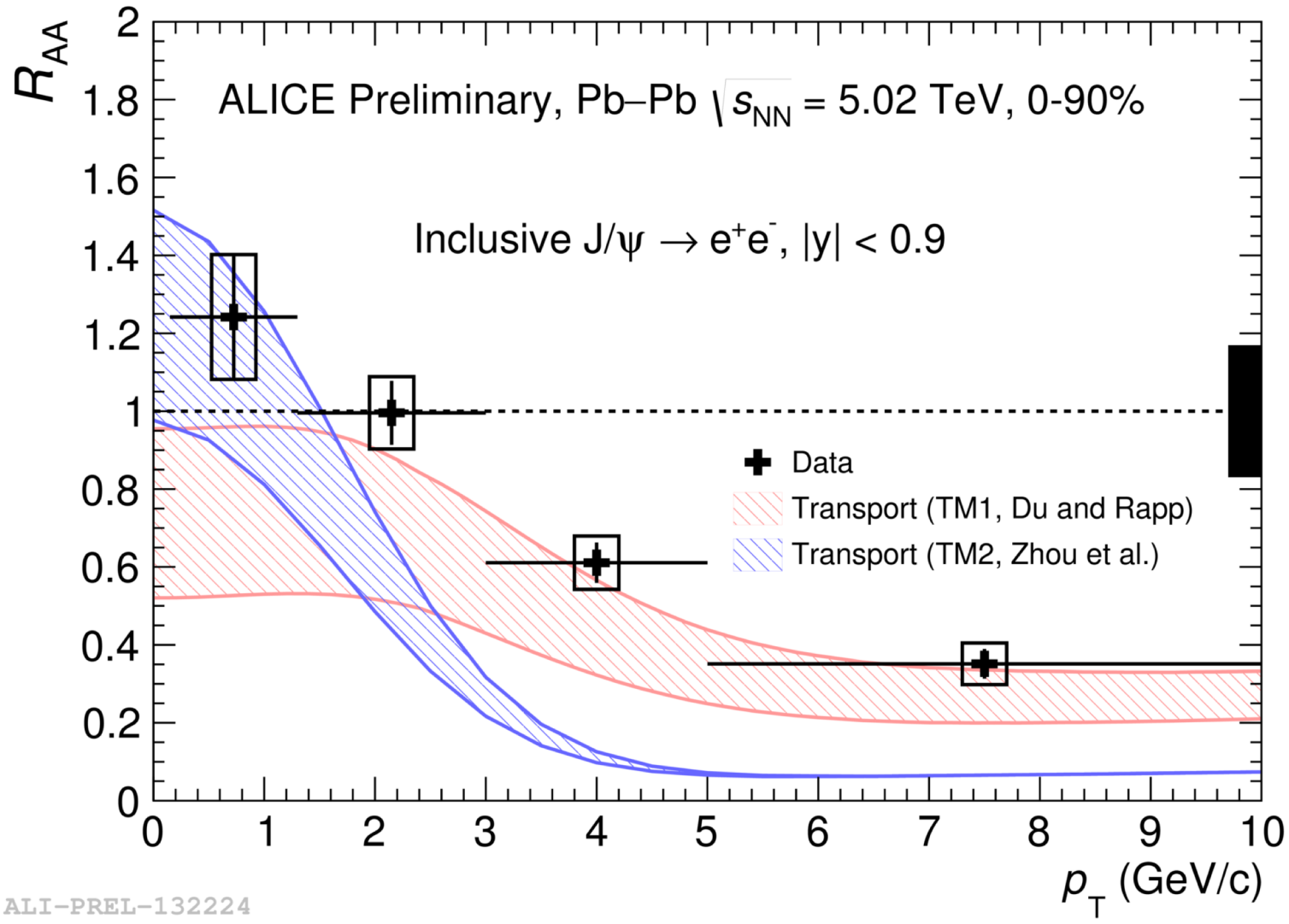


→ Xe-Xe measurement confirms large value of R_{AA} w.r.t. to RHIC energies seen in Pb-Pb collisions.

→ Confirms evidence for re-combination as new production mechanism which opens up with increasing beam energy and system size.

J/ψ in Xe-Xe and Pb-Pb (3)

P. Dillenseger, Mon 16:30

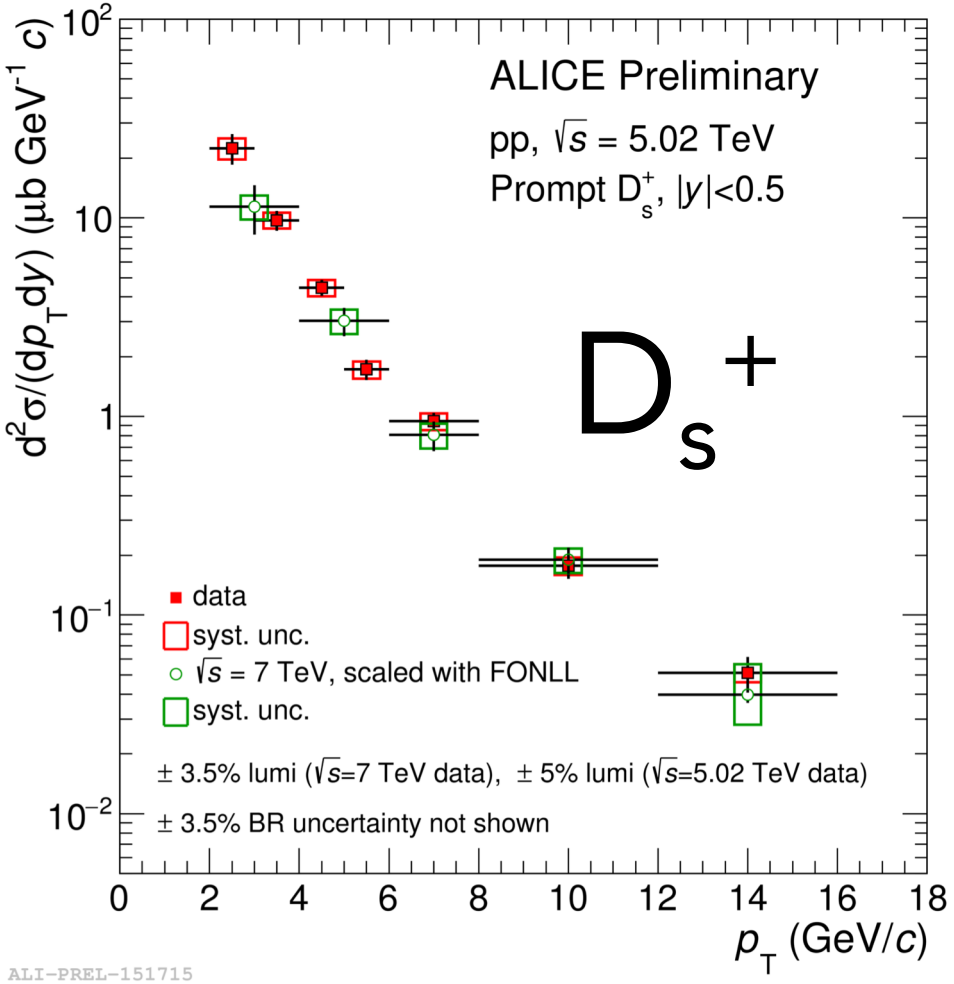


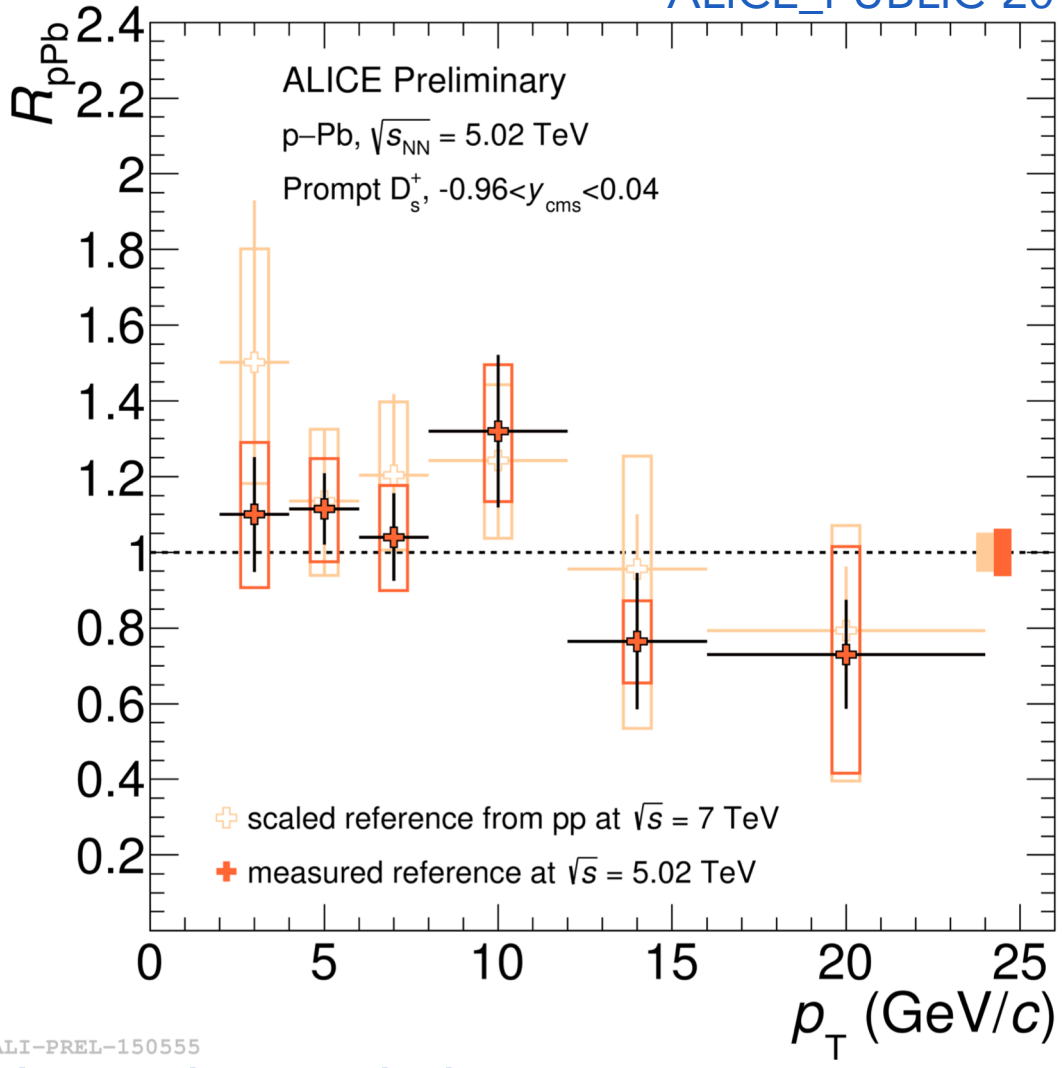
→ Xe-Xe measurement confirms large value of R_{AA} w.r.t. to RHIC energies seen in Pb-Pb collisions.

→ Confirms evidence for re-combination as new production mechanism which opens up with increasing beam energy and system size.

D-mesons in pp 5.02 TeV

H. Zanoli, Wed 15:20
ALICE_PUBLIC-2018-006



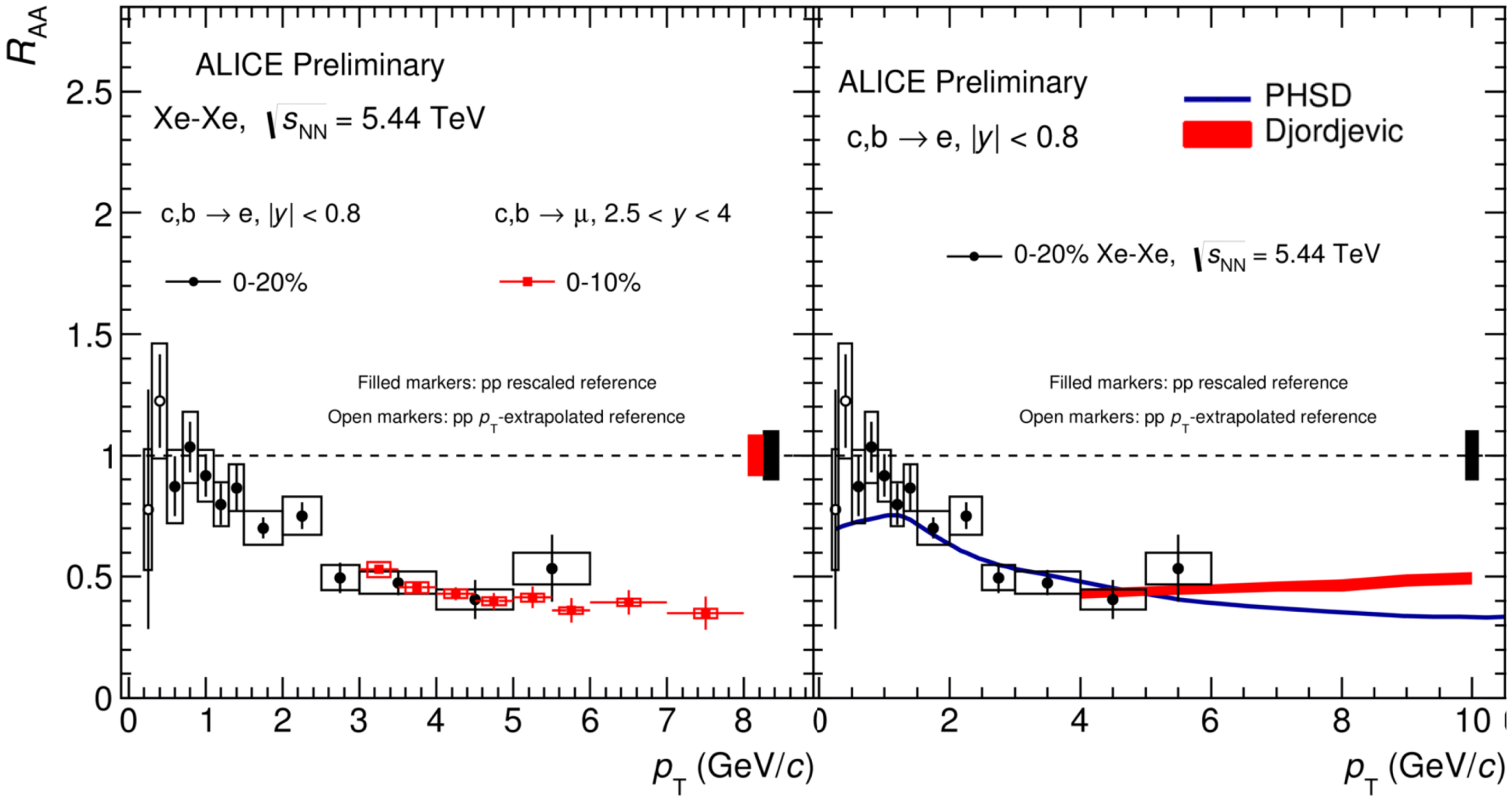


→Updated pp reference with approx. 10 times the statistics.

→Significant reduction of systematic uncertainties provides stringent constraints on models.

Heavy-flavor electrons and muons in Xe-Xe

A. Dubla, Tue 15:00

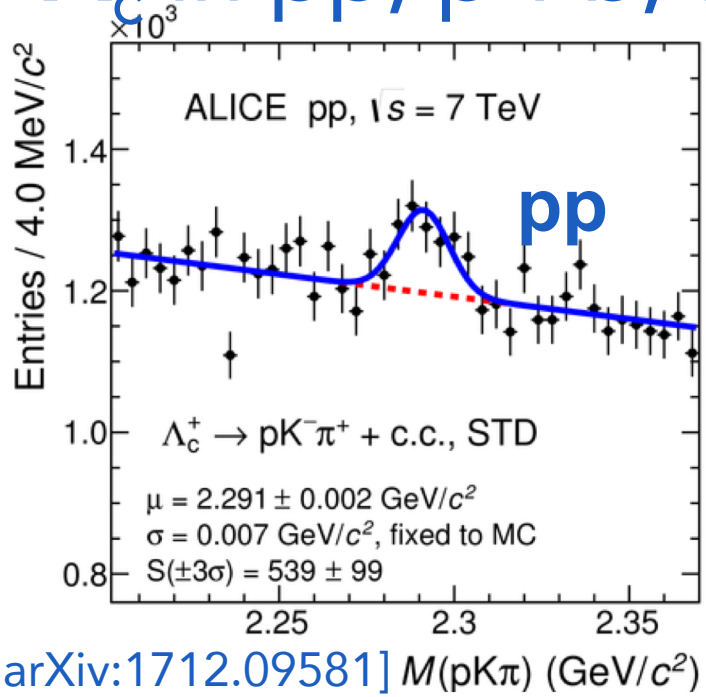


→HFE measured down to p_T = 200 MeV in low magnetic field setting (*B*=0.2T instead of nominal 0.5T).

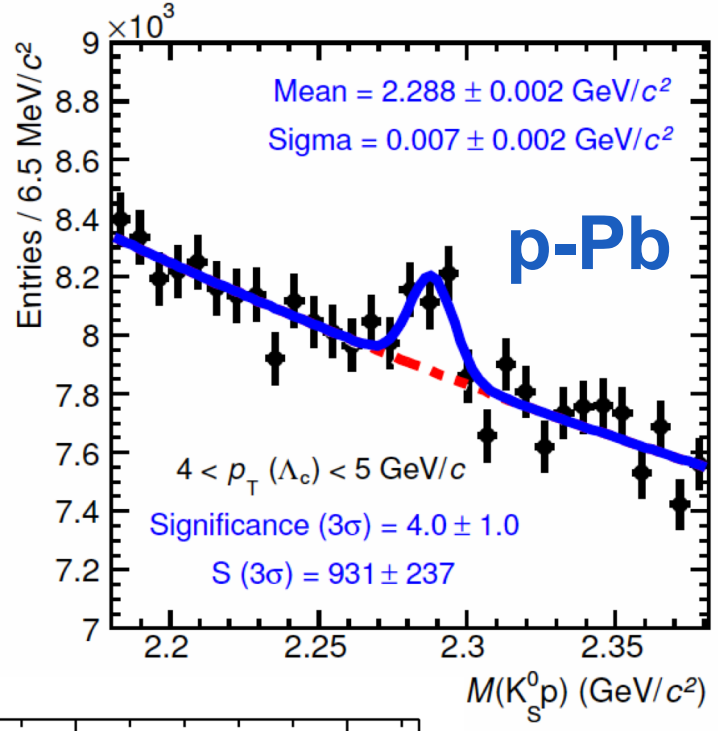
→Energy loss of heavy-flavor at higher p_T in agreement with model expectations.

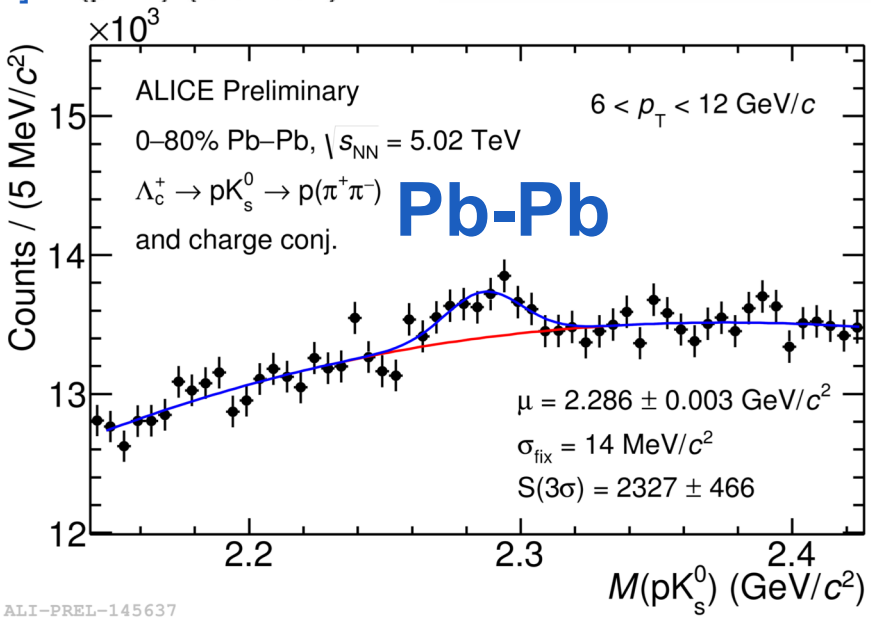
Λ_c in pp, p-Pb, and Pb-Pb collisions (1)

X. Peng, Wed 09:20



[arXiv:1712.09581]

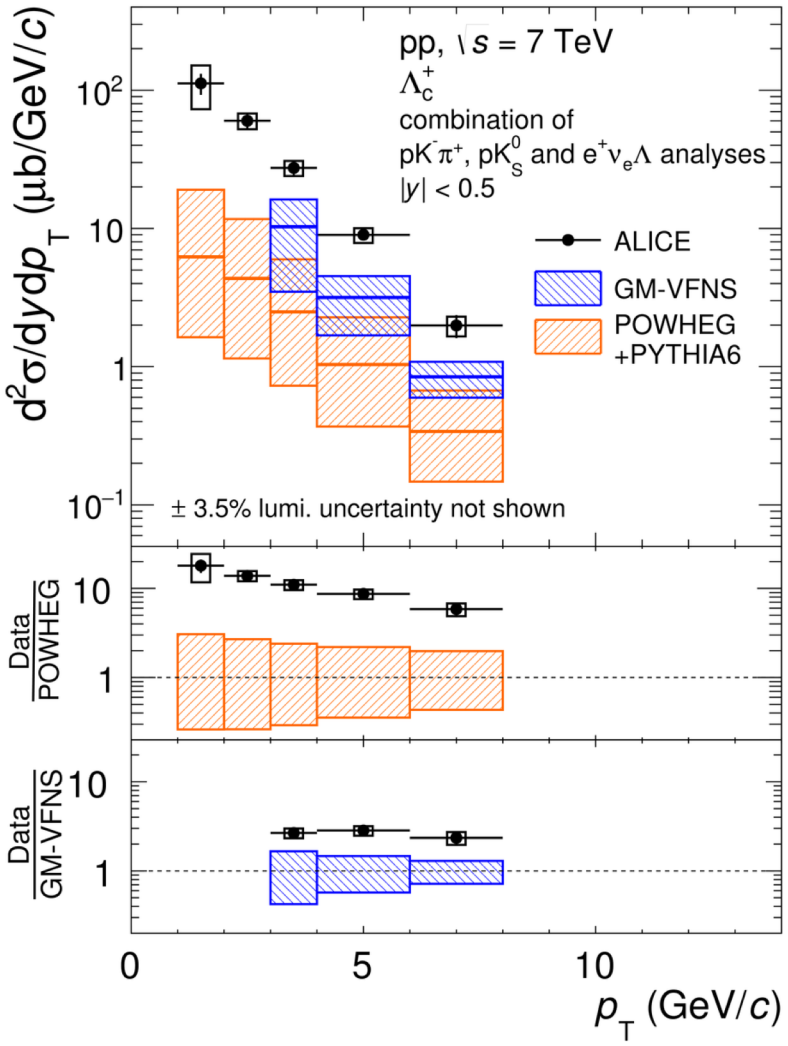


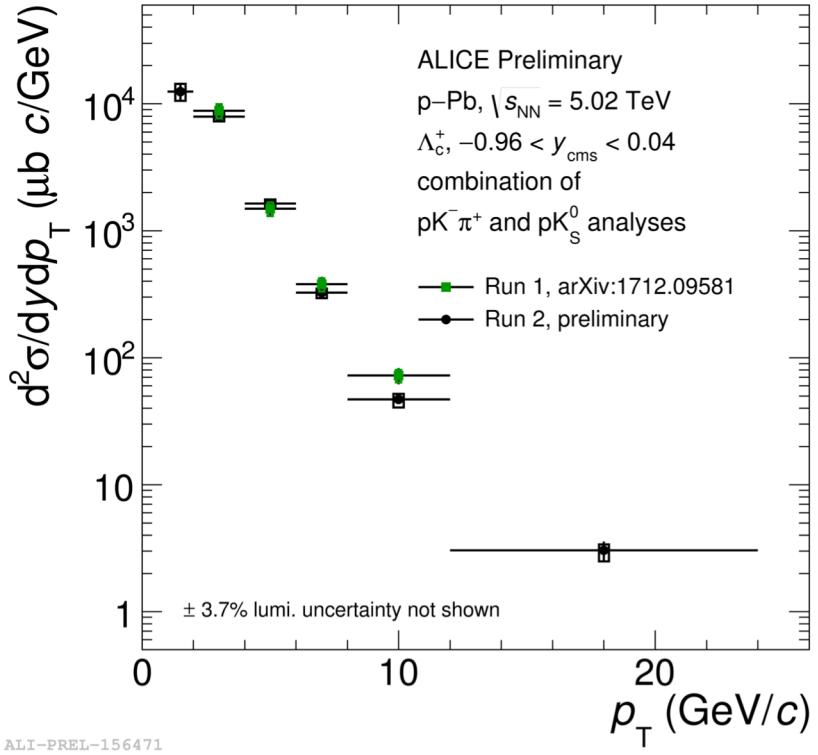


→ Very challenging measurement: extensive use of precise tracking and particle identification as well as multi-variate techniques.

Λ_c in pp, p-Pb, and Pb-Pb collisions (2)

[arXiv:1712.09581]
X. Peng, Wed 09:20



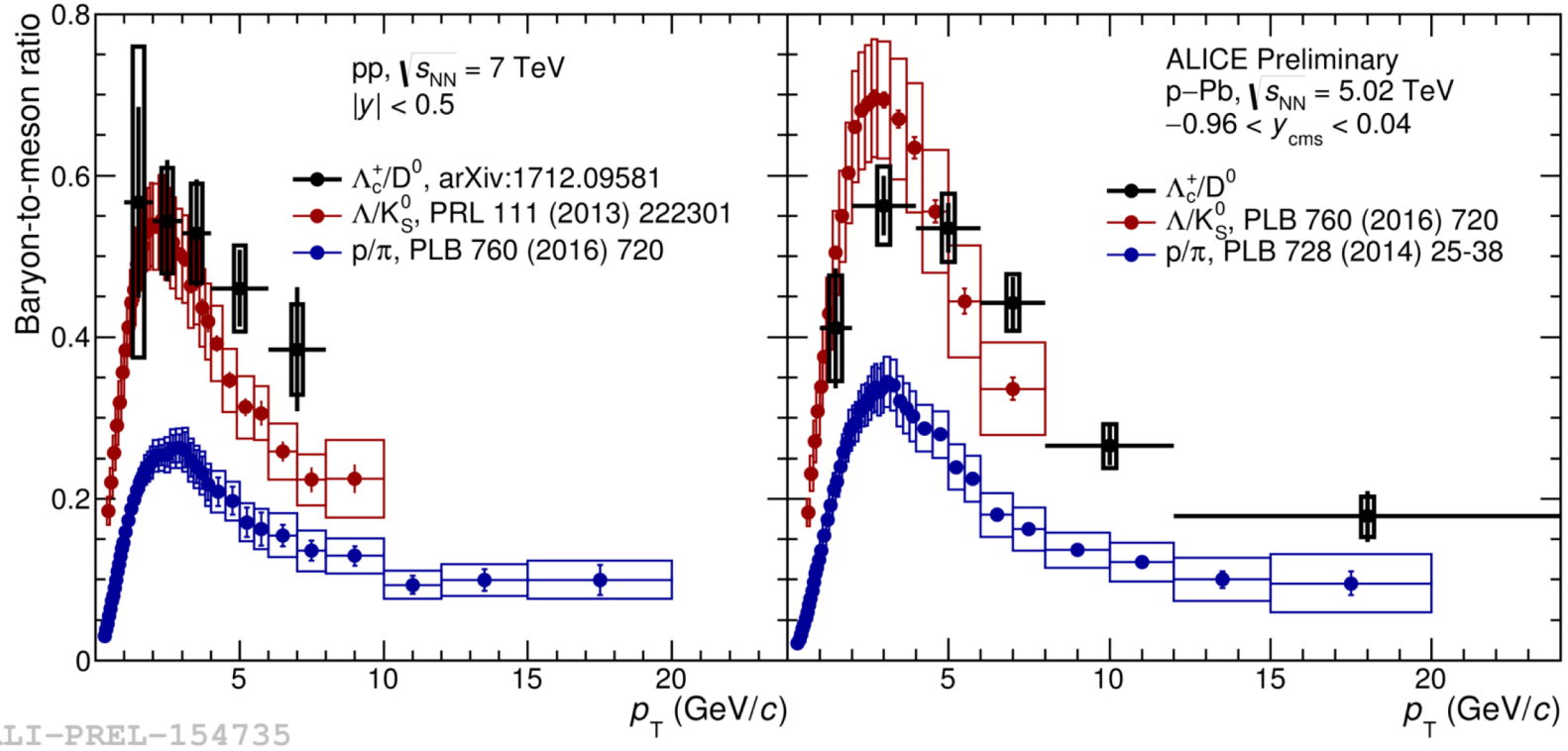


→ Very challenging measurement: extensive use of precise tracking and particle identification as well as multi-variate techniques.

→ Higher yield found than predicted by MC models and pQCD.

→ Fragmentation to heavy-flavor baryons is not well understood.

Baryon to meson ratios in pp and p-Pb collisions

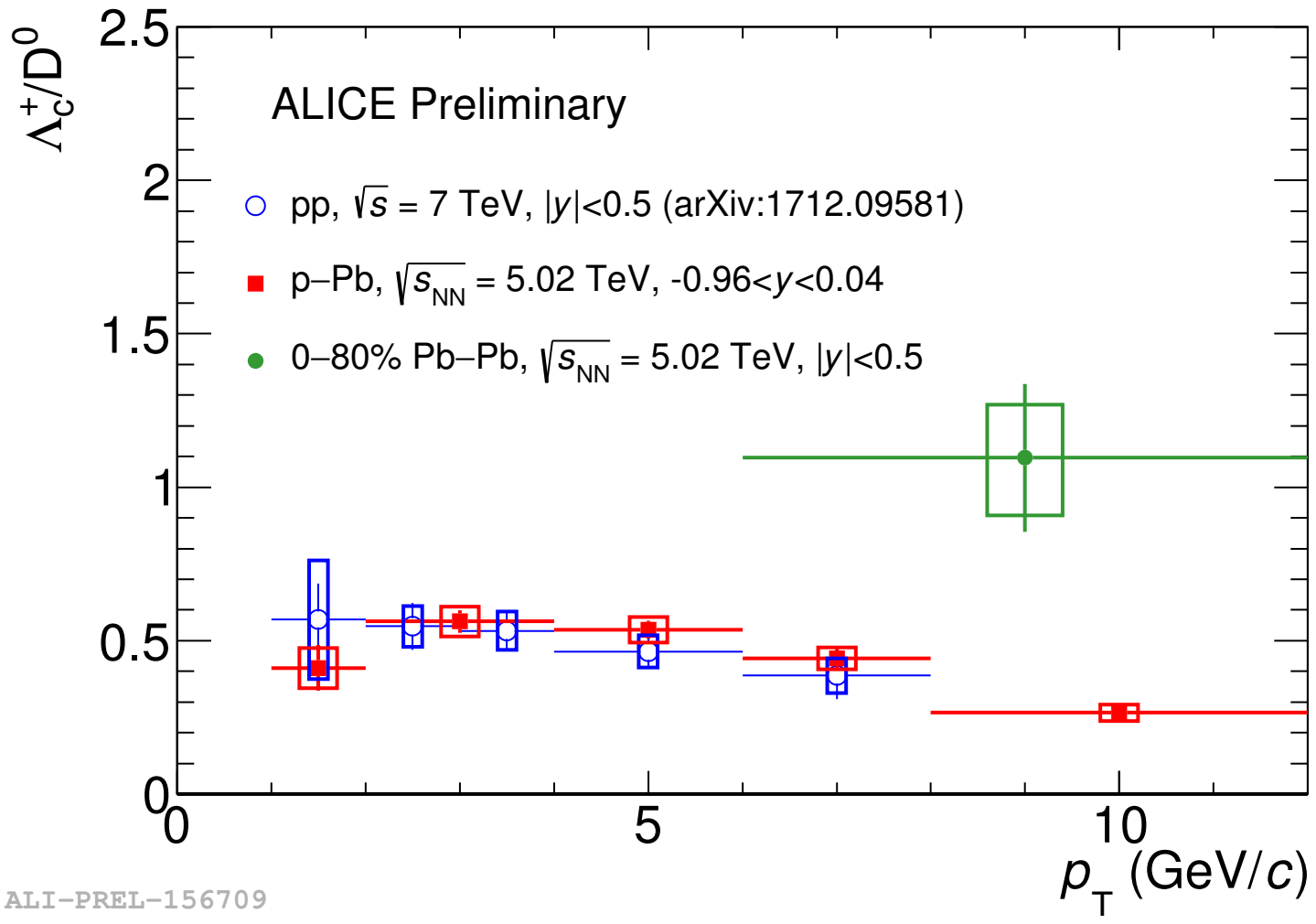


→ Remarkable similarities of baryon to meson ratio in the charm sector with light flavor results.

X. Peng, Wed 09:20

Λ_c/D^0 in Pb-Pb collisions

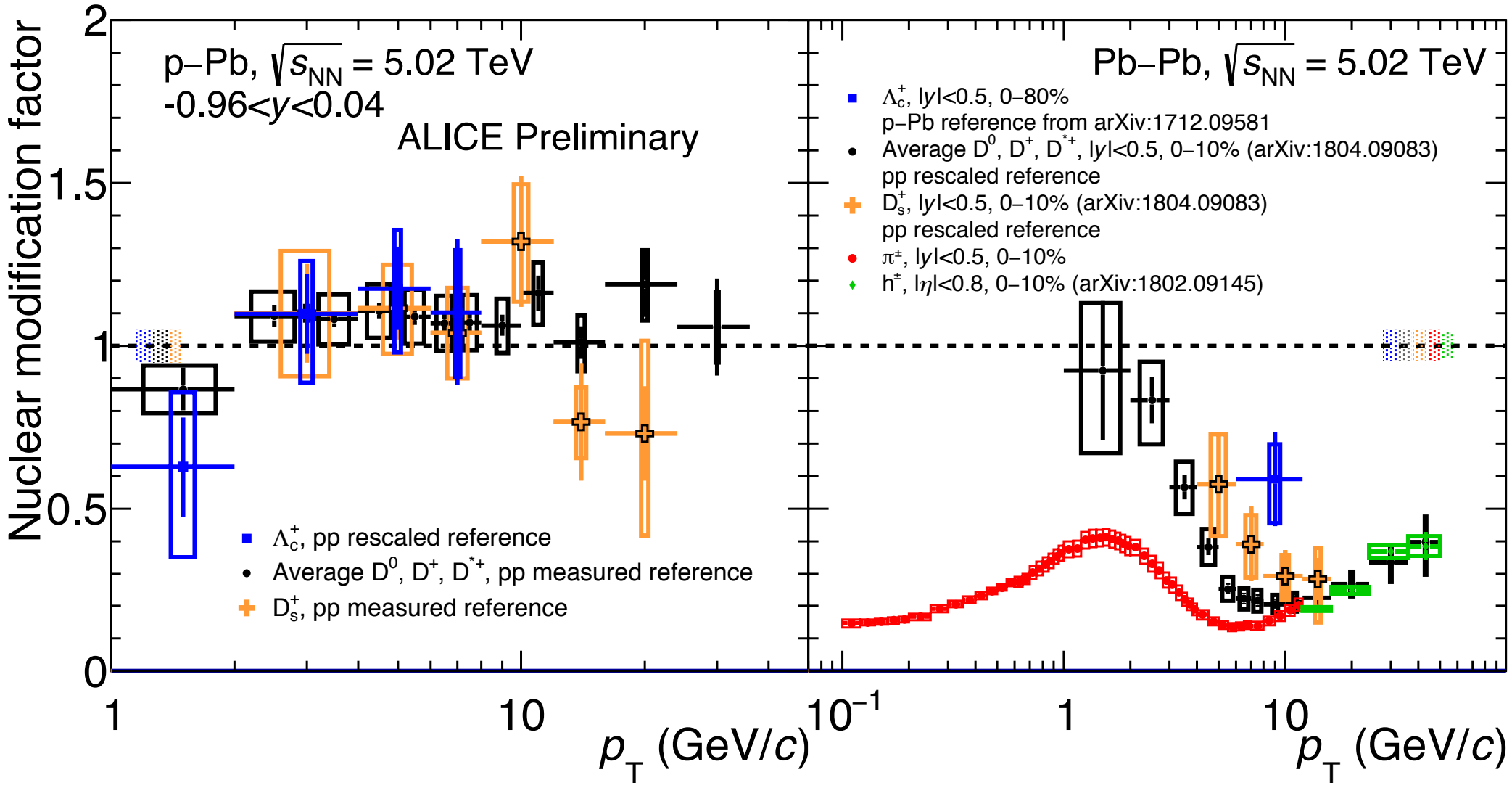
X. Peng, Wed 09:20



ALI-PREL-156709

→ Λ_c / D^0 ratio is ~1 at high transverse momenta in Pb-Pb collisions, higher than in pp and p-Pb collisions.

Family portrait of heavy-flavor R_{pA} and R_{AA}



→Ordering of R_{AA} consistent with recombination expectation.

ALICE *parallel talks* at Quark Matter 2018 (1)

Monday

- 16:30 Quarkonium measurements in nucleus-nucleus collisions with ALICE, P Dillenseger
- 16:30 Direct photon production and flow at low transverse momenta in pp, p-Pb and Pb-Pb collisions, F Bock
- 16:30 Elliptic flow coefficients of identified hadrons in pp and p-Pb collisions measured with ALICE, V Pacik
- 16:50 Investigating correlated fluctuations of conserved charges with cross-cumulants and net-lambda fluctuations in Pb-Pb collisions at ALICE, A Ohlson
- 18:10 Multiplicity dependence of strangeness and hadronic resonance production in pp and p-Pb collisions with ALICE at the LHC, A Dash
- 18:10 Balance functions of identified hadrons in Pb-Pb, p-Pb and p-p collisions from ALICE, J Pan
- 18:10 Low-mass dielectron measurements in pp, p-Pb and Pb-Pb collisions with ALICE at the LHC, R Bailhache
- 18:10 Charmonium photoproduction in ultraperipheral and peripheral Pb-Pb collisions with ALICE at the LHC, C Mayer

ALICE *parallel talks* at Quark Matter 2018 (2)

Tuesday

- 9:00 Measurements of anisotropic flow and flow fluctuations in Xe-Xe and Pb-Pb collisions with ALICE, J Margutti
- 9:00 Energy and system dependence of nuclear modification factors of inclusive charged particles and identified light hadrons measured in p-Pb, Xe-Xe and Pb-Pb collisions with ALICE, D Sekihata
- 9:20 Spin alignment measurements using vector mesons with ALICE detector at the LHC, R Singh
- 9:20 Upgrade of the ALICE central barrel tracking detectors: ITS and TPC, P Gasik
- 9:40 Muon physics at forward rapidity with the ALICE detector upgrade, S Siddhanta
- 10:20 Analysis of the apparent nuclear modification in peripheral 5.02 TeV Pb-Pb collisions with ALICE, M Knichel
- 10:20 Correlation between higher order flow harmonics and their non-linear modes for (un)identified charged hadrons in Pb-Pb collisions measured with ALICE, N Mohammadi
- 11:30 Measurements of heavy-flavour correlations and jets with ALICE at the LHC, B Trzeciak
- 11:50 Studies of jet grooming and recursive splittings in pp and PbPb collisions with ALICE, H Andrews
- 12:50 ALICE measurements of flow coefficients and their inter-correlations in small (pp and p-Pb) and large (Xe-Xe and Pb-Pb) collision systems, K Gajdosova
- 15:00 Heavy-flavour decay lepton production in Pb-Pb and Xe-Xe collisions at the LHC with ALICE, A Dubla
- 15:40 Constraining production models with light (anti-)nuclei measurements in small systems with ALICE at the LHC, M Colocci
- 16:00 Addressing the hyper-triton lifetime puzzle with ALICE at the LHC, S Trogolo
- 16:40 Event-shape, multiplicity-, and energy-dependent production of (un)identified particles in pp collisions with ALICE at the LHC, G Bencedi
- 16:40 Hadronic resonances, strange and multi-strange particle production in Xe-Xe and Pb-Pb collisions with ALICE at the LHC, D Silva de Albuquerque

ALICE *parallel talks* at Quark Matter 2018 (3)

Wednesday

- 9:20 Non-strange and strange D-meson and charm-baryon production in heavy-ion collisions measured with ALICE at the LHC, X Peng
- 10:20 ALICE constraints on the chiral magnetic effect from charge-dependent azimuthal correlations with identified hadrons, R Haque
- 11:10 Electroweak boson production measurements in p-Pb and Pb-Pb collisions at 5.02 TeV with ALICE, M Tarhini
- 11:50 Higher moment fluctuations of identified particle distributions from ALICE, N Behara
- 12:50 Testing the system size dependence of hydrodynamical expansion and thermal particle production with identified particle measurements in Xe-Xe and Pb-Pb collisions with ALICE, F Bellini
- 15:00 Three-dimensional femtoscopy with two identical pions and pion-kaon pairs in Pb-Pb collisions from the LHC ALICE experiment, A Pandey
- 15:20 Open-heavy-flavour production and elliptic flow in p-Pb collisions at the LHC with ALICE, H Correia Zanoli
- 16:00 The evolution of the near-side peak in two-particle number and transverse momentum correlations in Pb-Pb collisions from ALICE, M Varga-Kofarago
- 16:50 Quarkonium production in p-A collisions with ALICE, B Paul
- 17:10 ALICE results on system-size dependence of the charged-particle multiplicity density in p-Pb, Pb-Pb and Xe-Xe collisions, B Kim
- 18:10 Exploring jet profiles in pp and Pb-Pb collisions at 2.76 and 5.02 TeV with the ALICE detector, R Hosakawa
- 18:30 Light (anti-)nuclei production and elliptic flow in Pb-Pb collisions at the LHC with ALICE, M Puccio

ALICE *posters* at Quark Matter 2018

- Preliminary study of the (anti-)deuteron absorption in the detector material of ALICE at the LHC, Z. Yasin
- Direct photon flow in Pb-Pb collisions with ALICE, M. Sas
- Measurement of neutral mesons in pp collisions at sqrt(s) = 5 TeV via photon conversions in ALICE, H. Murakami
- Centrality dependence study of nuclear modification factor of electrons from heavy-flavour hadron decay in p-Pb collisions with ALICE at the LHC, S. De
- Dielectron production in Pb-Pb collisions at sqrt(s_{NN}) = 5.02 TeV with ALICE, C. Klein
- Angular correlations between J/ψ mesons and charged hadrons in proton-proton collisions at sqrt(s) = 13 TeV with ALICE, L. Altenkämper
- Hyperon production in p-Pb collisions at LHC energies, S. Delsanto
- D^0-meson production as a function of event transverse spherocity in pp collisions at sqrt(s) = 7 TeV with ALICE at the LHC, M. Jadhav
- Study of two particle correlations with photon and pion triggers in pp collisions at 13 TeV, R. Xu
- Studies of $\Lambda_c^+ \rightarrow pK_s^0$ in p-Pb collisions with the ALICE experiment at the LHC, E. Meninno
- K*(892)$^{\pm}$ production in pp collisions at sqrt(s) = 5.02 and 8 TeV with ALICE at the LHC, P. Sahoo
- Prompt and non-prompt J/ψ production measurements in high-multiplicity pp collisions at sqrt(s) = 13 TeV with ALICE at the LHC, F. Fionda
- Search for the d*(2380) in p-Pb collisions at 5 TeV with ALICE at the LHC, P. Fecchio
- Measurement of azimuthal correlations of D mesons with charged particles in pp collisions at sqrt(s) = 7 TeV with ALICE at the LHC, B. Naik
- Measurement of isolated photons in p-Pb collisions at 5.02 TeV with the EMCal detector in ALICE, E. Masson
- Production of electrons from beauty-hadron decays in Pb-Pb collisions at 5.02 TeV with ALICE, C. De Conti
- Inclusive full jet measurements in Pb-Pb collisions at sqrt(s_{NN}) = 5.02 TeV with ALICE, J. Mulligan
- Production of strange particles in jets and the underlying event in pp collisions at sqrt(s) = 13 TeV with ALICE at the LHC, P. Cui
- Dielectron production in pp collisions at sqrt(s) = 13 TeV measured in a dedicated low magnetic-field setting with ALICE, J. Jung
- ALICE studies of proton-hyperon and hyperon-hyperon interaction via the femtoscopy method in pp collisions, B. Hohlweger
- Measurement of D meson azimuthal correlations with charged particles in p-Pb collisions at sqrt(s_{NN}) = 5.02 TeV with ALICE, S. Kumar
- Energy and centrality dependence of resonance production in heavy-ion collisions at the LHC, A. Knospe
- Production of electrons from beauty-hadron decays in pp collisions at the LHC with ALICE, J. Kwon
- The strange and multi-strange particle production in pp collisions at sqrt(s) = 13TeV with ALICE at the LHC, P. Kalinak
- Searches for pion condensation in pp and Xe-Xe collisions at the LHC with the ALICE Inner Tracking System, I. Ravasenga
- Kaon isospin fluctuation in Pb-Pb collisions at sqrt(s_{NN}) = 2.76 TeV with ALICE at LHC, R. Nayak
- Measurement of low p_T electrons from heavy-flavour hadron decays in Pb-Pb collisions at 5 TeV with ALICE, M. Faggin
- J/ψ polarization in Pb-Pb collisions at sqrt(s_{NN}) = 5.02 TeV with ALICE at the LHC, L. Micheletti
- D^0-meson production in p-Pb collisions measured with ALICE at the LHC, C. Terrevoli
- Application of MVA methods to the analysis of inclusive J/ψ in Pb-Pb collisions with ALICE at the LHC, A. Harlenderova and L. Layer
- Multivariate background suppression in the low-mass dielectron analysis in Pb-Pb collisions at sqrt(s_{NN})= 5.02 TeV with ALICE, S. Lehner

99 for you to enjoy!

- Pathlength dependence of particle-yield modification on the near-side with ALICE at the LHC, H. Kim
- Charged particle spectra in Xe-Xe collisions at sqrt(s_{NN}) = 5.44 TeV measured with ALICE, P. Huhn
- Energy dependence of the transverse momentum distribution of charged particles in Pb-Pb measured with ALICE, M. Habib
- Multiplicity dependent production of heavy-flavour decay electrons in p-Pb collisions with ALICE, P. Dhankeer
- Production of pions, kaons and protons as a function of charged particle multiplicity in pp collisions at sqrt(2) = 13 TeV with ALICE at the LHC, P. Sarma
- Energy dependence of transverse momentum spectra of primary charged particles in proton-proton collisions measured by ALICE at the LHC, E. Perez Lezama
- J/ψ production as a function of charged particle multiplicity in pp collisions at sqrt(s) = 2.76 and 5.02 TeV with ALICE, A. Khatun
- Forward instrumentation for the ALICE Upgrade: the Fast Interaction Trigger and the FoCal proposal, I. Bearden
- Using machine learning for data quality assurance, particle identification, and fast simulations in ALICE, L. Graczykowski
- Probing beauty and charm production in p-Pb collisions with high p_T electrons measured with ALICE, D. Kawana
- Bayesian unfolding of charged particle p_T spectra with ALICE at the LHC, M. Kruger
- TMVA methods to reconstruct $\Lambda_c \rightarrow pK_s^0$ in p-Pb collisions with ALICE at the LHC, J. Wilkinson
- Pion-Kaon femtoscopy in Pb-Pb collisions at 2.76 TeV measured with ALICE, S. Dash
- J/ψ coherent photo-production at very low transverse momentum in Pb-Pb collisions at sqrt(s_{NN}) = 5.02 TeV with ALICE, Z. Zhou
- Performance of the large Time-Of-Flight detector of ALICE, F. Carnesecchi
- Measurement of Λ_c/D^0 ratio in Pb-Pb collisions at 5.02 TeV with ALICE, Y. Watanabe
- Energy dependence of particle production and R_{AA} in Pb-Pb collisions with ALICE, N. Jacazio
- D-meson v_2 measurement in Pb-Pb collisions at 5.02 TeV with ALICE, G. Luparello
- Anisotropic flow of multi-strange particles in Pb-Pb collisions at sqrt(s_{NN}) = 5.02 TeV with ALICE, Y. Zhu
- Upsilon production in p-Pb collisions with ALICE at the LHC, W. Shaikh
- Rivet as an Experiment-Theory Interface for the Heavy-Ion Community, P. Karczmarczyk
- Measurement of D^{*+}-meson production as a function of centrality in p-Pb collisions with ALICE, C. Bedda
- Measurement of (anti-)^{3}He production in p-Pb collisions and of (anti-)^{3}He elliptic flow in Pb-Pb collisions with ALICE at the LHC, A. Caliva
- Energy and Multiplicity Dependence of $K^*(892)^0$ Production in pp Collisions with ALICE at the LHC, A. Khuntia
- Measurement of neutral $K^*(892)$ and $\phi(1020)$ production in p-Pb collisions at sqrt(s_{NN}) = 8.16 TeV with ALICE at the LHC, A. Mallick
- Multi-differential study of J/ψ R_{AA} in forward rapidity in Pb-Pb collisions at sqrt(s_{NN}) = 5.02 TeV with ALICE, H. Hushnud
- J/ψ production at mid-rapidity in p-Pb collisions with the ALICE detector, S. Hayashi
- Measurement of D_s^+/D^+ as a function of transverse momentum and charged particle multiplicity in pp, p-Pb and Pb-Pb collisions with ALICE, F. Grosa
- Identification of charged Kaons using kink topology in pp and Pb-Pb collisions with ALICE at the LHC, N. Husain
- Measurements of heavy-flavour production via electrons in the relativistic heavy-ion collisions with ALICE, S. Sakai
- Dielectron production in pp collisions at sqrt(s) = 7 TeV with ALICE, H. Scheid
- Inclusive ψ(2S) Suppression in p-Pb collisions with ALICE at the LHC, J. Ghosh
- Measurement of Λ_c production via $\Lambda_c \rightarrow pK^-\pi^+$ channel in p-Pb collisions at 5.02 TeV, C. Hills
- Low-mass dimuon measurements in pp and Pb-Pb collisions with ALICE at the LHC, A. Uras
- Energy dependence of $\phi(1020)$ production at mid-rapidity in pp collisions with ALICE at the LHC, S. Tripathy
- Measurement of low-mass dielectrons in minimum-bias and high-multiplicity pp collisions at 13 TeV with ALICE, I. Vorobyev
- Measurement of charged jet cross-section and properties in proton-proton collisions at 2.76 TeV with ALICE, R. Biswas
- Measurement of the Underlying Event in pp collisions at sqrt(s) = 13 TeV with the ALICE experiment at the LHC, X. Ren
- Direct virtual photons production in minimum-bias and high-multiplicity pp collisions at 13 TeV at the LHC with ALICE, O. Vazquez Doce
- Measurement of D^{*+}-meson production in small systems with ALICE at the LHC, A. Veen
- Event shape engineering for the D-meson elliptic flow in Pb-Pb collisions at sqrt(s_{NN}) = 5.02 TeV with ALICE at the LHC, A. Festanti
- Low-mass Dielectrons in p-Pb collisions at sqrt(s_{NN}) = 5.02 TeV with ALICE, A. Capon
- J/ψ production as a function of charged particle multiplicity in pp collisions at sqrt(s) = 13 TeV at forward rapidity with ALICE, D. Thakur
- Measurement of Neutral Mesons and Direct Photons in pp collisions with the ALICE EMCal detector at the LHC, D. Mühlheim
- Direct γ-hadron correlations in Pb-Pb collisions at sqrt(s_{NN}) = 5.02 TeV with ALICE, E. Epple
- First results of charged K*(892) resonance production in pp collisions at sqrt(s) = 13 with ALICE at the LHC, K. Garg
- Two-particle transverse momentum correlations in Pb-Pb collisions at ALICE, V. Gonzalez
- Search for a ΛNN bound state in Pb-Pb collisions with ALICE at the LHC, A. Mastroserio
- Production and anisotropy of beauty decay electrons in Pb-Pb collisions at sqrt(s_{NN}) = 2.76 TeV with ALICE, M. Völkl
- f0(980) resonance production in pp collisions with the ALICE detector at LHC, A. Lorenzo
- Multiplicity dependence of azimuthal correlations of D mesons with charged particles in p-Pb collisions with ALICE, M. Mazzilli
- Production of electrons from heavy-flavour hadron decay in proton- proton and nucleus-nucleus collisions with ALICE at the LHC, S. Hornung
- Multiplicity dependence study of the pseudorapidity density distribution of charged particles in pp collisions with ALICE, P. Palni
- Pseudorapidity dependence of anisotropic flow in Pb-Pb collisions measured with ALICE, F. Thoresen
- Multiplicity dependence of strangeness production in proton-proton collisions at sqrt(s) = 5.02 TeV with ALICE at the LHC, L. Tropp
- Measurements of D^0 meson production in pp collisions with ALICE at the LHC, N. Valle
- Study of Υ production as a function of charged-particle multiplicity in pp collisions at sqrt(s) = 13 TeV with ALICE, T. Chowdury
- Measurement of the p_T-differential cross section and fragmentation function of D^0-tagged jets in pp collisions with ALICE, S. Aiola
- Constraining heavy-flavour production mechanisms with dielectrons in pp collisions at sqrt(s) = 13 TeV with ALICE, A. Dashi
- Factorization of two-particle probability distributions in Pb-Pb collisions at sqrt(s_{NN}) = 5.02 TeV with ALICE, C. Bourjau
- Electron identification and trigger performance of the ALICE Transition Radiation Detector in p-Pb collisions, Y. Pachmayer
- Measurement of D^+-meson production in pp and p-Pb collisions with ALICE at the LHC, R. Bala
- Measurement of neutral meson spectra in proton-proton collisions at sqrt(s) = 5 TeV with the ALICE EMCal detector, A. Matyja
- Production of heavy-flavour hadron decay electrons in pp collisions at sqrt(s) = 13 TeV as a function of charged-particle multiplicity with ALICE, S. Acharya
- Particle production mechanisms studied via angular correlations of pions, kaons, protons, and lambdas in pp collisions at 7 TeV, M. Janik
- Using femtoscopy to probe the strong interaction for mesons and baryons and their anti-particles in pp and Pb-Pb collisions with ALICE, J. Buxton
- Transverse sphericity dependence of di-hadron angular correlations in pp collisions with ALICE at the LHC, F. Erhardt
- D^0-charged particle azimuthal correlations in pp collisions at sqrt(s) = 13 TeV with the ALICE experiment at the LHC, S. Sadhu

ALICE *papers submitted* for Quark Matter 2018

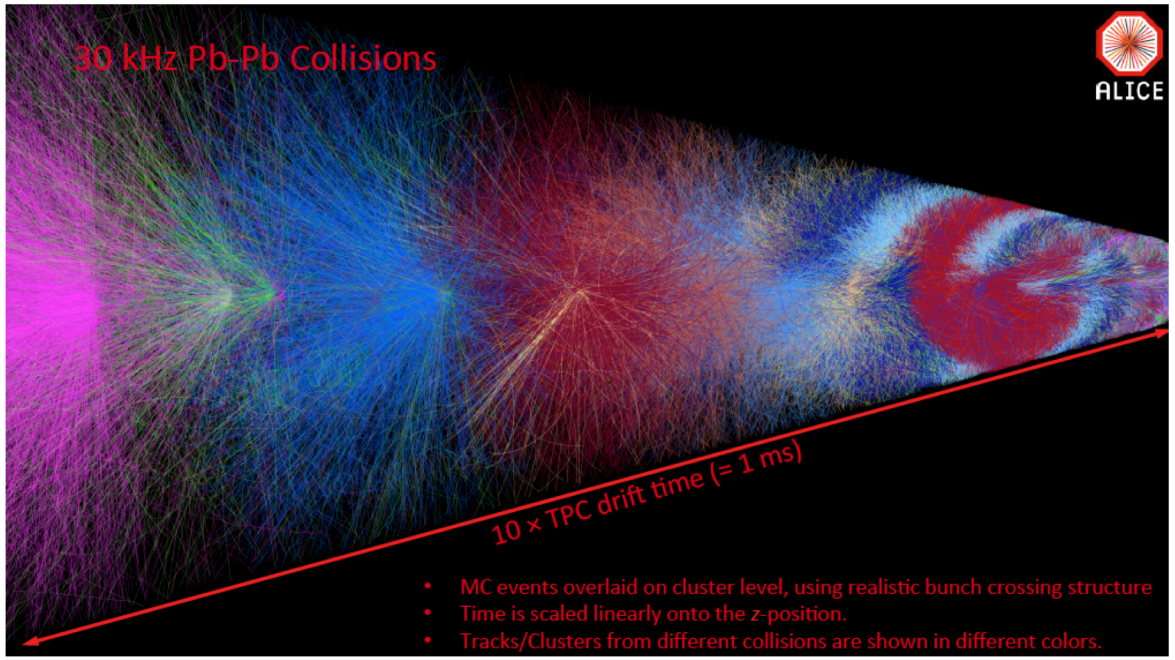
- arXiv:1805.01832, "Anisotropic flow in Xe-Xe collisions at $\sqrt{s_{NN}}$ = 5.44 TeV", "Anisotropic flow of identified particles in Pb-Pb collisions at $\sqrt{s_{NN}}$ =5.02 TeV"
- arXiv:1805.04367, "Azimuthal anisotropy of heavy-flavour decay electrons in p-Pb collisions at $\sqrt{s_{NN}}$ = 5.02 TeV"
- arXiv:1805.04432, "Centrality and pseudorapidity dependence of the charged-particle multiplicity density in Xe-Xe collisions at $\sqrt{s_{NN}}$ = 5.44 TeV"
- arXiv:1805.04407, "Dielectron and heavy-quark production in inelastic and high-multiplicity proton-proton collisions at $\sqrt{s}$ = 13 TeV",
- arXiv:1805.04391, "Dielectron production in proton-proton collisions at $\sqrt{s}$ = 7 TeV"
- arXiv:1805.04403, "Direct photon elliptic flow in Pb-Pb collisions at $\sqrt{s_{NN}}$ = 2.76 TeV"
- arXiv:1805.04381, "Inclusive J/**ψ** production at forward and backward rapidity in p-Pb collisions at $\sqrt{s_{NN}}$ = 8.16 TeV"
- arXiv:1805.04383, "Inclusive J/**ψ** production in Xe-Xe collisions at $\sqrt{s_{NN}}$ = 5.44 TeV"
- arXiv:1805.04374, "Measurement of the inclusive J/**ψ** polarization at forward rapidity in pp collisions at $\sqrt{s}$ =8 TeV"
- arXiv:1805.04379, "Measurements of low-p_T electrons from semileptonic heavy-flavour hadron decays at mid-rapidity in pp and Pb-Pb collisions at $\sqrt{s_{NN}}$ = 2.76 TeV"
- arXiv:1805.04365, "Production of the **ρ**(770)0 meson in pp and Pb-Pb collisions at $\sqrt{s_{NN}}$ = 2.76 TeV"
- arXiv:1805.04361, "Suppression of **Λ**(1520) resonance production in central Pb-Pb collisions at $\sqrt{s_{NN}}$ = 2.76 TeV"
- arXiv:1805.04399, "Transverse momentum spectra and nuclear modification factors of charged particles in Xe-Xe collisions at $\sqrt{s_{NN}}$ = 5.44 TeV"
- arXiv:1805.04422, "Two particle differential transverse momentum and number density correlations in p-Pb and Pb-Pb at the LHC"
- arXiv:1805.04387, "**Υ** suppression at forward rapidity in Pb-Pb collisions at $\sqrt{s_{NN}}$ = 5.02 TeV"

Summary and conclusion

- Many new results: detailed collectivity studies from small to large systems and on jet medium interactions constraining the properties of the QGP, search for evidence of deconfinement with heavy-flavor and quarkonia,…

- Progress on long standing questions and pursuing new avenues: direct photon flow, anti-nuclei vs system size, low mass dileptons, direct comparisons to Lattice QCD, ..

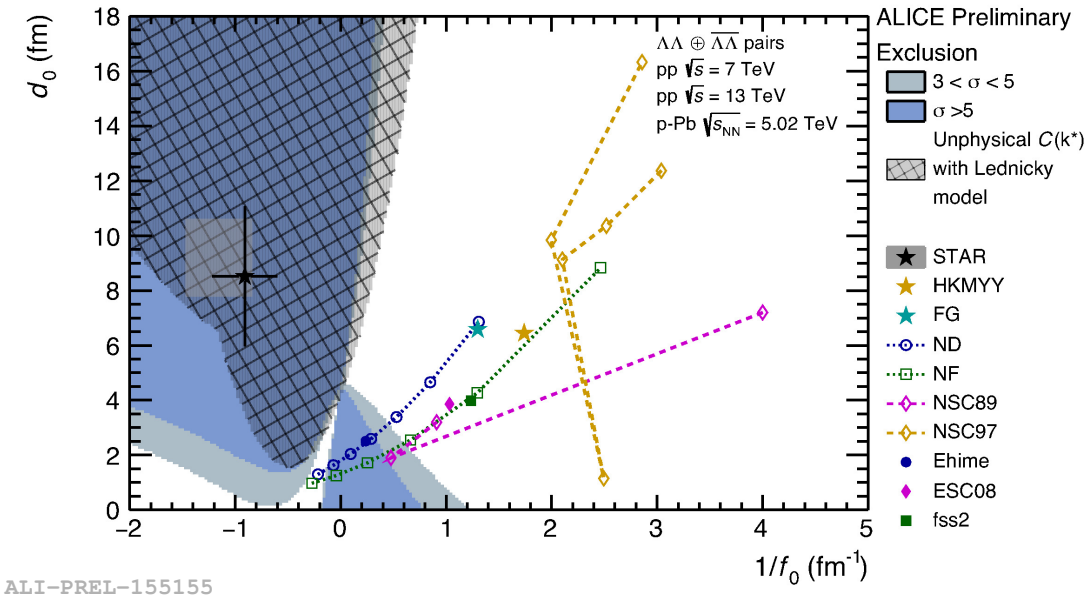
- Even after 25 years, this is just the beginning:
  - Large upgrade program in preparation!
    ⇒ continuous read-out of 50 kHz Pb-Pb
  - Upgrade of ITS, TPC, MFT will be installed starting from next year.
  - ALICE will continue to take data at least until 2028 (long shutdown 4).

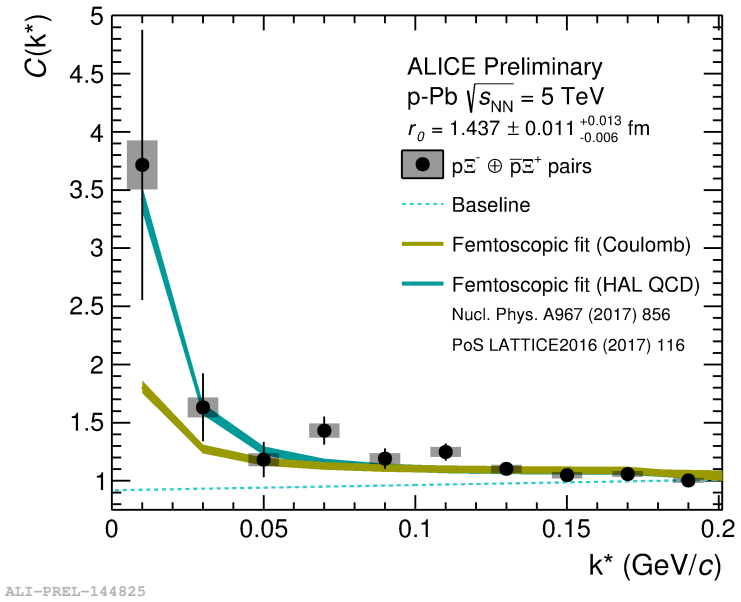


P. Gasik, Wed 17:10
S. Siddhanta, Wed 17:10

Additional slides

Constraining hyperon-nucleon potentials





- Reversing the paradigm of femtoscopy: Study the interaction among the particles

- Λ–Λ interaction: strong constraints on the scattering parameter phase space
  - Models predicting a strong attraction at a small effective range d_0 are excluded
  - H-Dibaryon: region of phase space strongly constrained ($1/f_0 < 0$, small d_0)

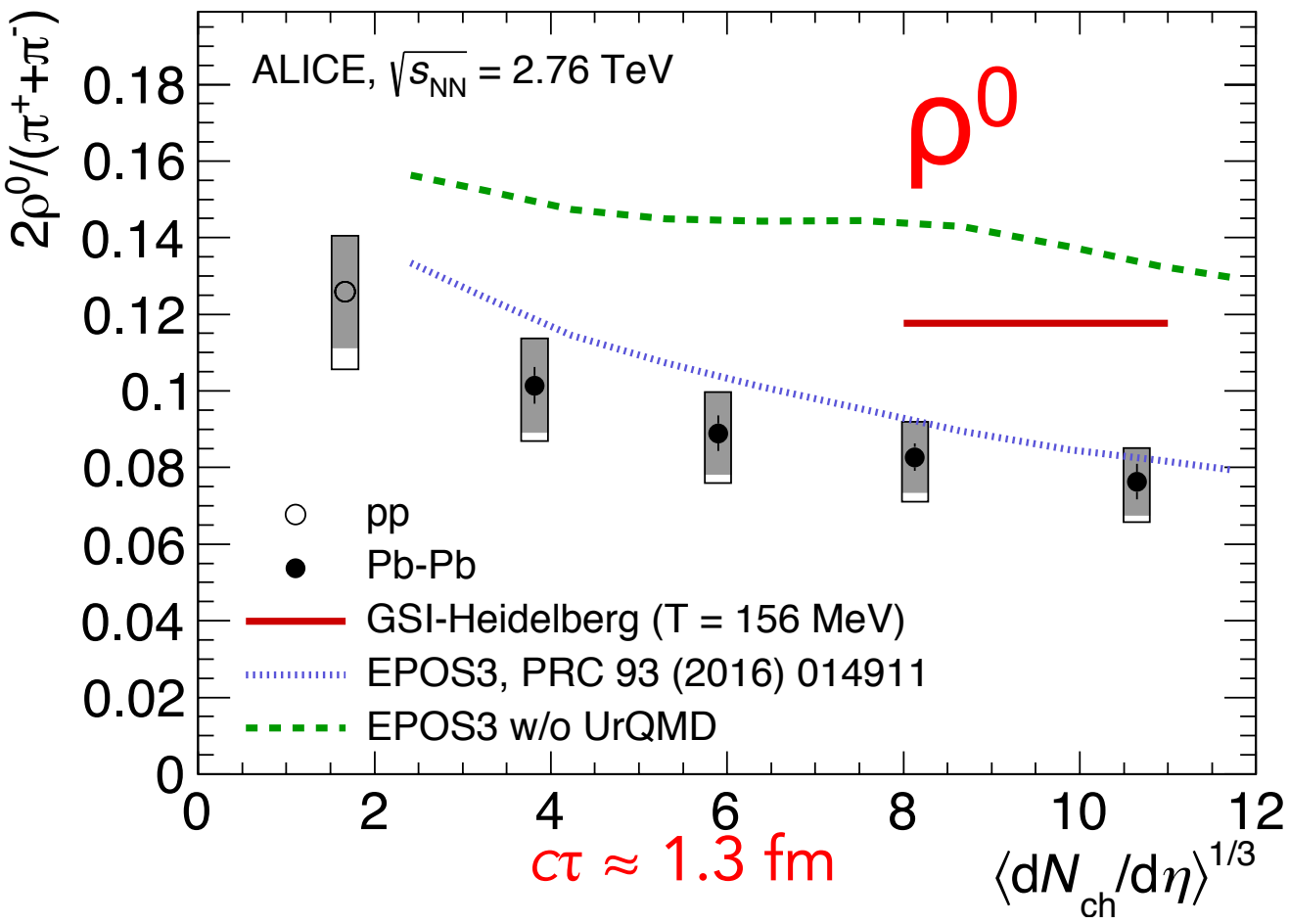
$$C(k^*) = \int S(r)|\Psi(k^*, \vec{r})|^2 \, d\vec{r}$$

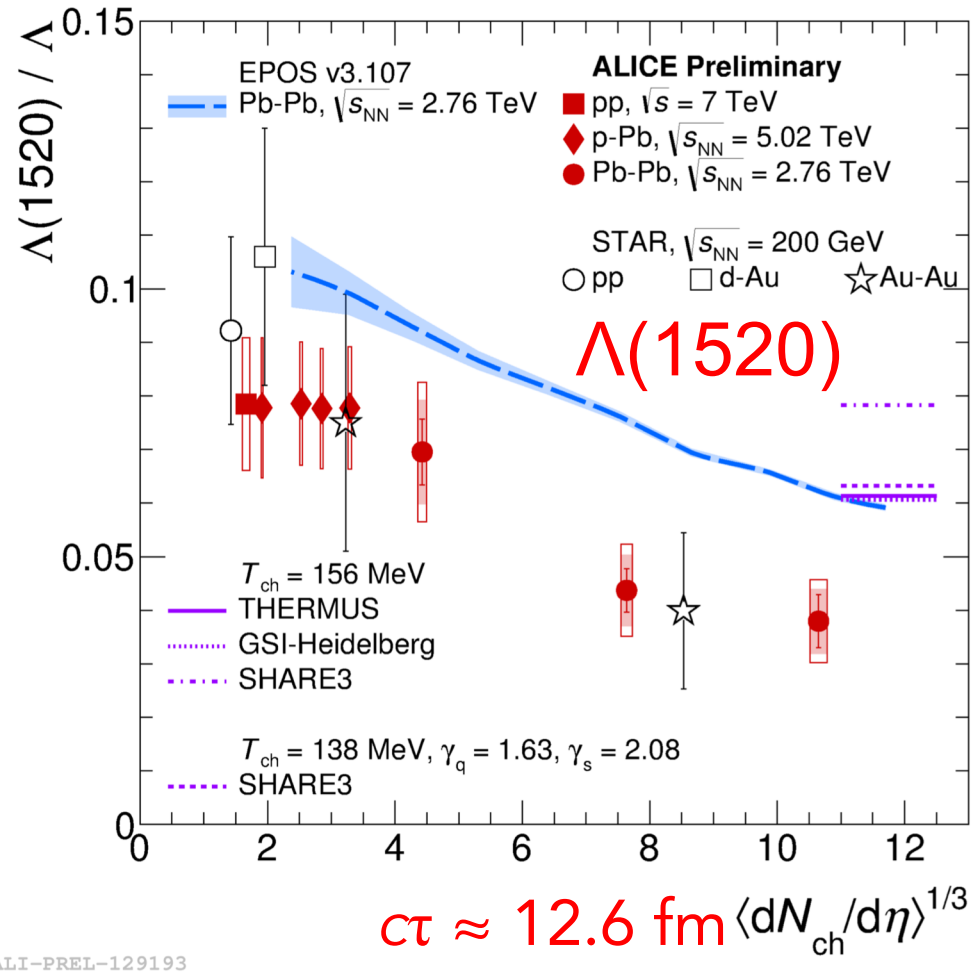
Emission source Two-particle wave function

- Observation of an attractive strong potential for the p–Ξ^- in p-Pb
  – In line with preliminary calculations by the HAL QCD collaboration (p-val: 0.055 vs. 0.004 for Coulomb only)

Indications for a long lasting hadronic phase

A. Dash, Mon 18:10





ALI-PREL-129193

→ Observed yields of hadronic resonances with lifetimes similar to that of the hadronic phase get suppressed by elastic hadronic re-scattering of their decay daughters.

Non-linear flow modes in Pb-Pb for identified particles

→ Harmonics n>3 show a stronger non-linearity with the n-th order spatial anisotropy ε_n:

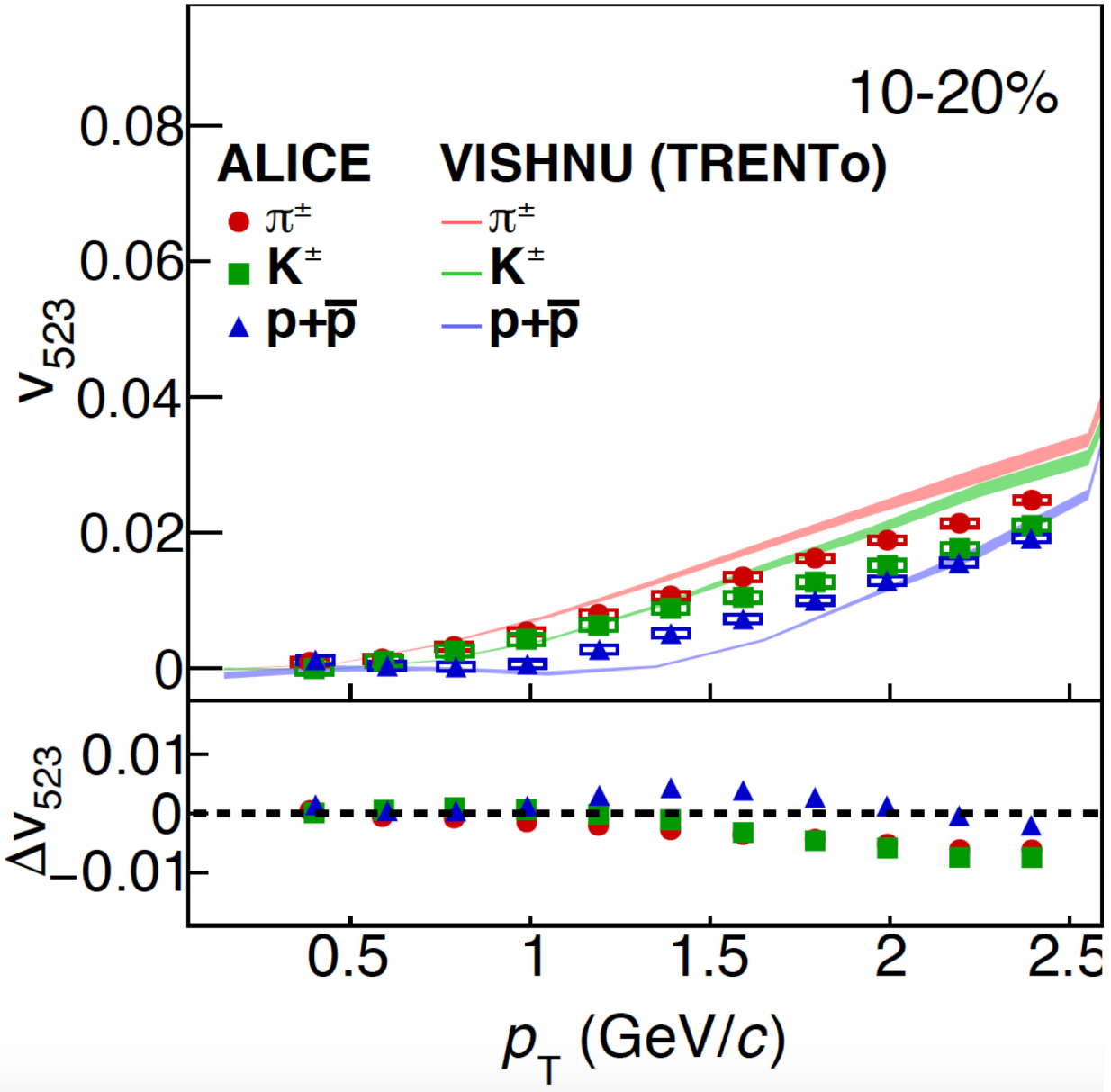
$$v_n e^{in\Psi_n} = k\varepsilon_n e^{in\Phi_n} + \mathcal{E}$$

e.g.:

$$V_5 = V_5^{NL} + V_5^{L} = \chi_{5,23} V_2 V_3 + V_5^{L}$$

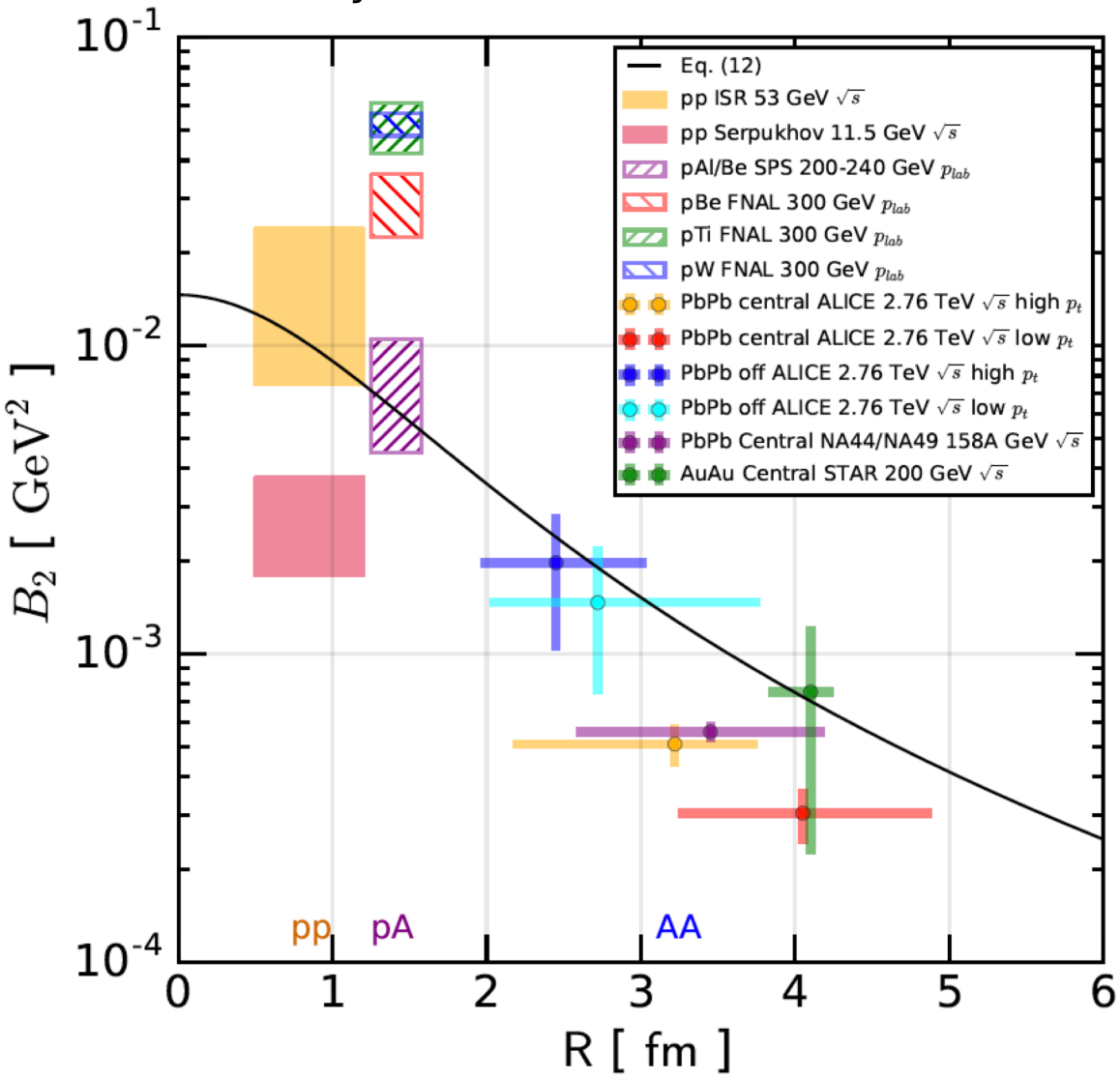
→ **Test of hydrodynamics in its extreme details.**

→ **Only slightly worse agreement found than with the plain v_n.**

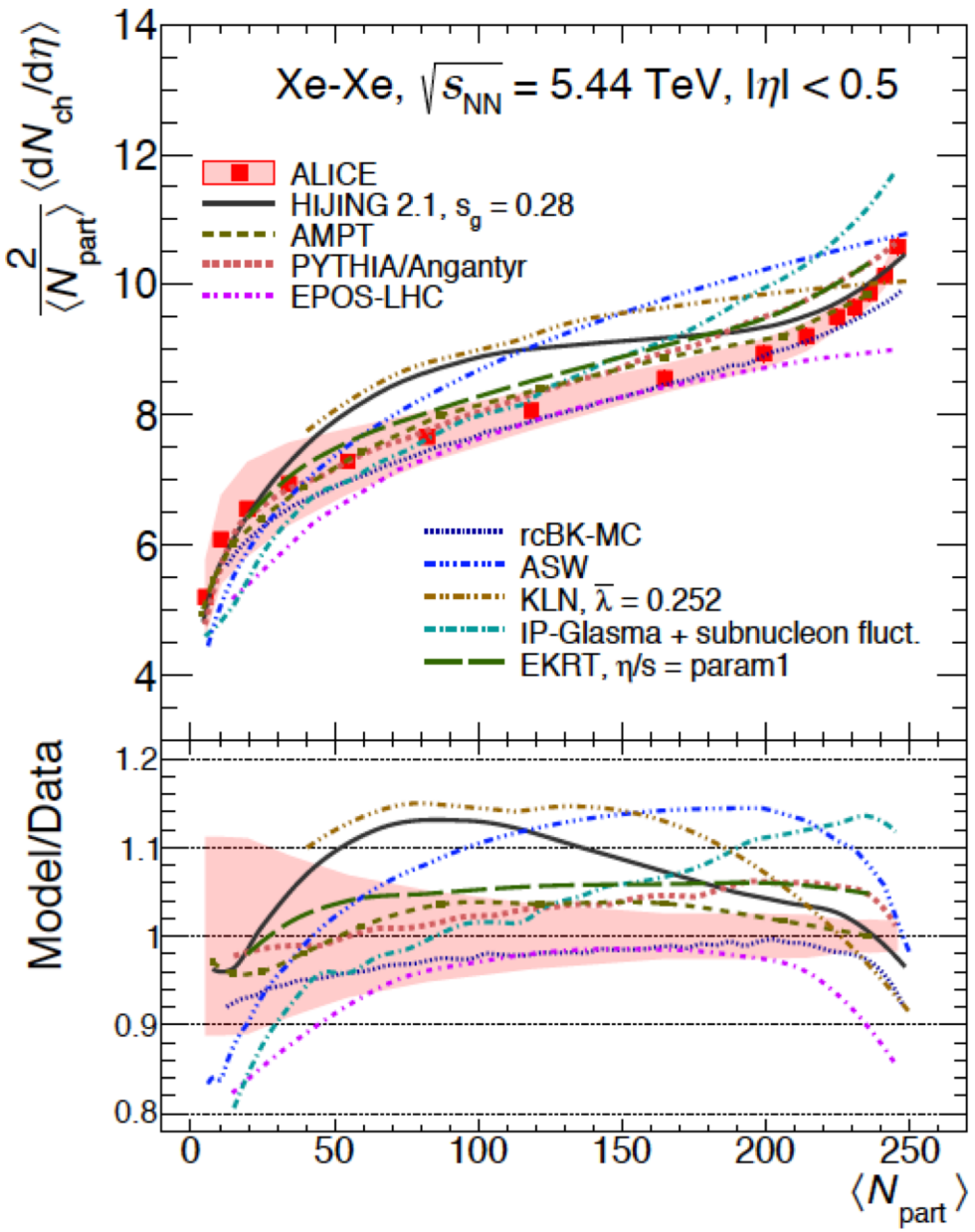


(anti-)deuteron production across system size

[K. Blum et al., Phys.Rev. D96 (2017) no.10, 103021]



⟨d*N*/d*η*⟩ in Xe-Xe model comparison



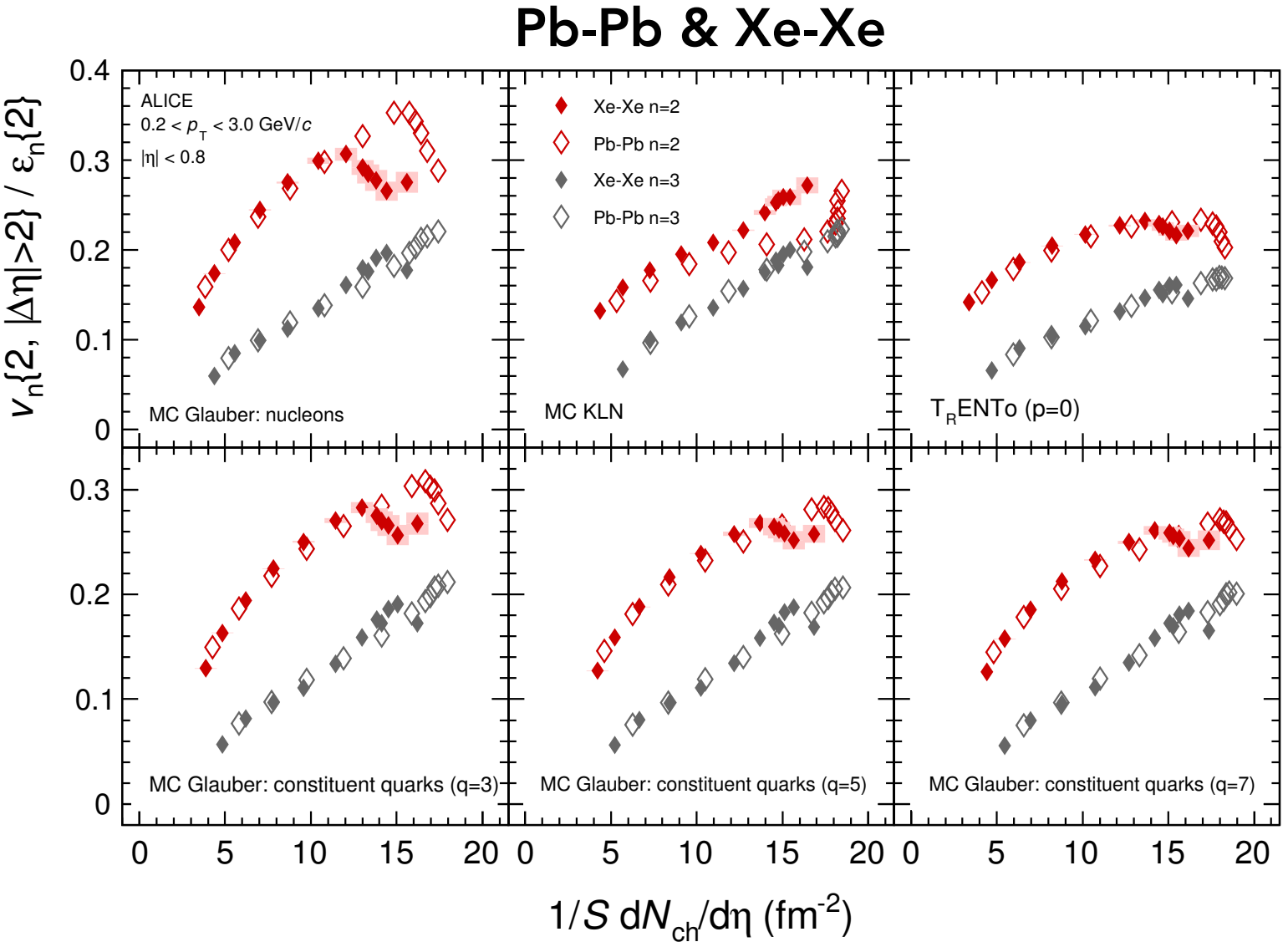
Two scaling violations observed:

(1.) N_{part} scaling violated
→ known since a long time, confirmed by new Xe-Xe data
→ well described by **participant quark scaling $N_{q\text{-part}}$** and many theoretical models

(2.) Central collisions of medium-size nuclei produce more particles per N_{part} than mid-central collisions of large nuclei at the same N_{part}
→ not explained by participant quark scaling and not fully reproduced by models

v_2 in Pb-Pb and Xe-Xe: initial conditions

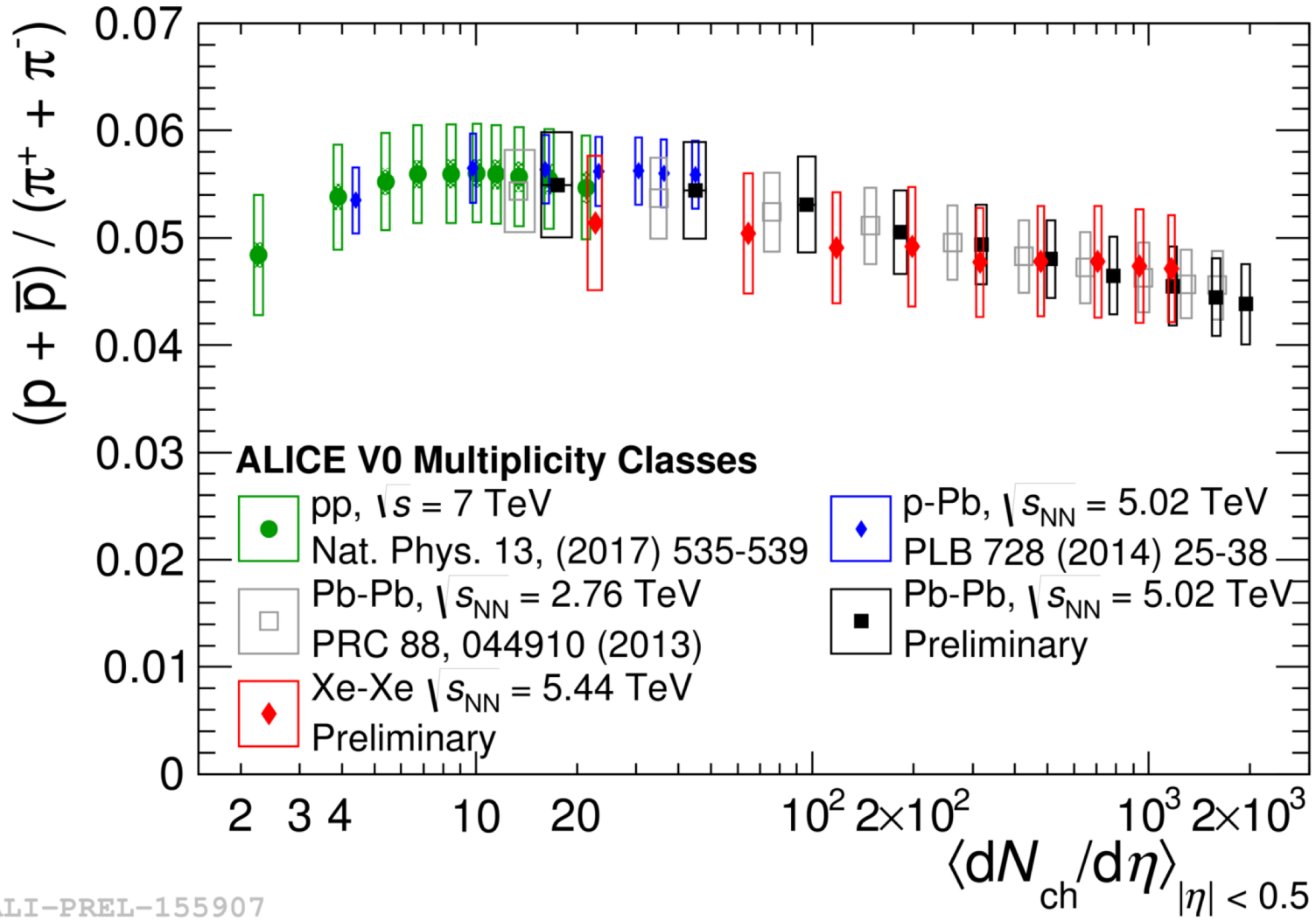
[arXiv:1805.01832]



→ Detailed measurement of v_2{m} as a function of charged particle density for **different geometries**.

→ Scaling with transverse density and eccentricity as expected from hydro only restored for **initial conditions** modeled with TrENTO or **constituent quark Glauber**.

Proton-to-pion ratio

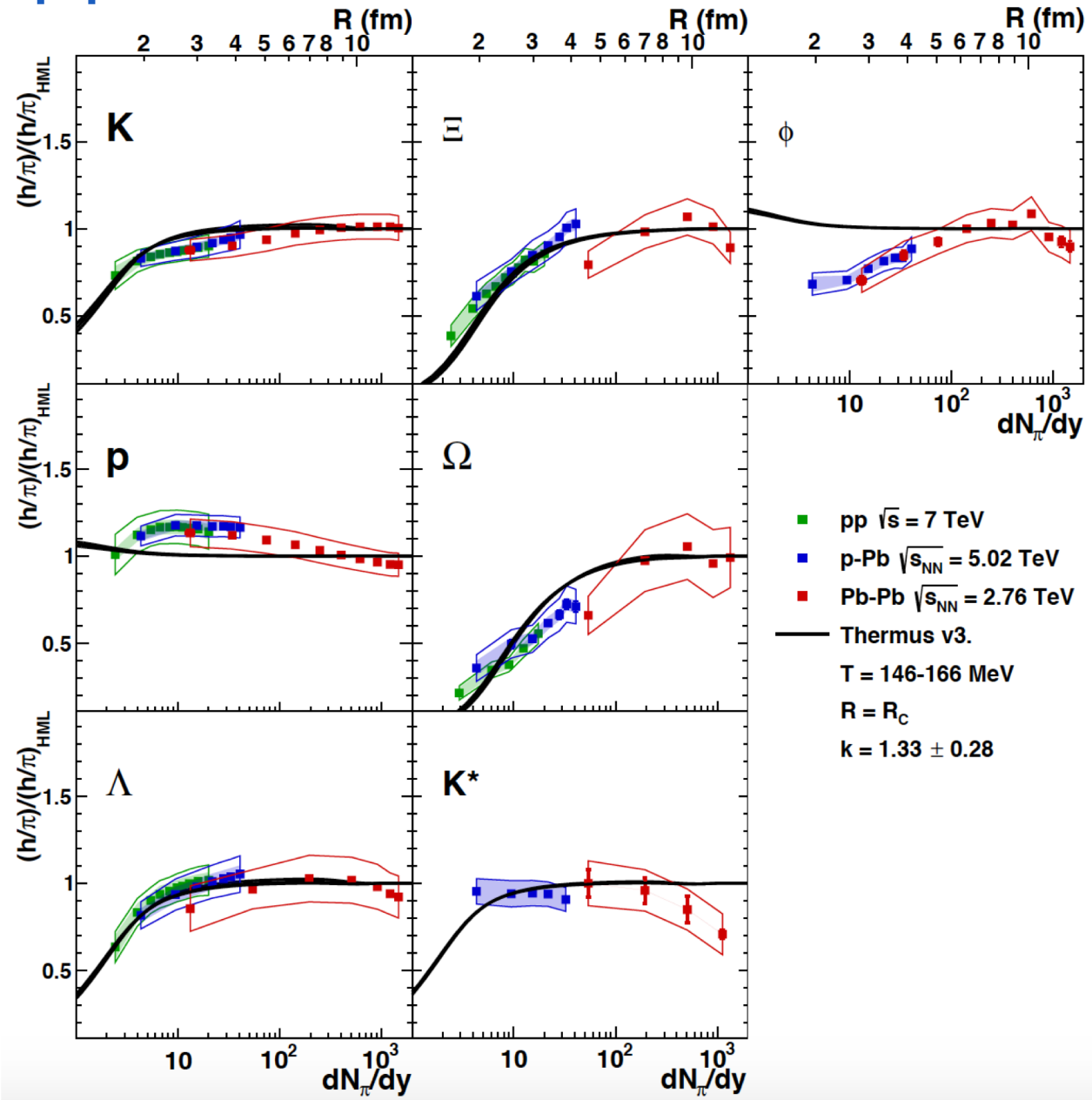


ALI-PREL-155907

Slightly decreasing trend of proton to pion ratio with increasing centrality observed in both Xe-Xe and Pb-Pb at both energies.

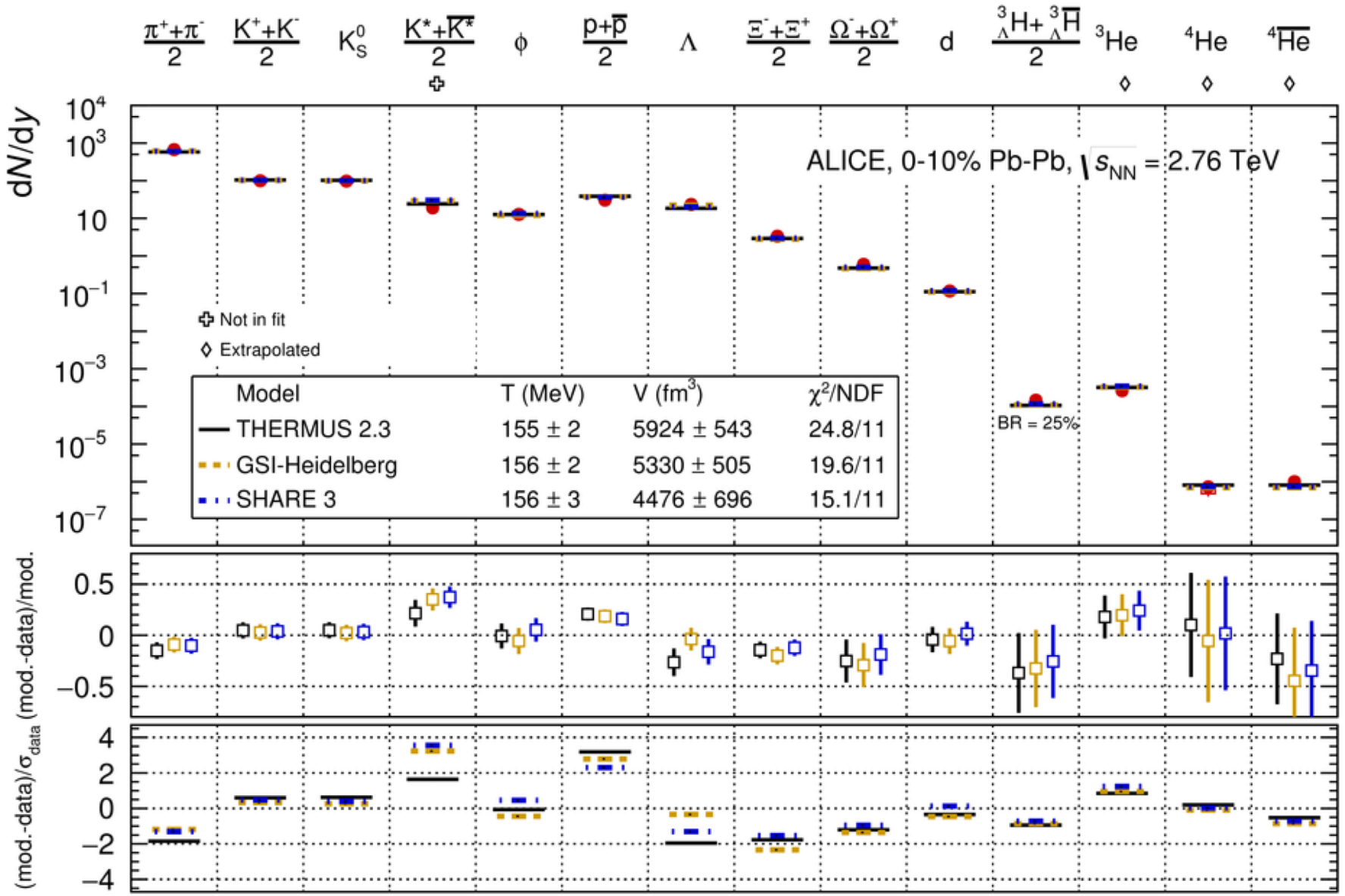
→ Leads to increasing differences and lower chemical freeze-out temperature in thermal-statistical fit with increasing multiplicity.

Strangeness canonical suppression

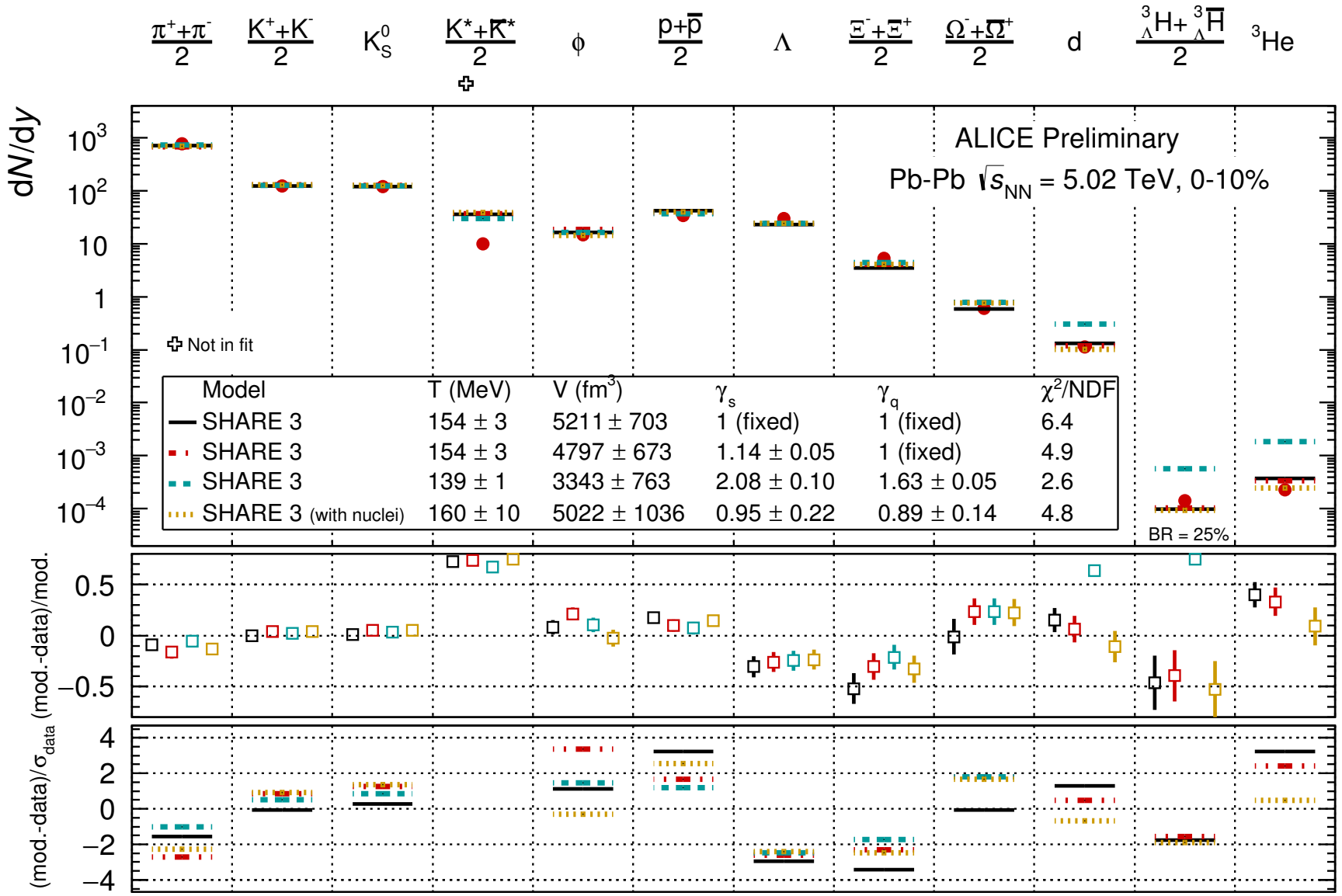


[V. Vislavicius, AK, arXiv:1610.03001]

Thermal fit 2.76 TeV Pb-Pb



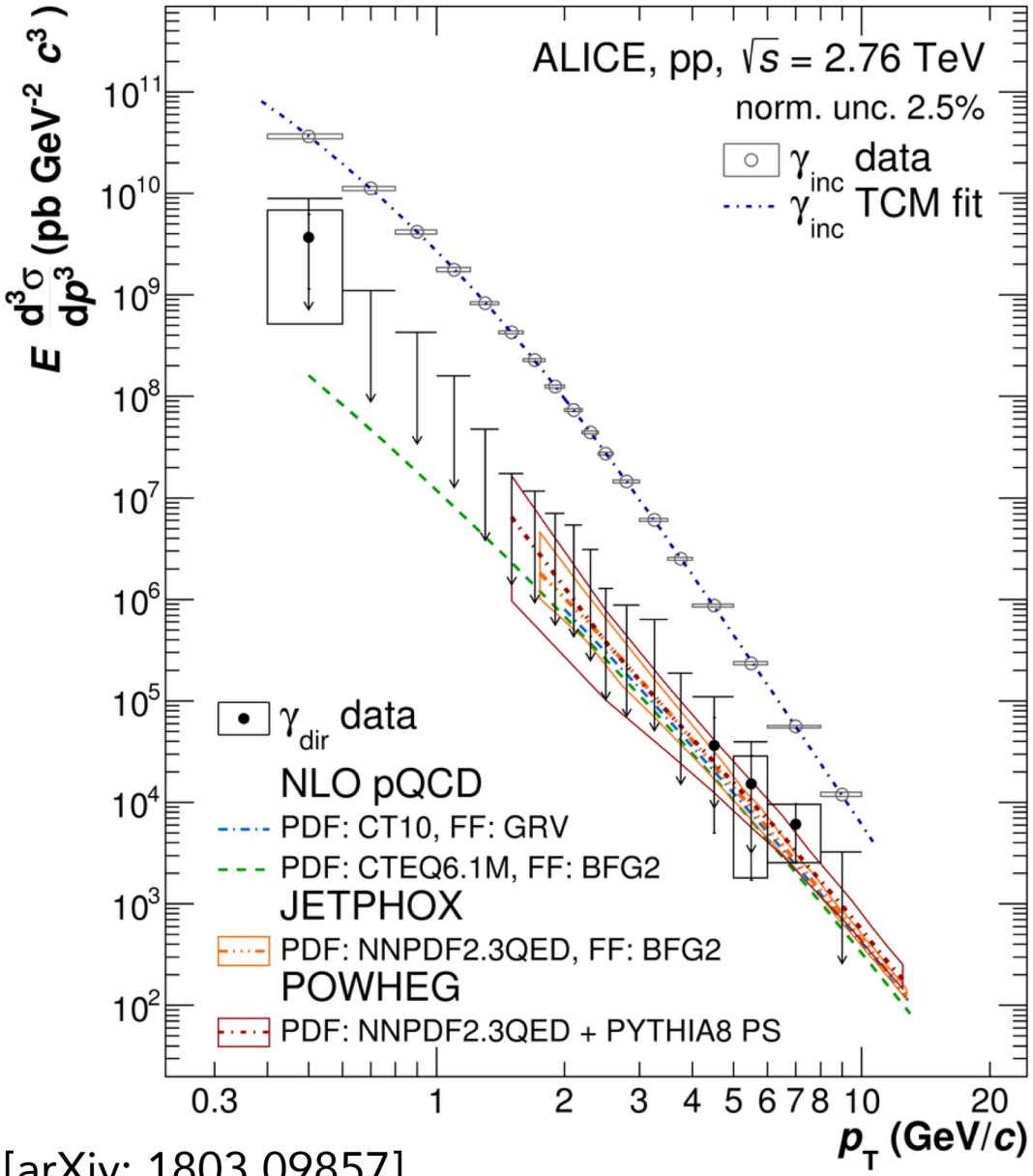
Thermal fit with non-equilibrium parameters



Model	T (MeV)	V (fm^3)	γ_s	γ_q	χ^2/NDF
SHARE 3	154 ± 3	5211 ± 703	1 (fixed)	1 (fixed)	6.4
SHARE 3	154 ± 3	4797 ± 673	1.14 ± 0.05	1 (fixed)	4.9
SHARE 3	139 ± 1	3343 ± 763	2.08 ± 0.10	1.63 ± 0.05	2.6
SHARE 3 (with nuclei)	160 ± 10	5022 ± 1036	0.95 ± 0.22	0.89 ± 0.14	4.8

ALI-PREL-154871

Direct photon production in pp and p-Pb collisions (1)

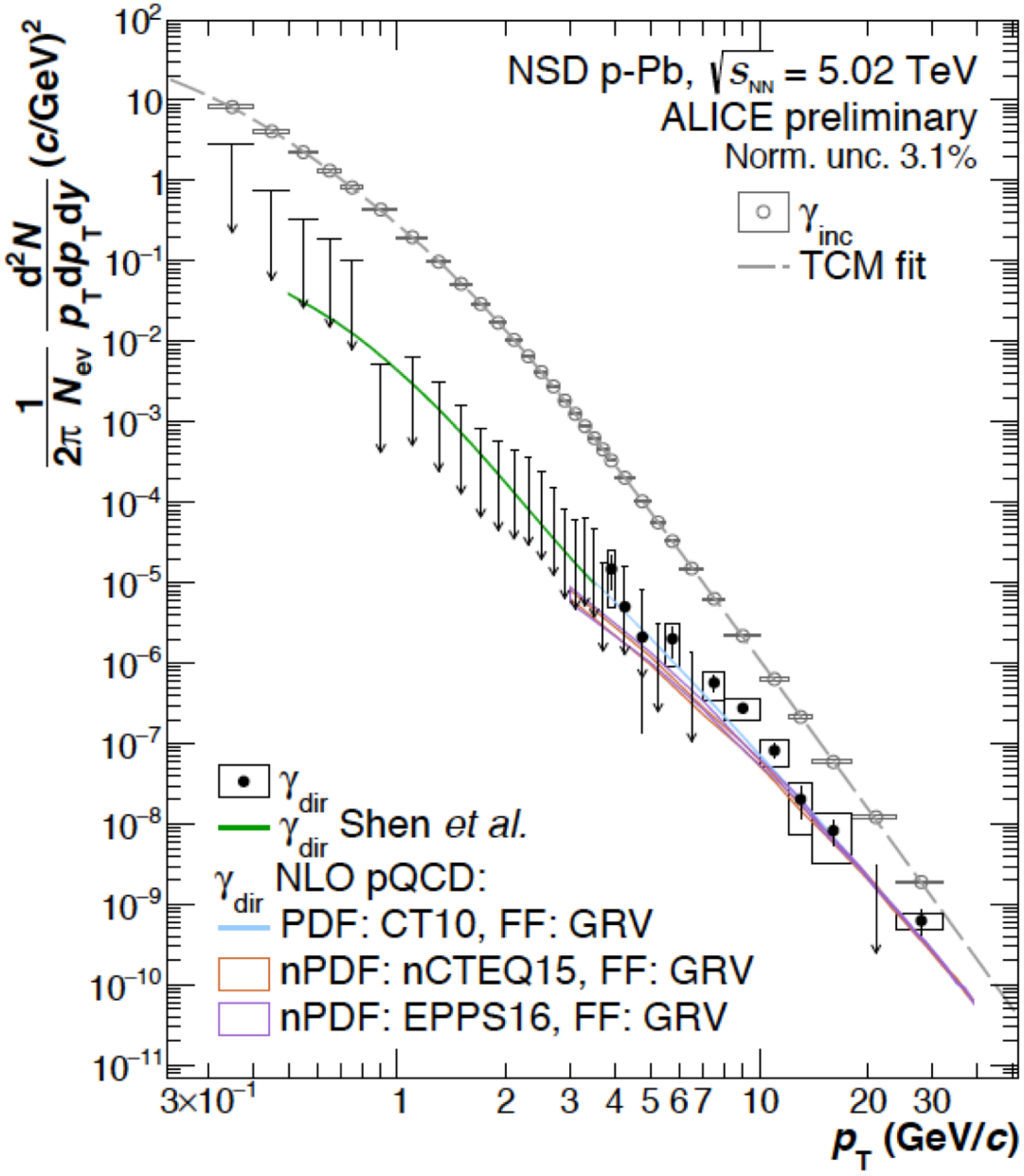


[arXiv: 1803.09857]

→ Expected excess of direct photons with respect to decay photons is only ≈1-3% at low momenta => still not in reach with current statistical and systematic uncertainty.

→ Direct photon spectrum can be extracted above ≈ 4 GeV/c where it is in agreement with pQCD calculations.

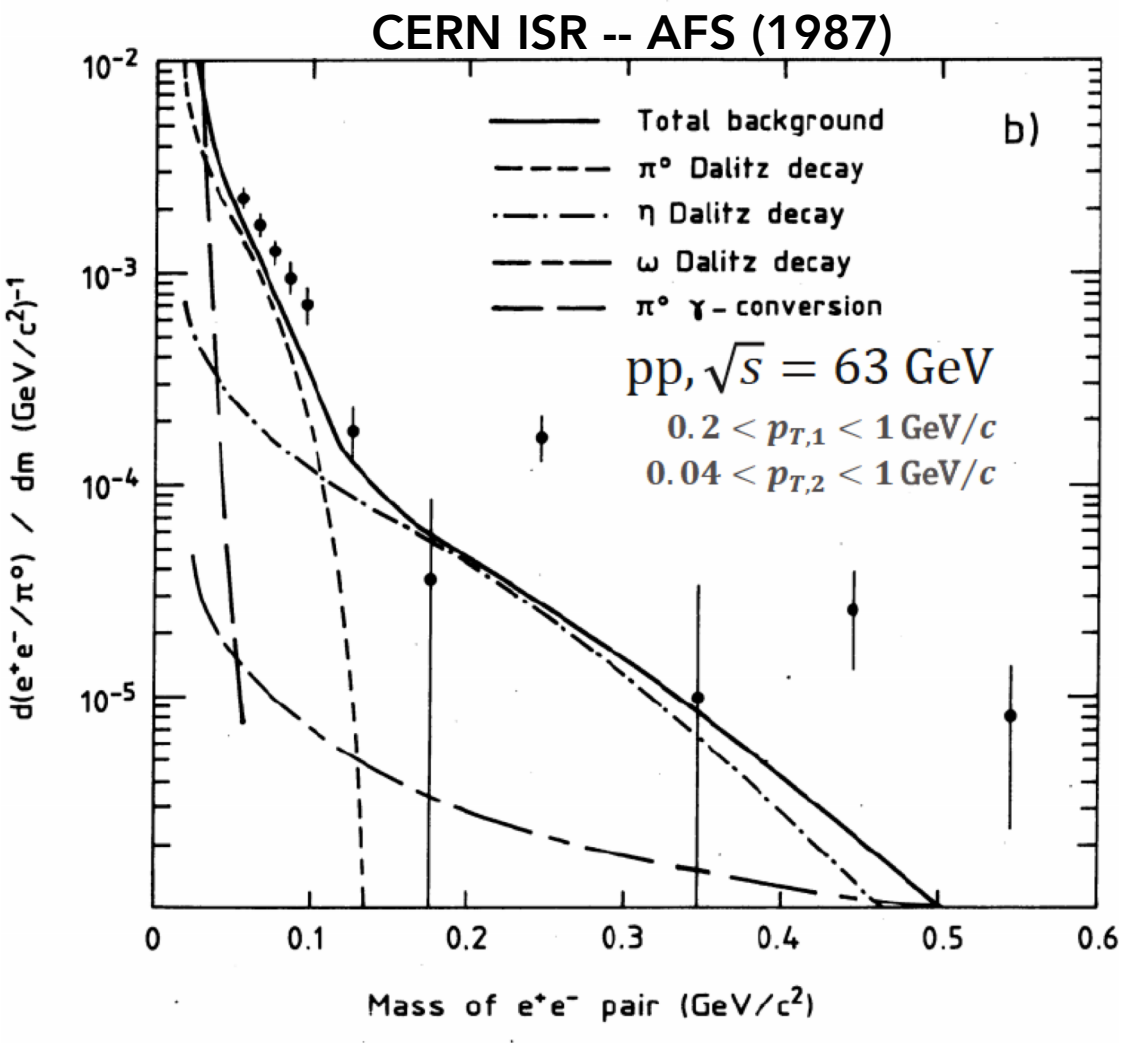
Direct photon production in pp and p-Pb collisions (2)



→ Expected excess of direct photons with respect to decay photons is only ≈1-3% at low momenta => still not in reach with current statistical and systematic uncertainty.

→ Direct photon spectrum can be extracted above ≈ 4 GeV/c where it is in agreement with pQCD calculations.

Low mass di-leptons with low magnetic field (B=0.2T)



→ Rise in e/π ratio at low pT was observed at ISR energies and attributed to low-mass dielectron pairs.

→ Excess above the cocktail was observed in $0.05 < m_{ee} < 0.6$ GeV/c^2.

→ Unresolved issue in the field: "Challenge for the future" (30 years of heavy-ions at CERN workshop in 2016)