Selected highlights from QM2014

--- 19-24/May/2014, Darmstadt, Germany ---

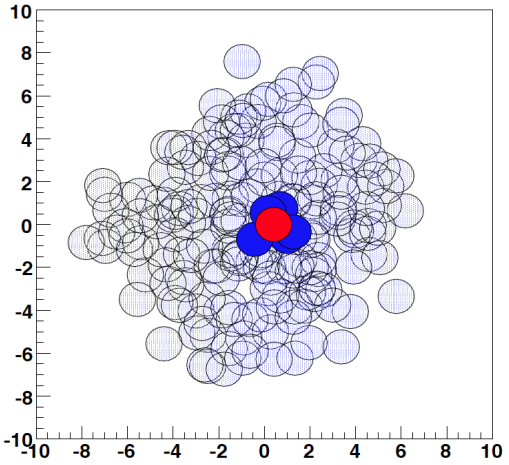
ShinIchi Esumi, Univ. of Tsukuba

contents

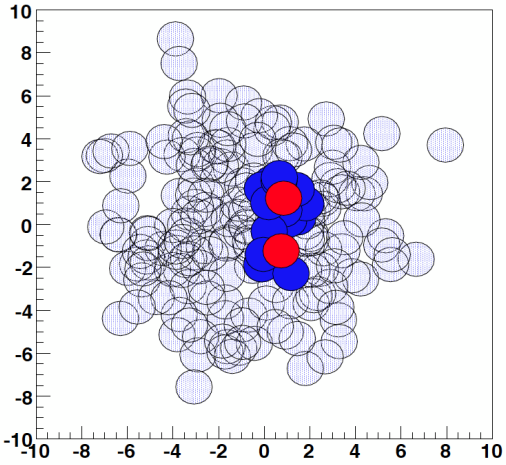
- pPb at LHC, dAu at RHIC
- HF, jet, flow and fluctuation
- energy scan

Many thanks to H. Masui, T. Niida and T. Todoroki (Tsukuba)
for fruitful discussions

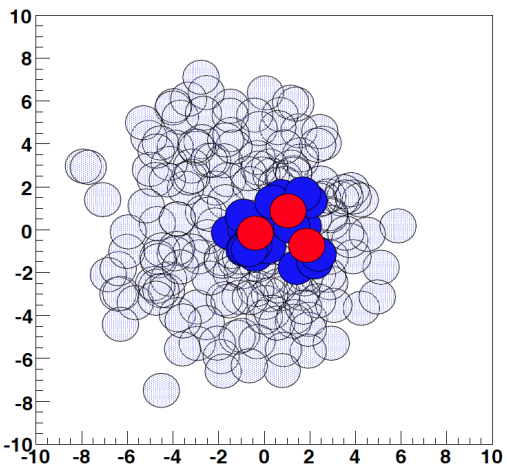
pA



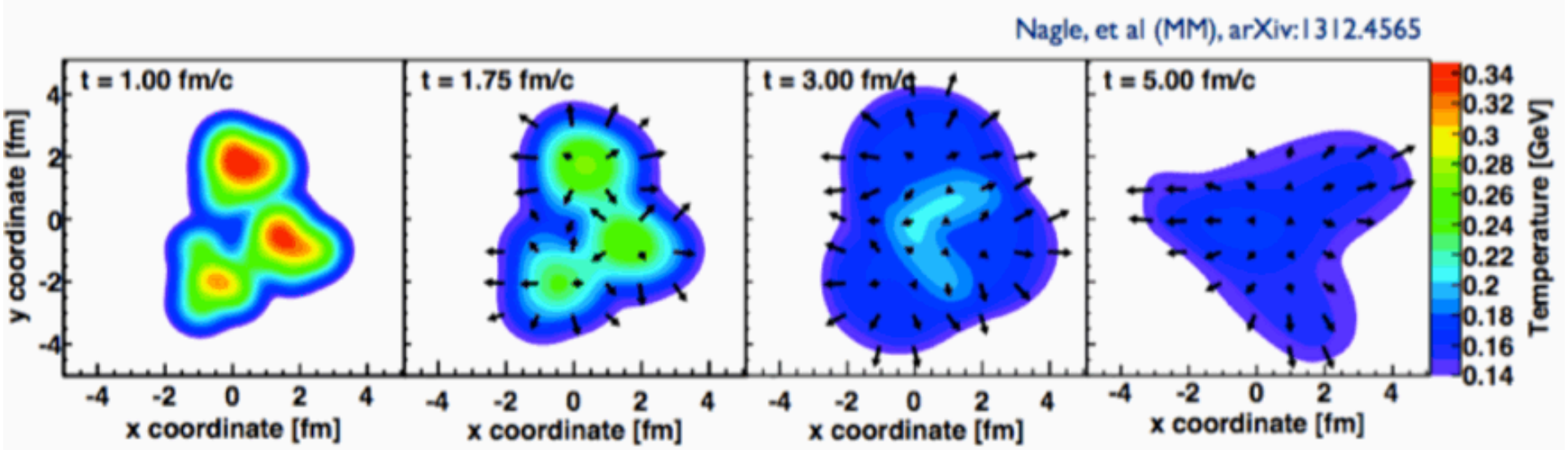
dA



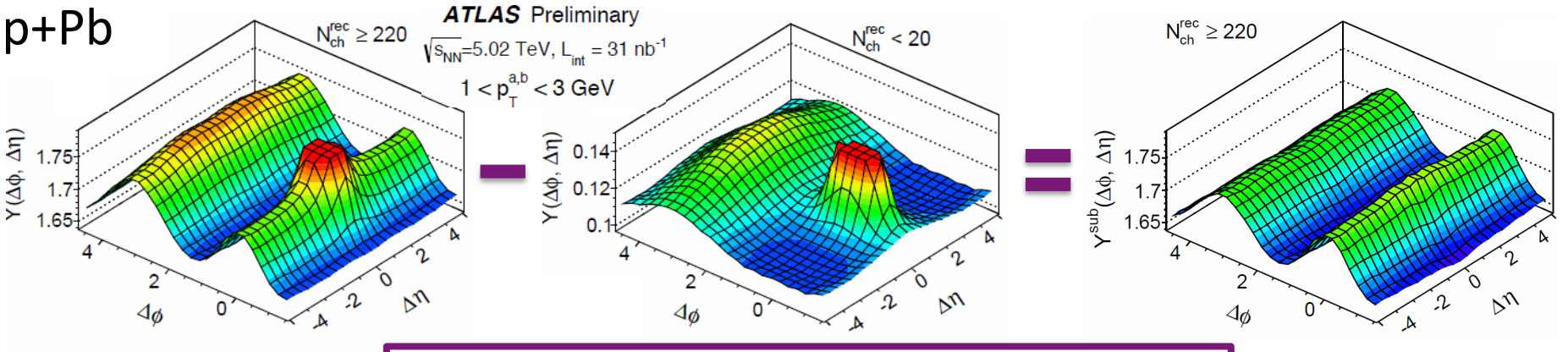
^{3}HeA



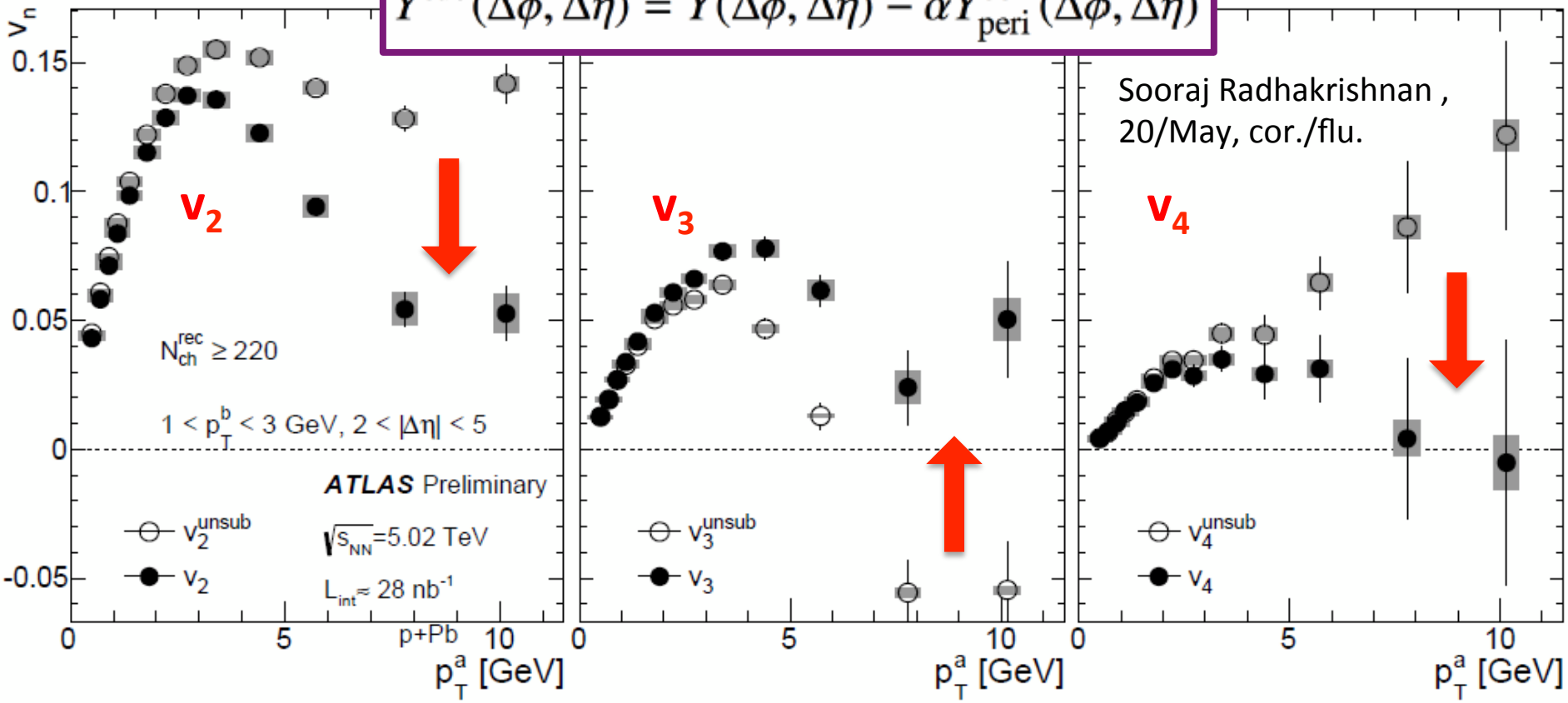
Anne Sickles, 22/May



p+Pb

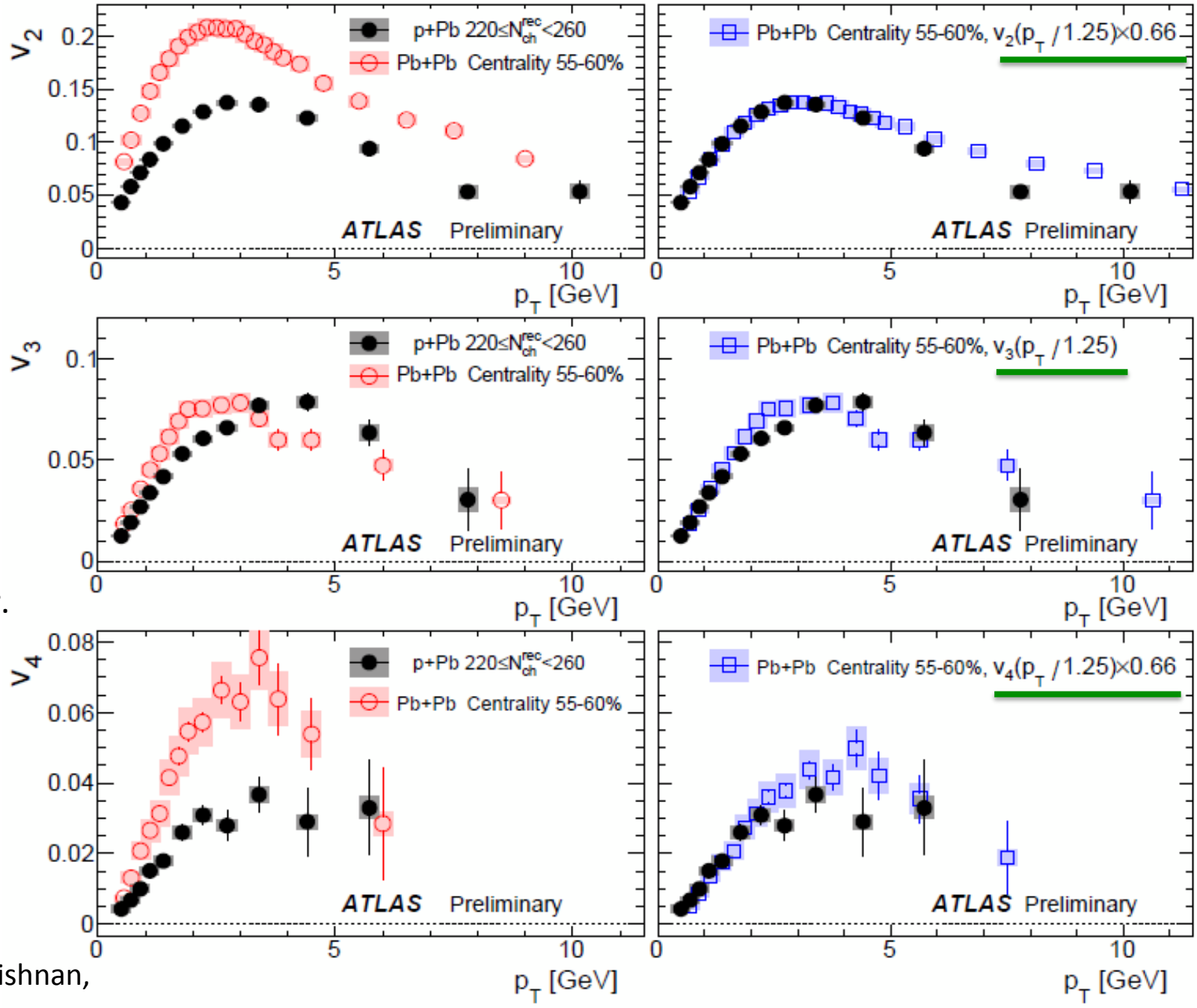


$$Y^{\mathrm{sub}}(\Delta\phi,\Delta\eta) = Y(\Delta\phi,\Delta\eta) - \alpha Y^{\mathrm{corr}}_{\mathrm{peri}}(\Delta\phi,\Delta\eta)$$



[p + Pb]
vs
[Pb + Pb]

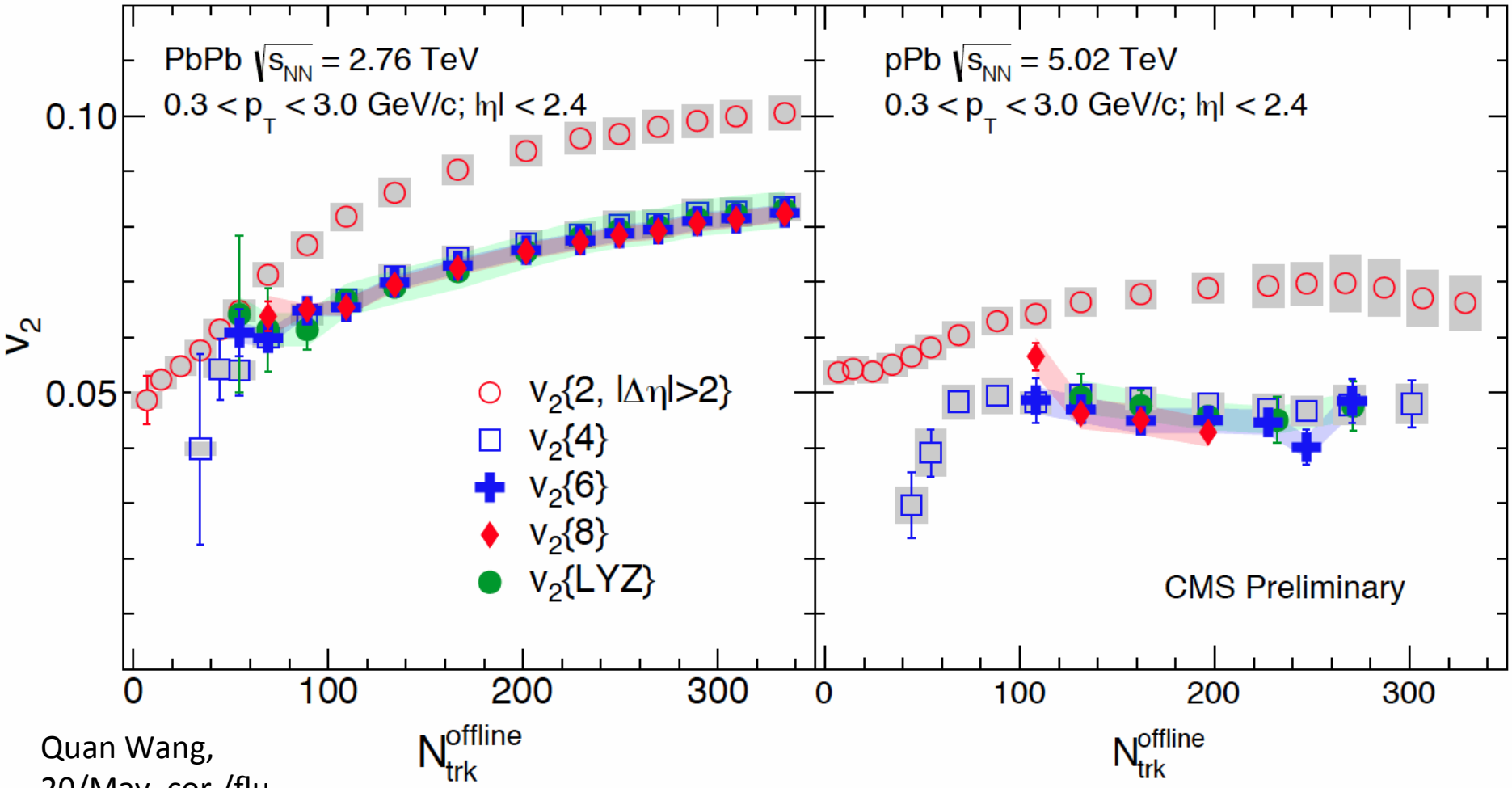
$v_n(p_T)$ shapes are all similar.



Sooraj Radhakrishnan, 20/May, cor./flu.

PbPb

pPb

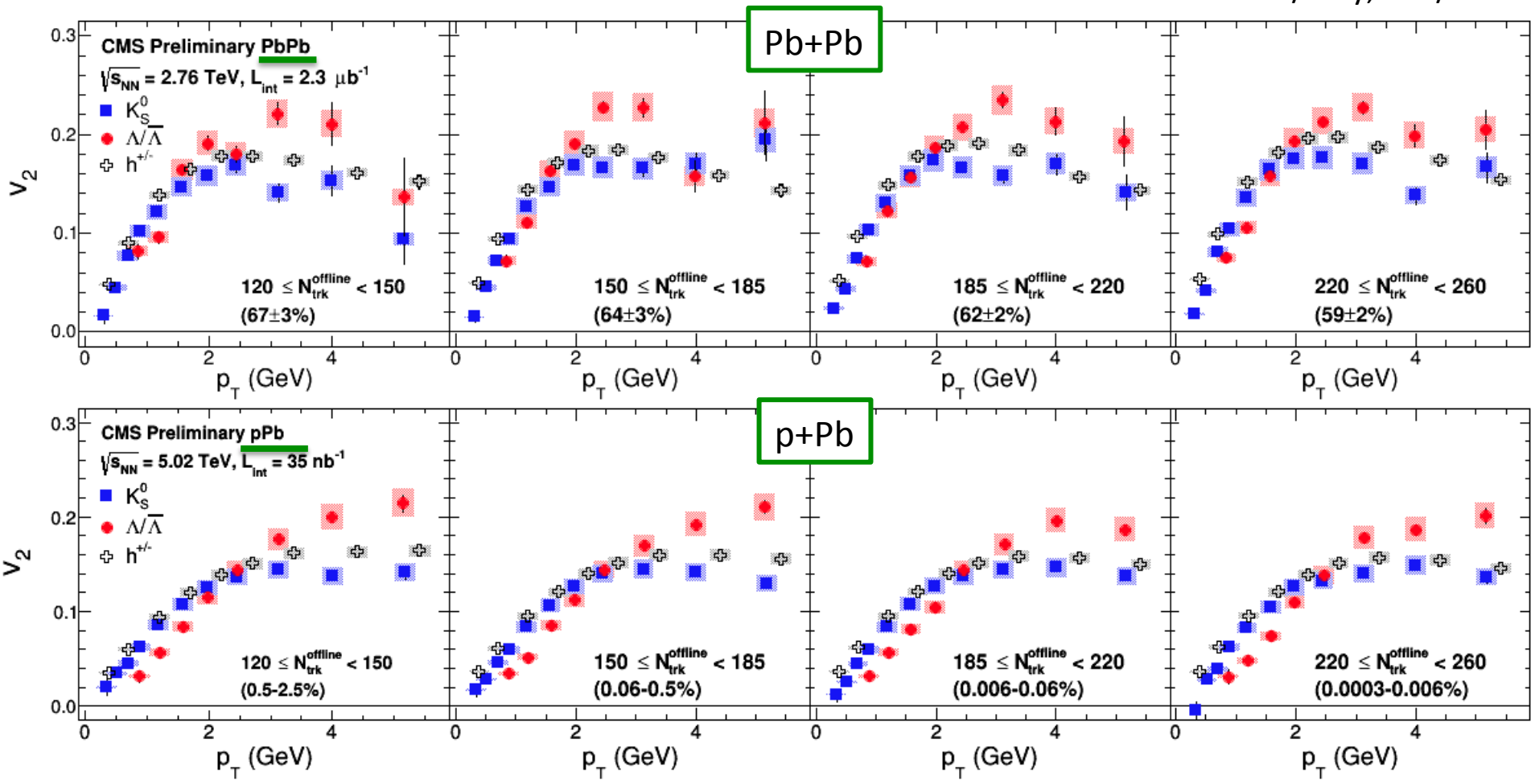


Quan Wang,
20/May, cor./flu.

multi-particle cumulant results
v_2{n} with higher n are all similar.

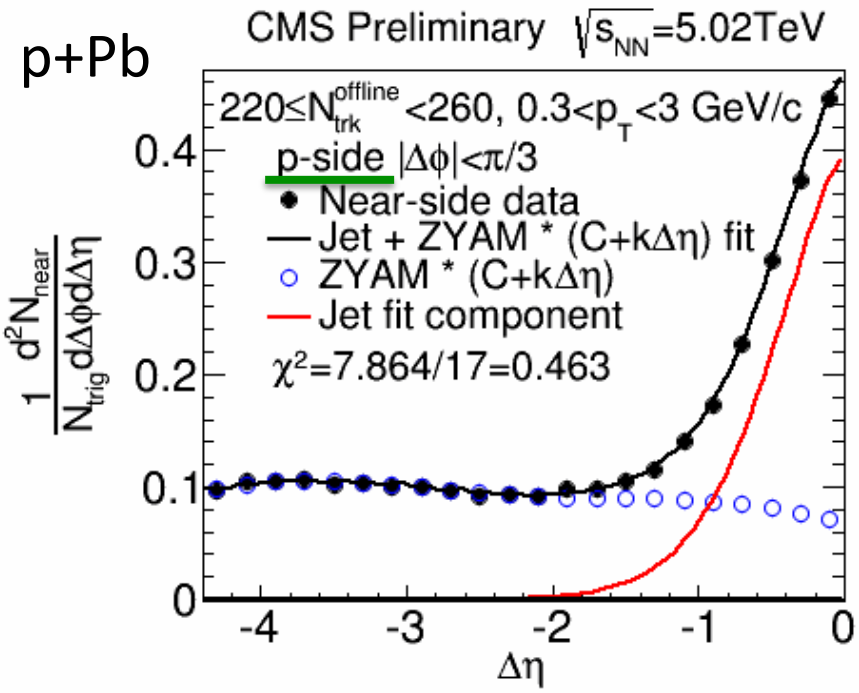
Comparison between Pb+Pb and p+Pb at the same multiplicity for PIDed v_2 as a function of pT

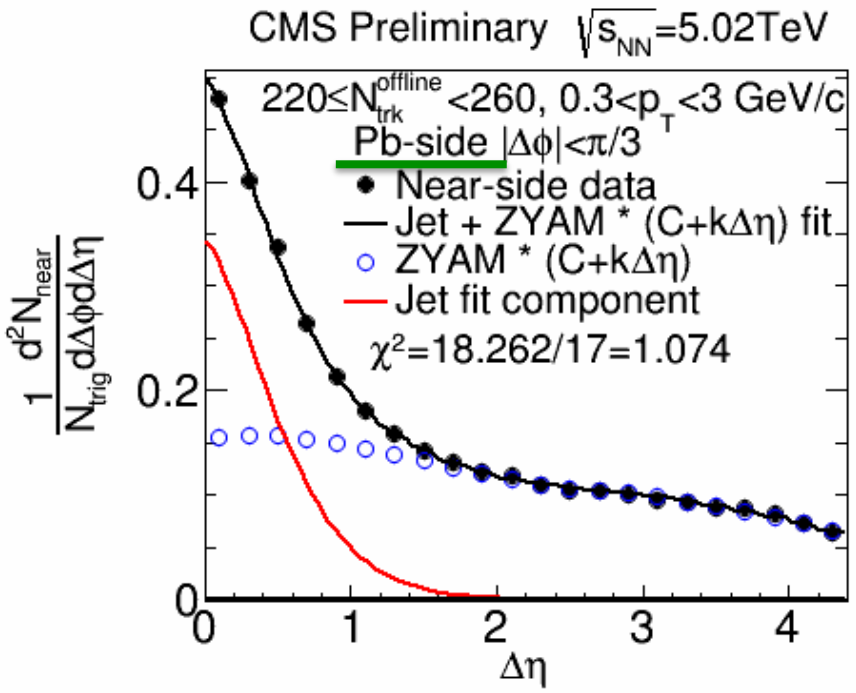
Monika Sharma,
20/May, cor./flu.

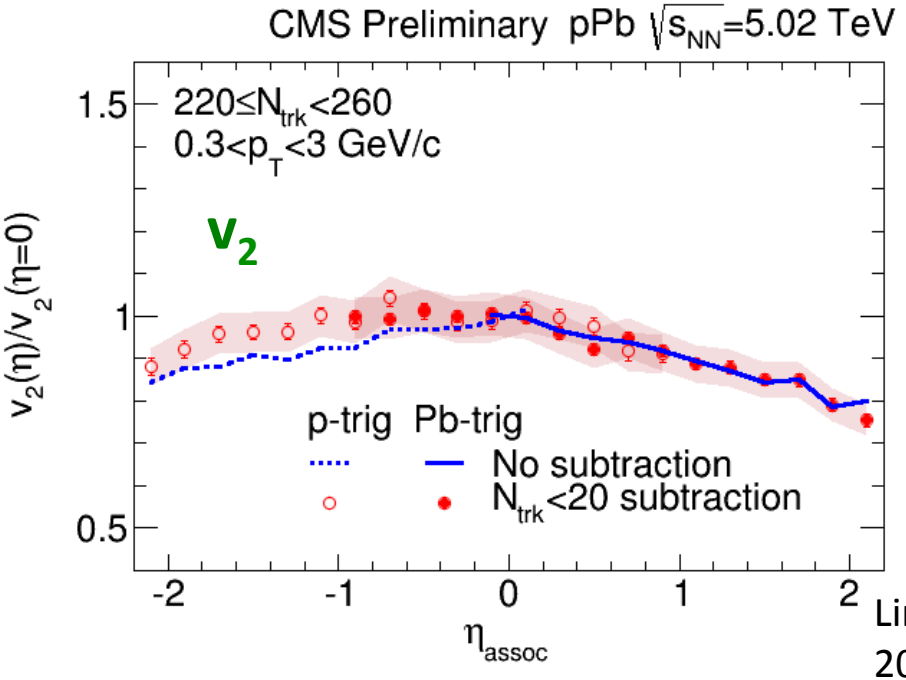


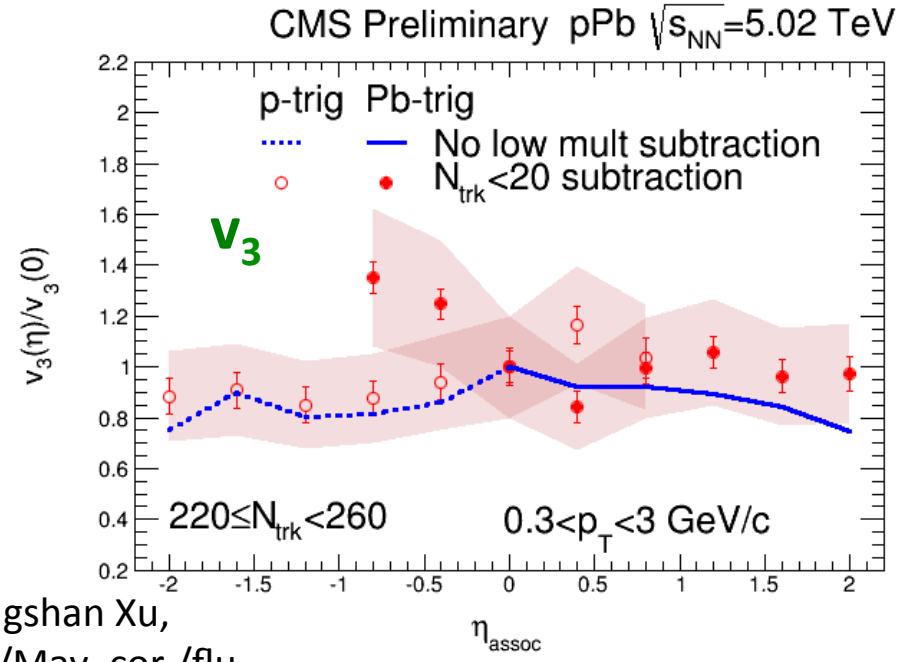
mass- and baryon-meson dependences are all similar
or even larger splitting for pA?

p+Pb



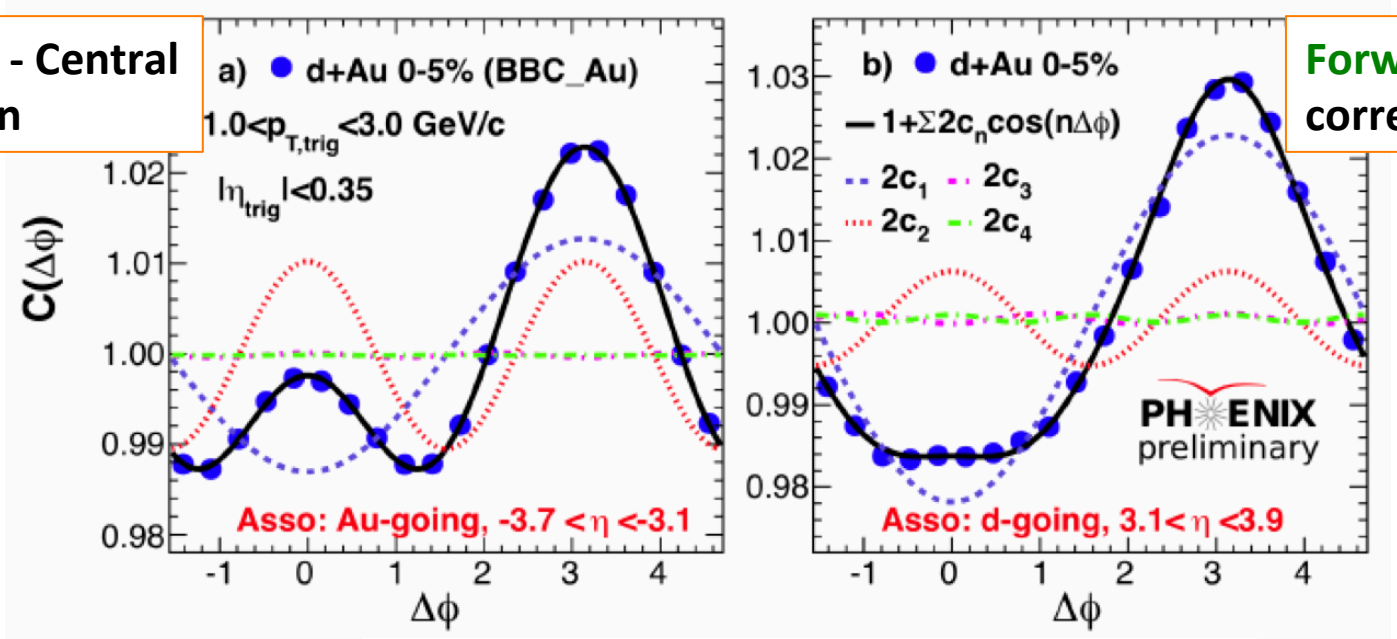






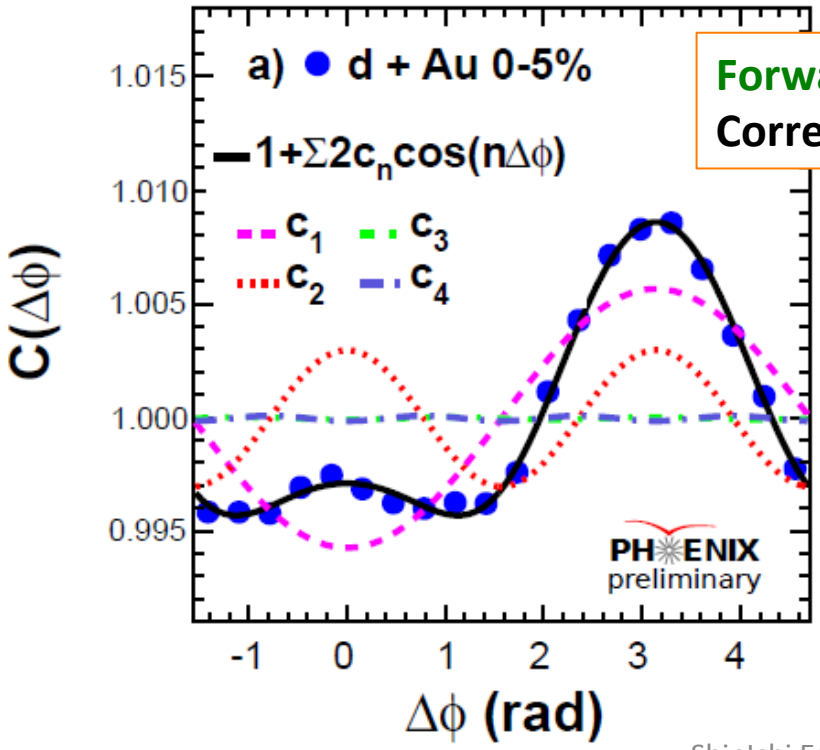
Lingshan Xu,
20/May, cor./flu.

Backward - Central correlation



Forward - Central correlation

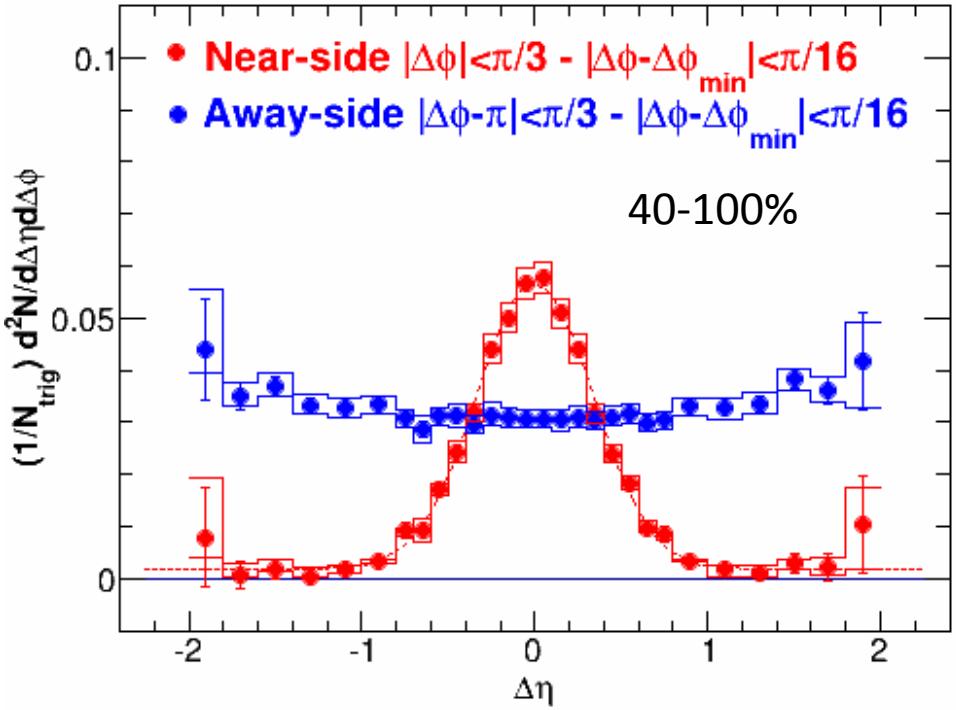
200GeV d + Au
at RHIC-PHENIX

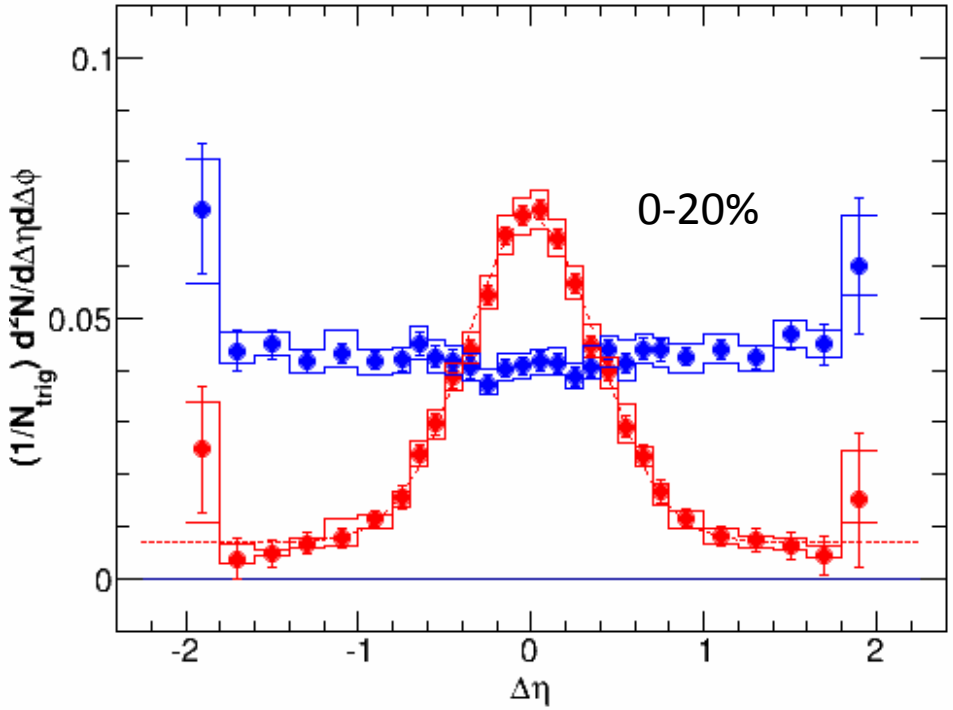


Forward - Backward
Correlation with |Δη| > 6.0

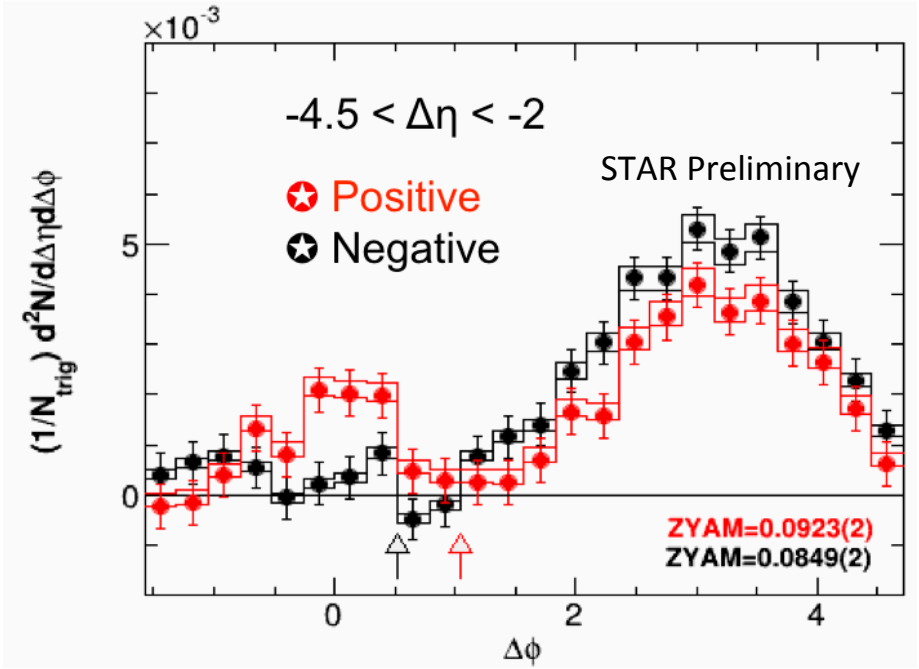
Au-going : -3.7 < η < -3.1
d-going : 3.1 < η < 3.9

Shengli Huang,
20/May, cor./flu.





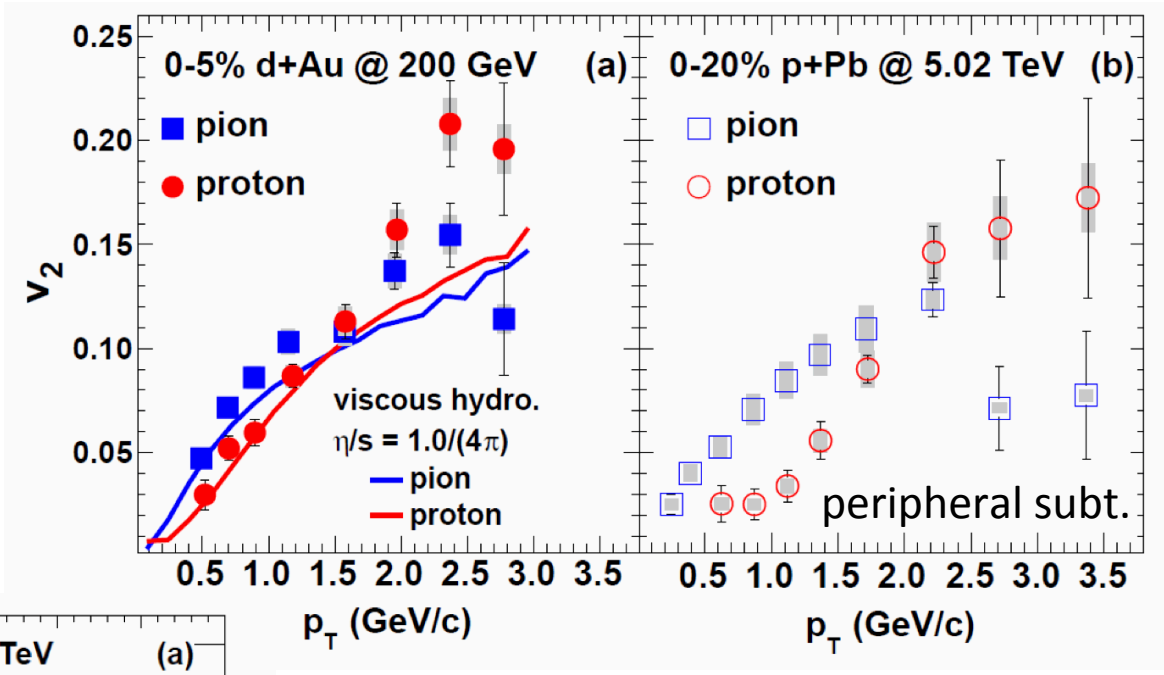
200GeV d + Au
at RHIC-STAR

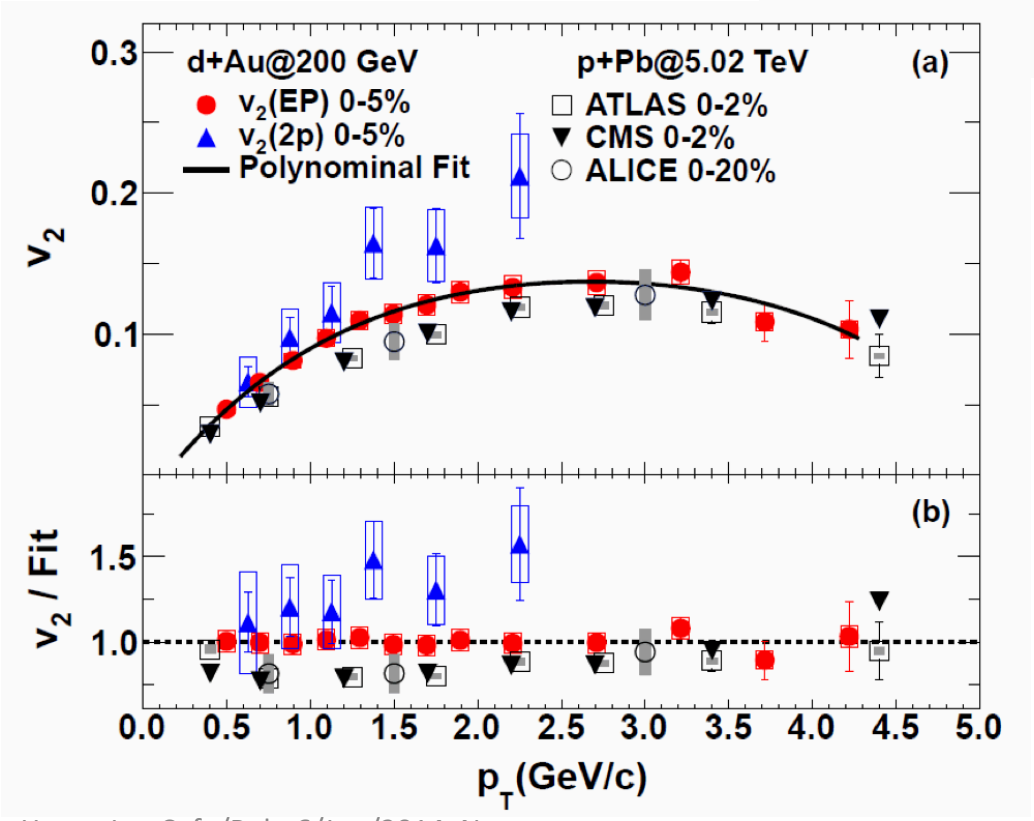


STAR claims
no flow effect
in dAu.

Yi Li,
19/May, initial state

200GeV d + Au
at RHIC-PHENIX





two PHENIX results

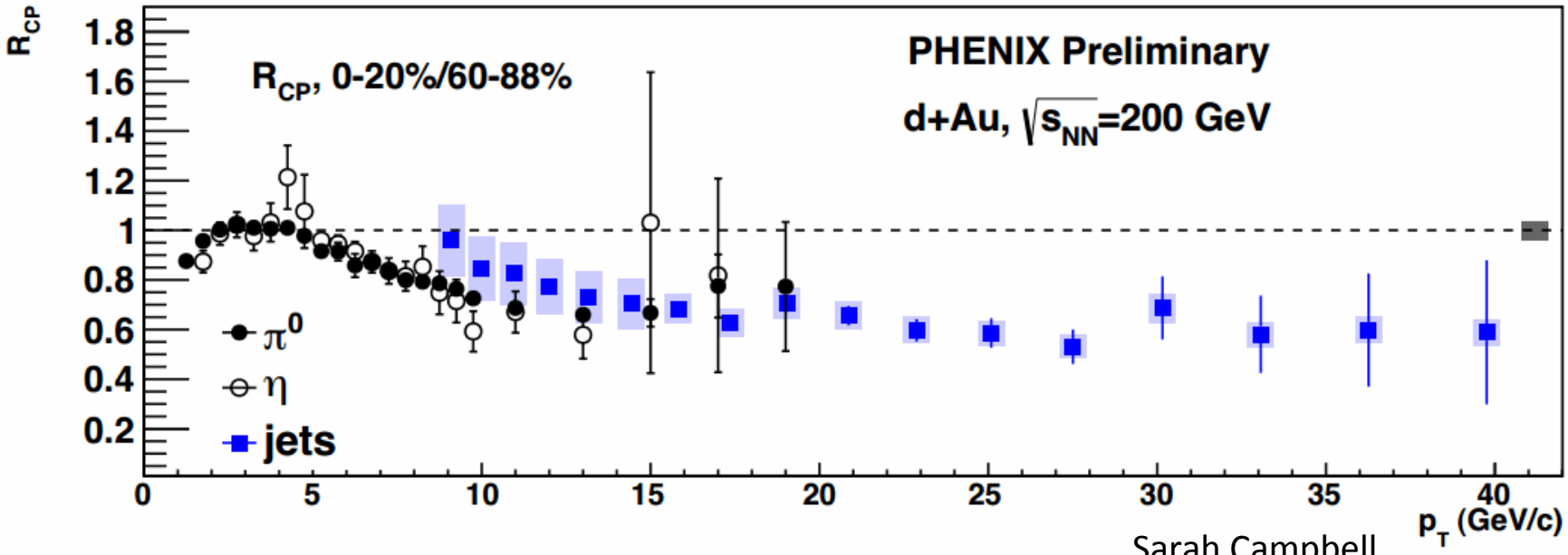
2P : two particle within $|\eta|<0.35$
and peripheral subtracted

EP^{MPC} : resolution is determined
via 3-sub event correlations

- Φ_2 central arm [$|\eta|<0.35$]
- Φ_2 Au-side MPC [$-4<\eta<-3$]
- Φ_1 Au-spectator ZDC [$\eta<-5$]

Shengli Huang,
20/May, cor./flu.

Jet suppression in dAu?



Sarah Campbell, 19/May, collective

Correction factor, c

$$R_{dA} = \frac{c\, dN^{d+Au}/dy}{\langle N_{Coll}\rangle\, dN^{p+p}/dy}$$

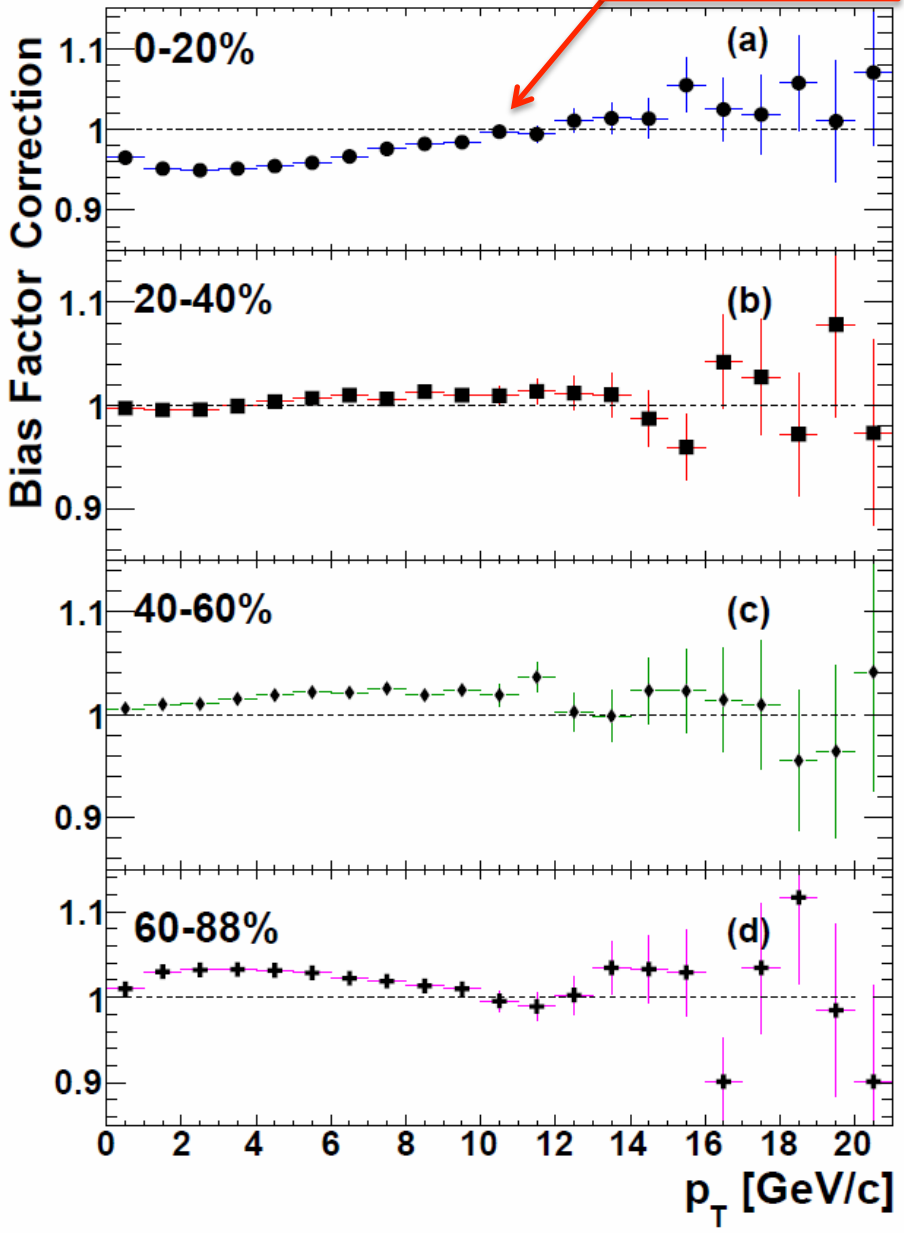
Centrality	Bias Factor, c
0-20%	0.94 ± 0.01
20-40%	1.00 ± 0.01
40-60%	1.03 ± 0.02
60-88%	1.03 ± 0.06

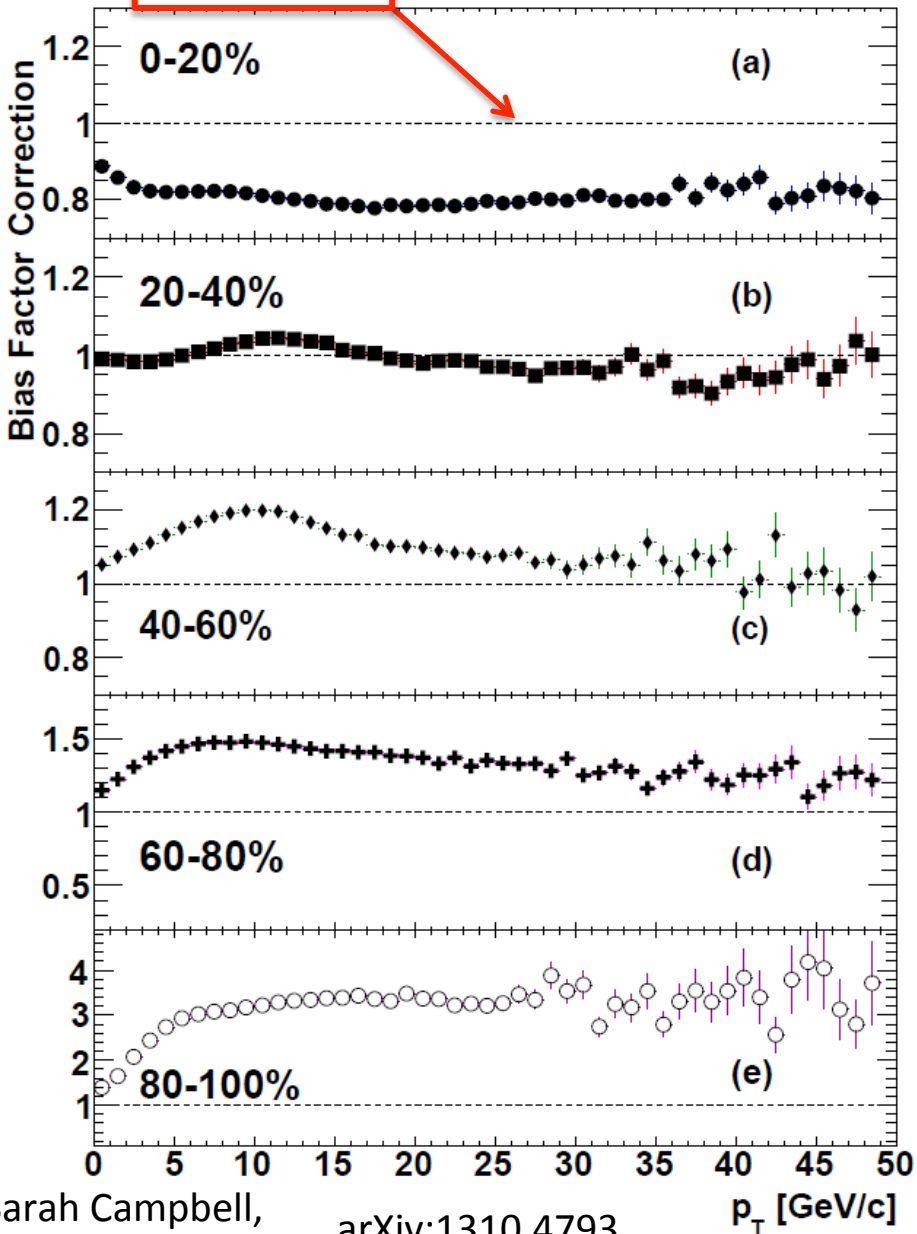
Multiplicity effect only

Competing effects
- Trigger bias: 0.89
- Multiplicity effect: 1.16

These corrections are in **all** of our d+Au publications, both the 2003 and 2008 data

Bias test at dAu (RHIC) and at pPb(LHC) with Hijing

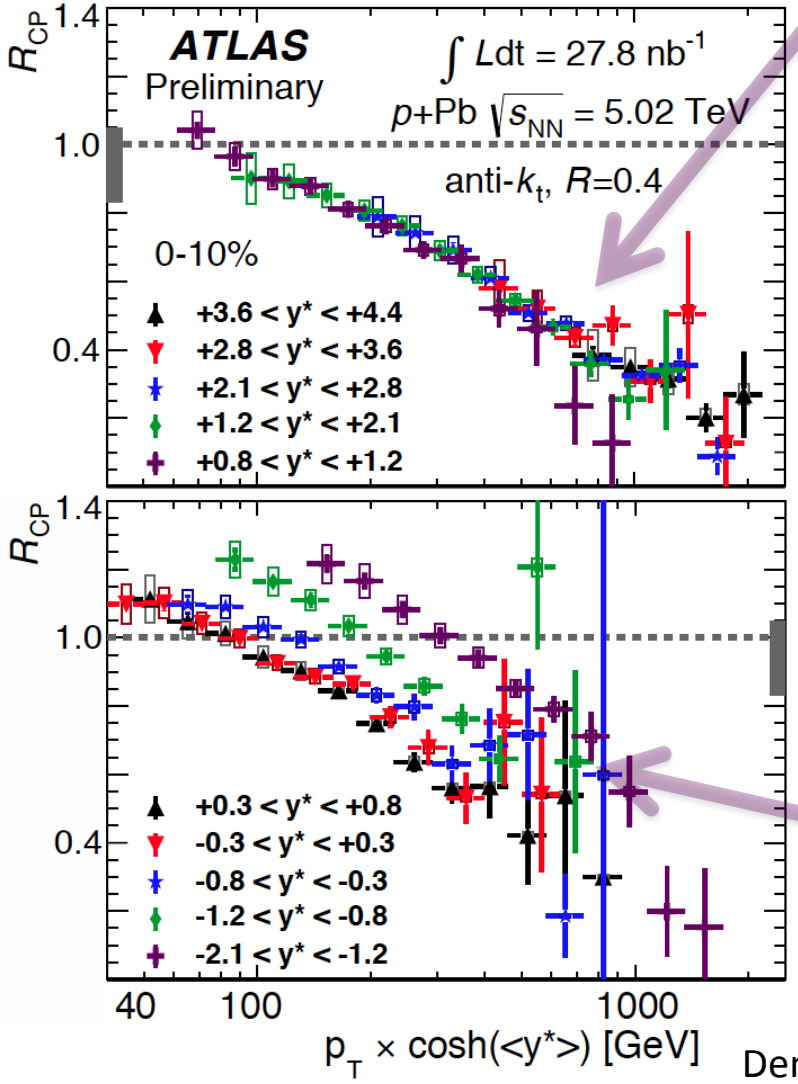


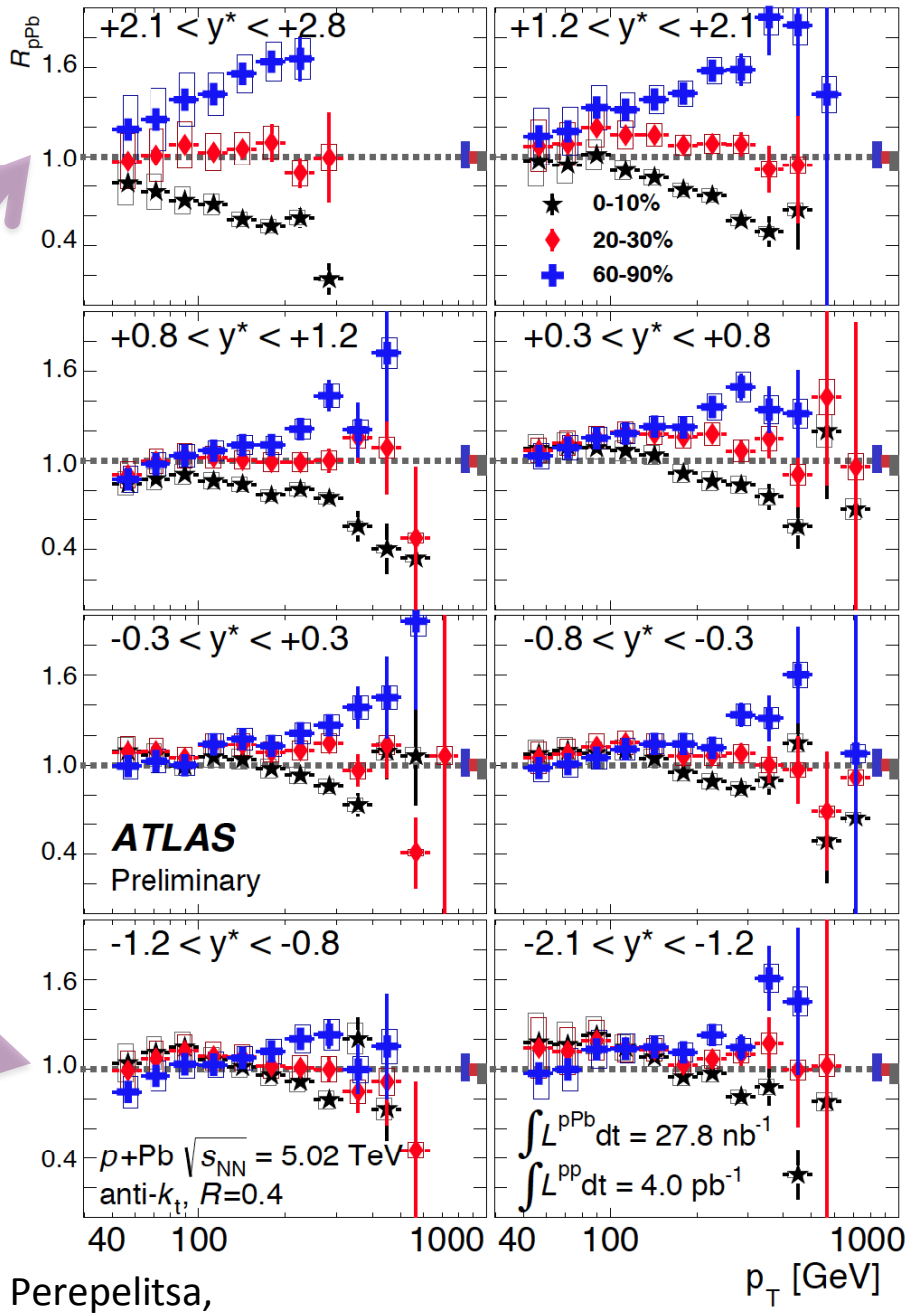


Sarah Campbell, 19/May, collective

arXiv:1310.4793

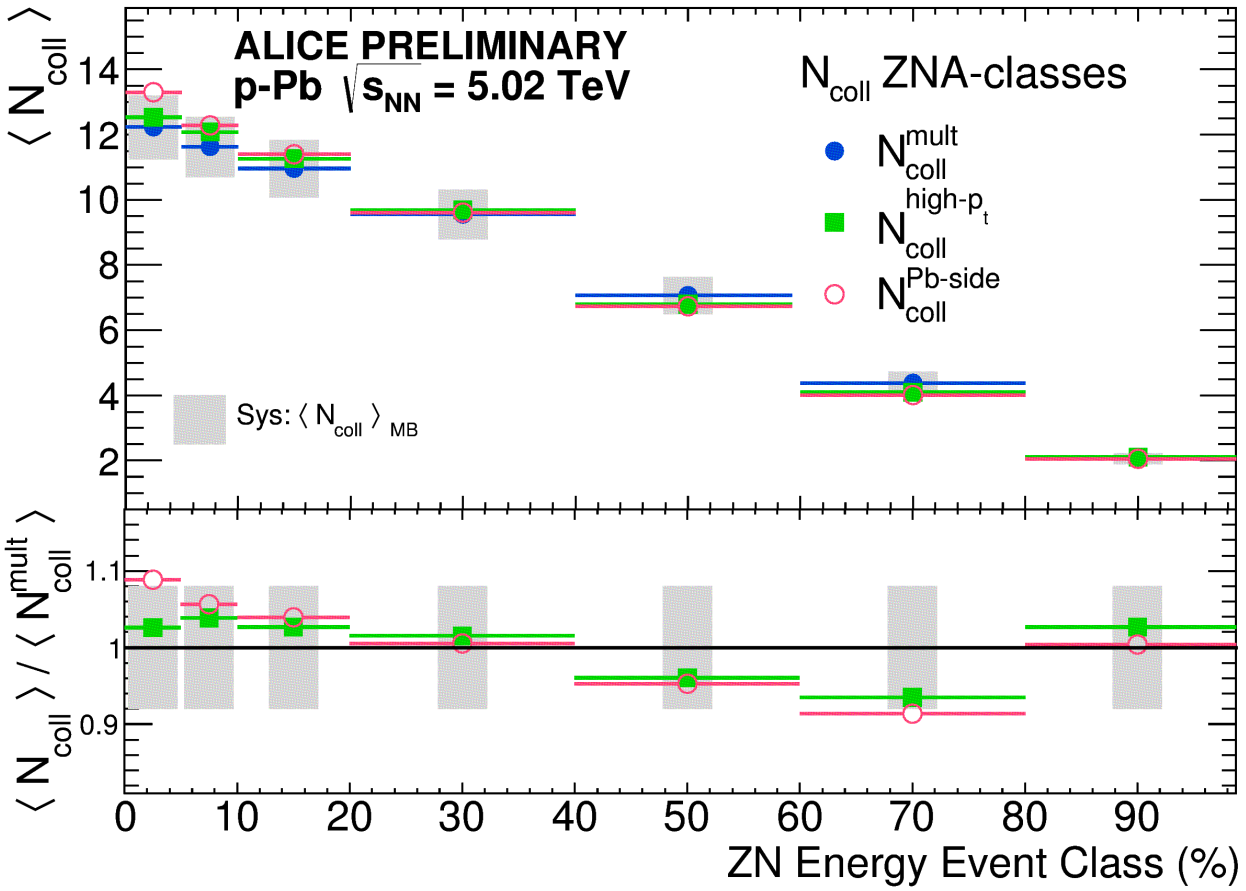
Jet suppression in central pPb? or enhancement in peripheral?



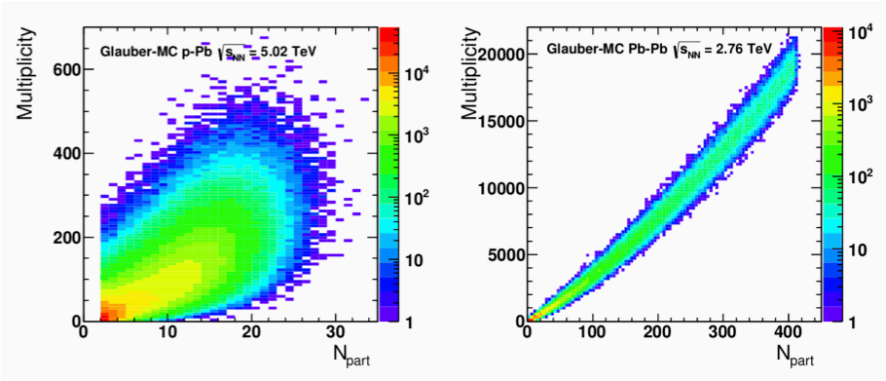


Dennis Perepelitsa, 20/May, Jets

Centrality Event Class definition in pA



Alberica Toia,
19/May, Initial state



Assumption:

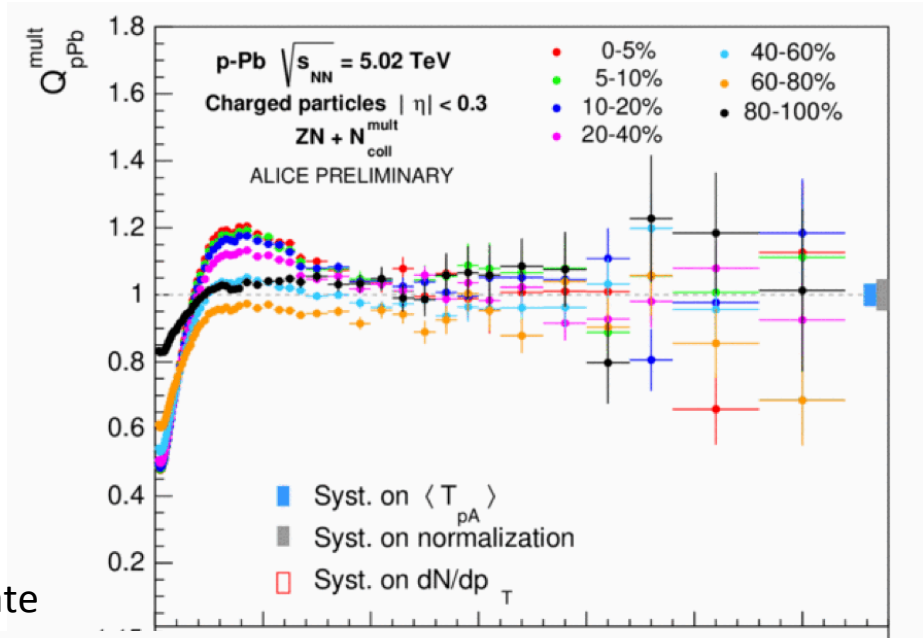
- Mid-rap dN/dh scales with N_{part} (= N_{coll} - 1 in pA)
- Pb-side dN/dh scales with N_{part}^{target} (= N_{coll} in pA)
- Yield at high-pT scales with N_{coll}

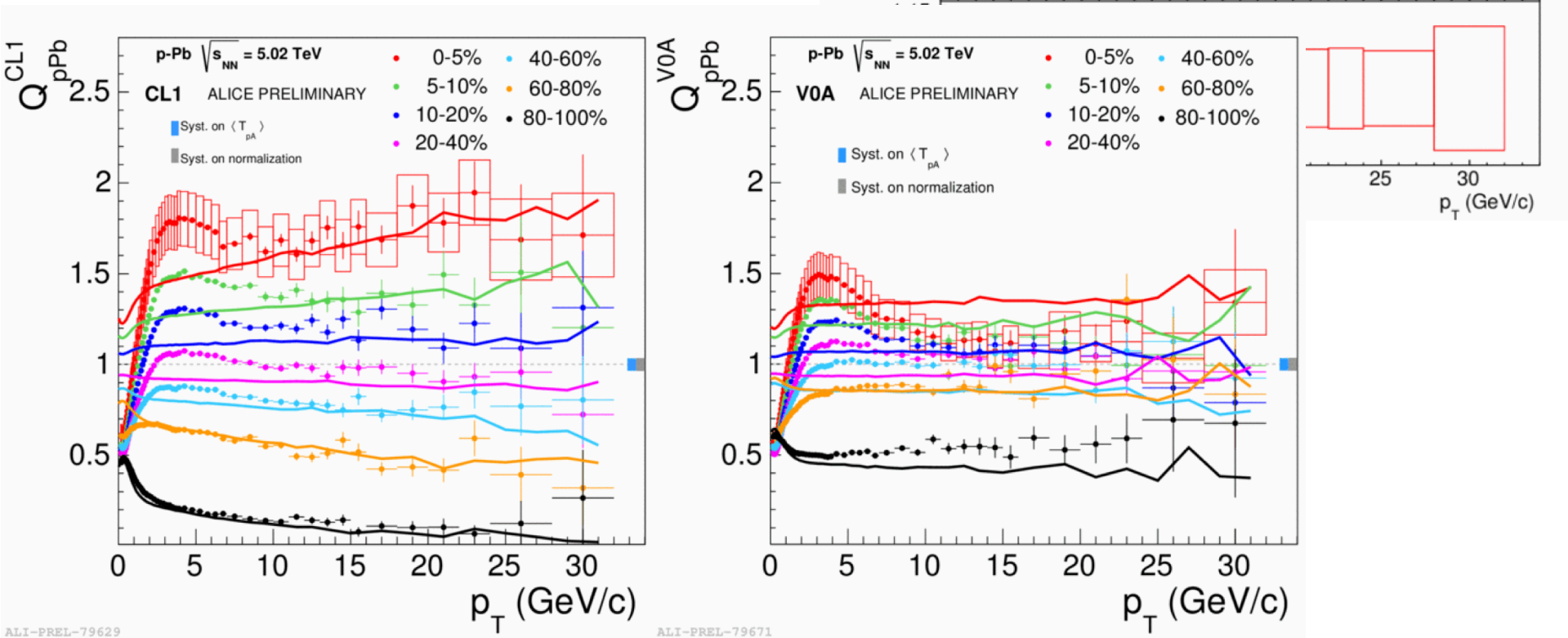
The result depends on η-region of "centrality estimator" in pA

$$Q^{i}_{pA} = \frac{dN_{pA}/dp_T}{\langle N_{coll} \rangle_i \, dN_{pp}/dp_T}$$

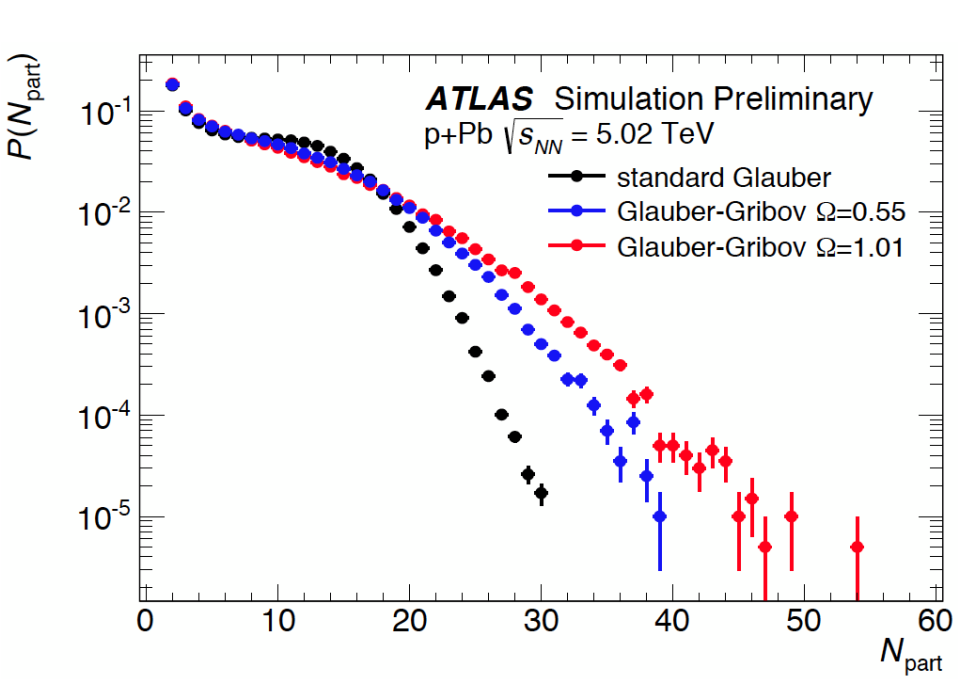
Multiplicity fluctuations
Jet-veto bias
Geometric bias

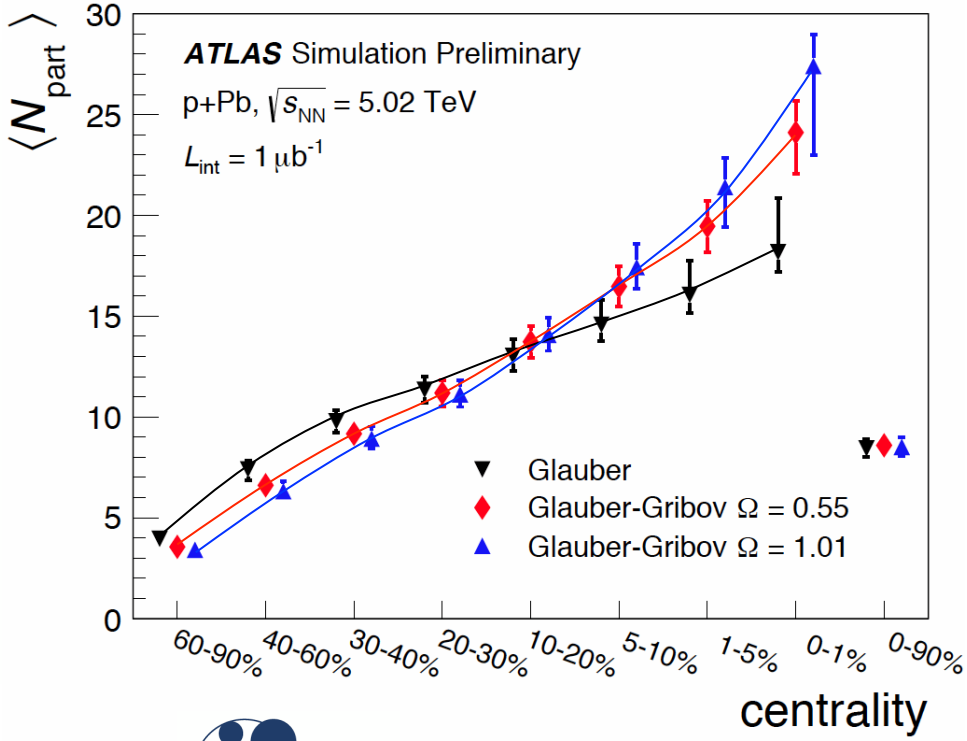
Alberica Toia,
19/May, Initial state





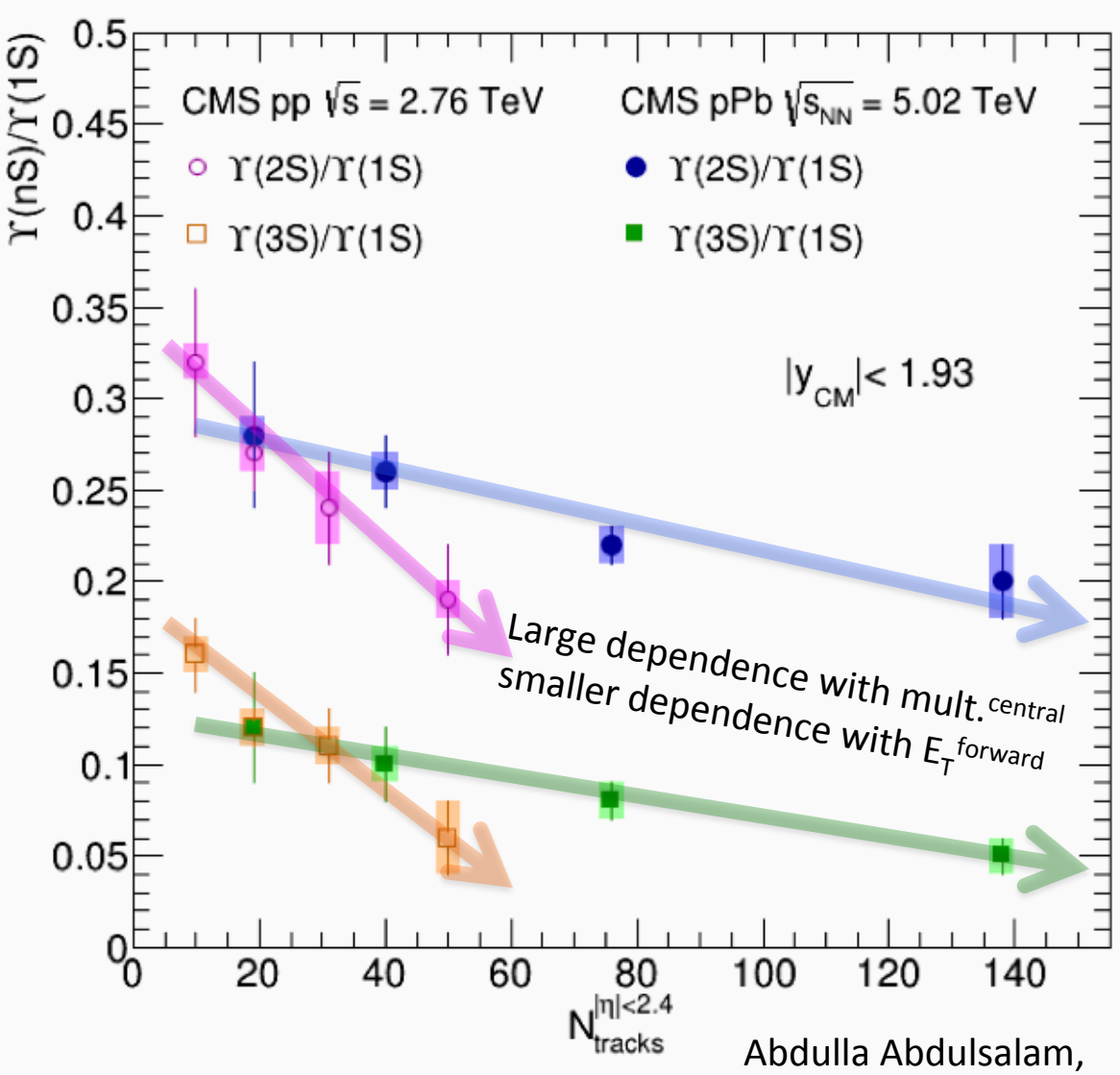
Glauber options for mapping centrality to N_{part}, N_{coll} in pA (ATLAS)

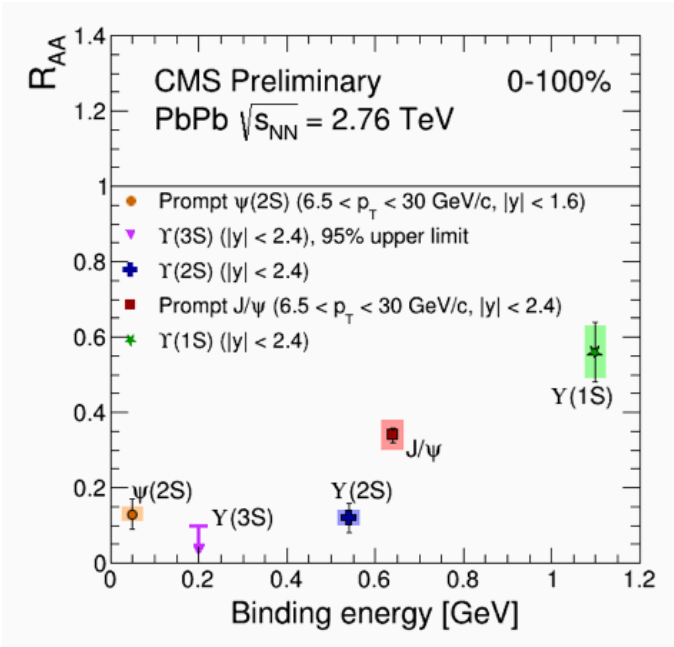


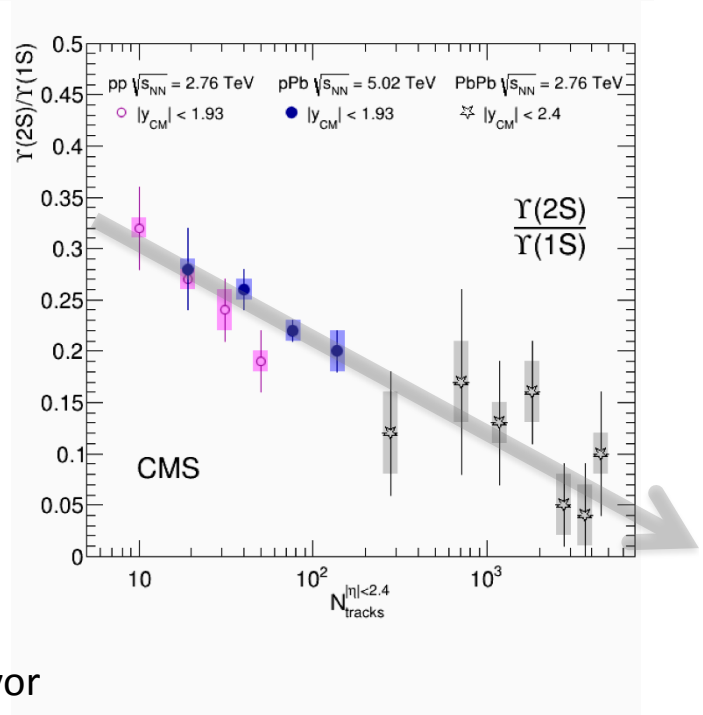


Glauber-Gribov
- color fluctuation (Ω)

Upsilon in pp and pPb vs multiplcity



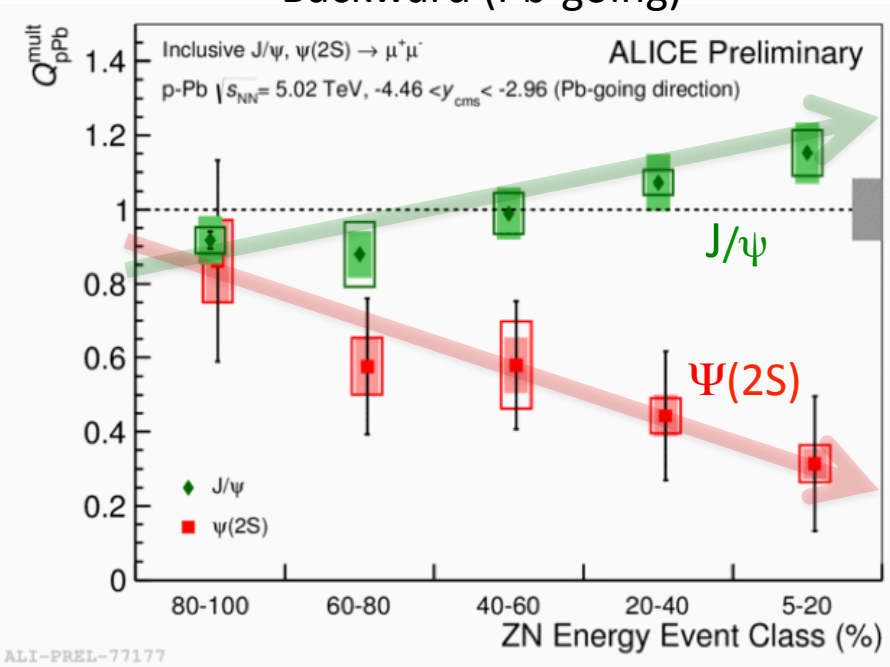




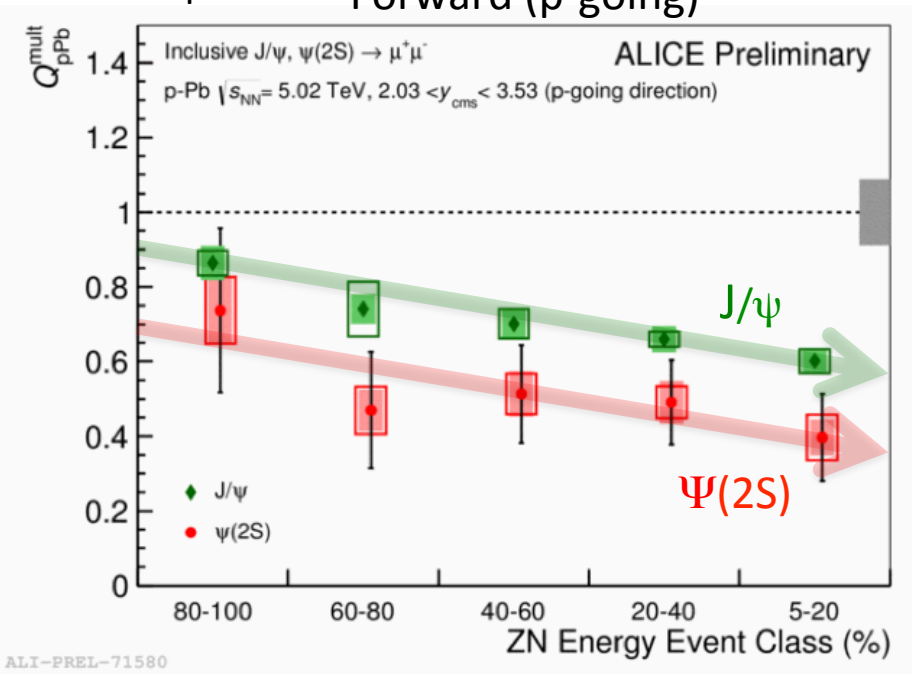
Abdulla Abdulsalam,
21/May, open heavy flavor

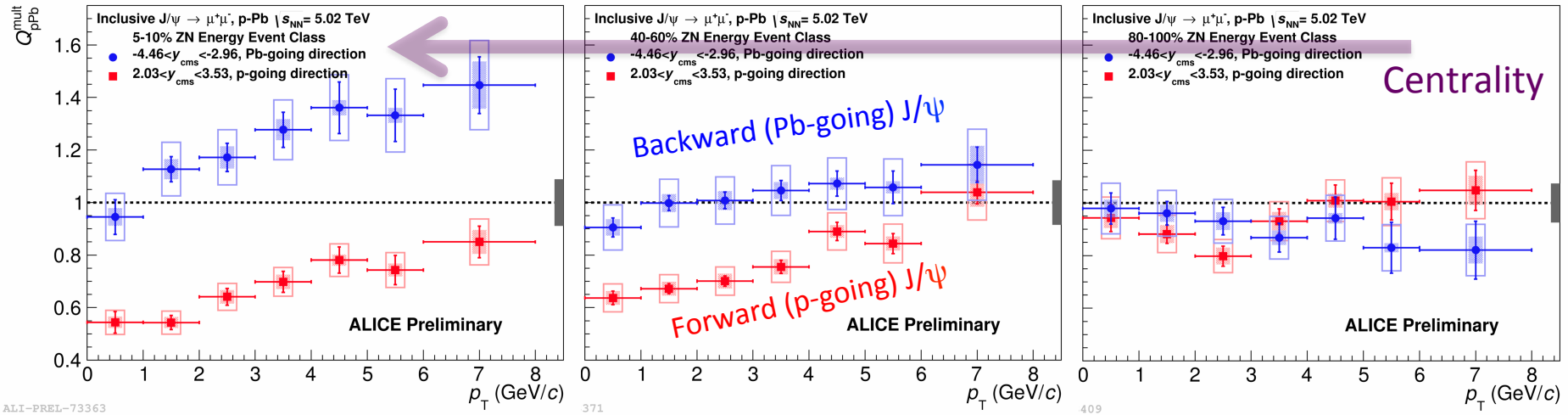
Charmonia Q_{pA}

Backward (Pb-going)



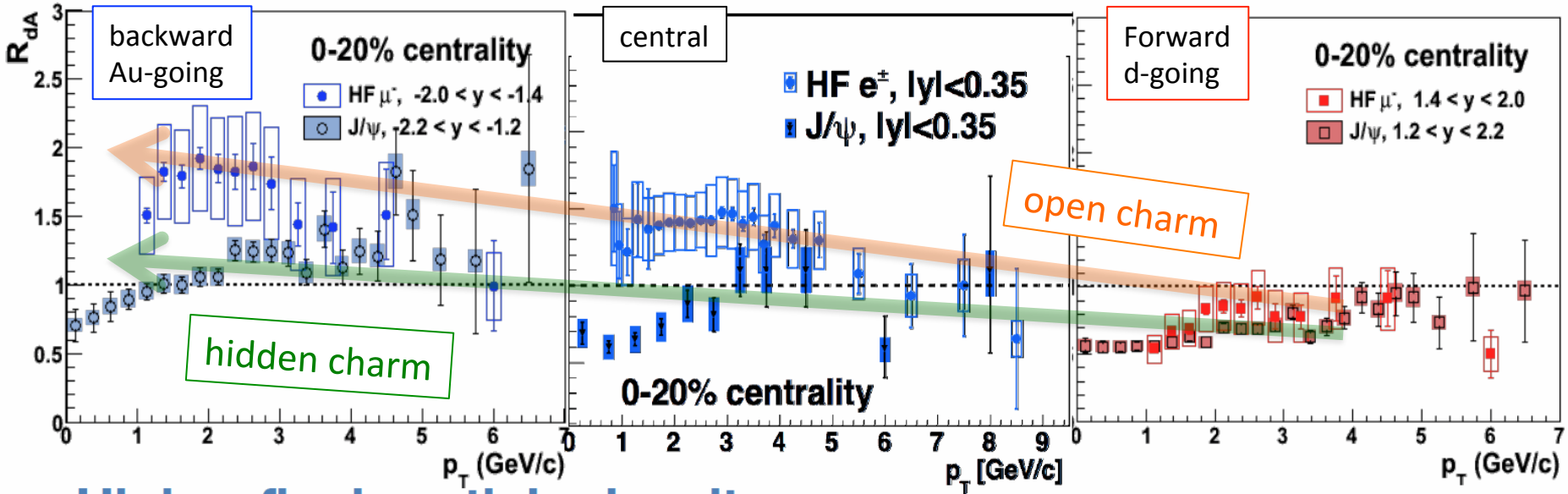
Forward (p-going)





Javier Martin Blanco, Roberta Arnaldi,
20/May, open heavy flavor

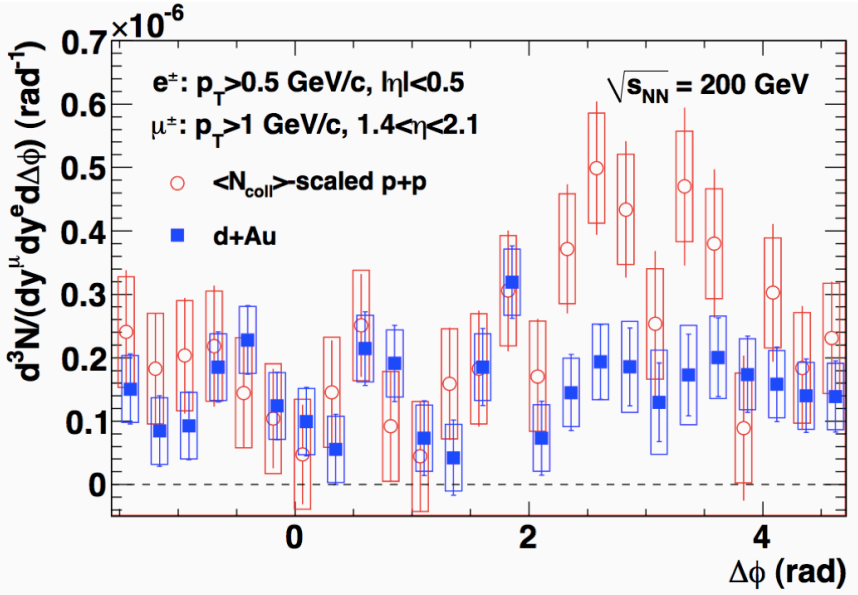
arXiv:1310.1005, Phys.Rev.Lett. 109 (2012) 24, 242301, Phys.Rev. C87 (2013) 3, 034904



Higher final particle density

Xiaochun He, 22/May

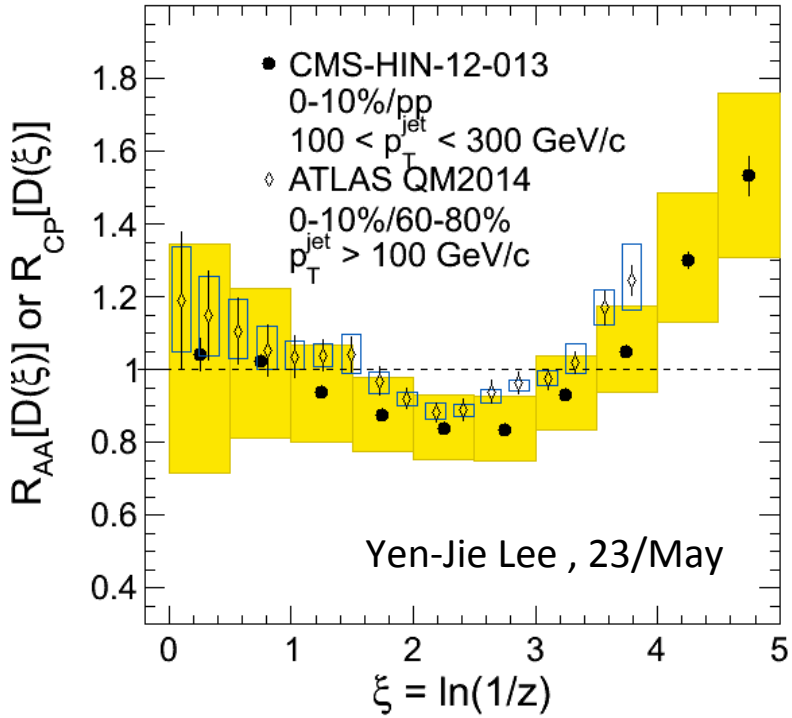
Probing lower-x gluons in Au



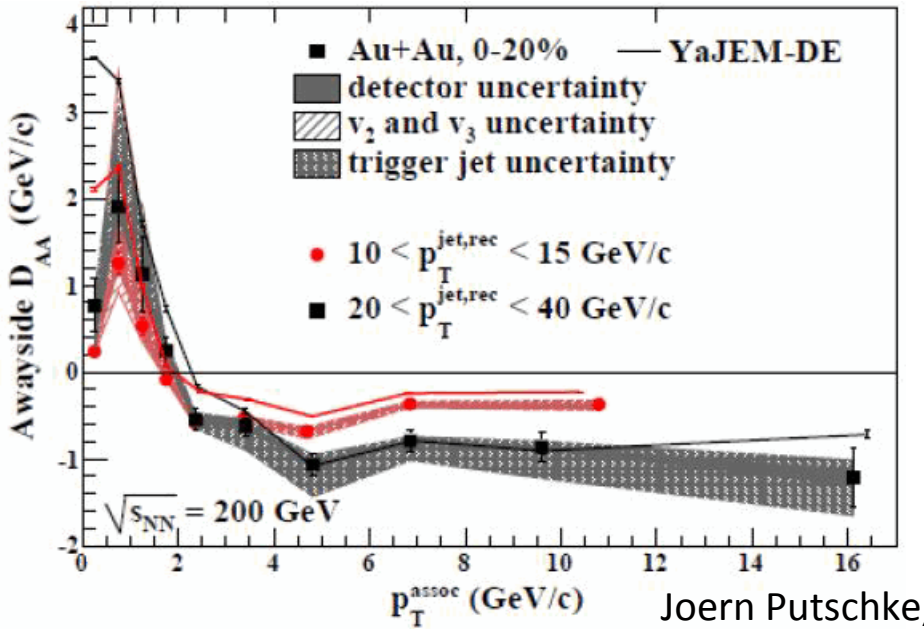
Heavy Flavor and J/psi in dAu

away-side suppression in dAu for
central e - forward μ correlation

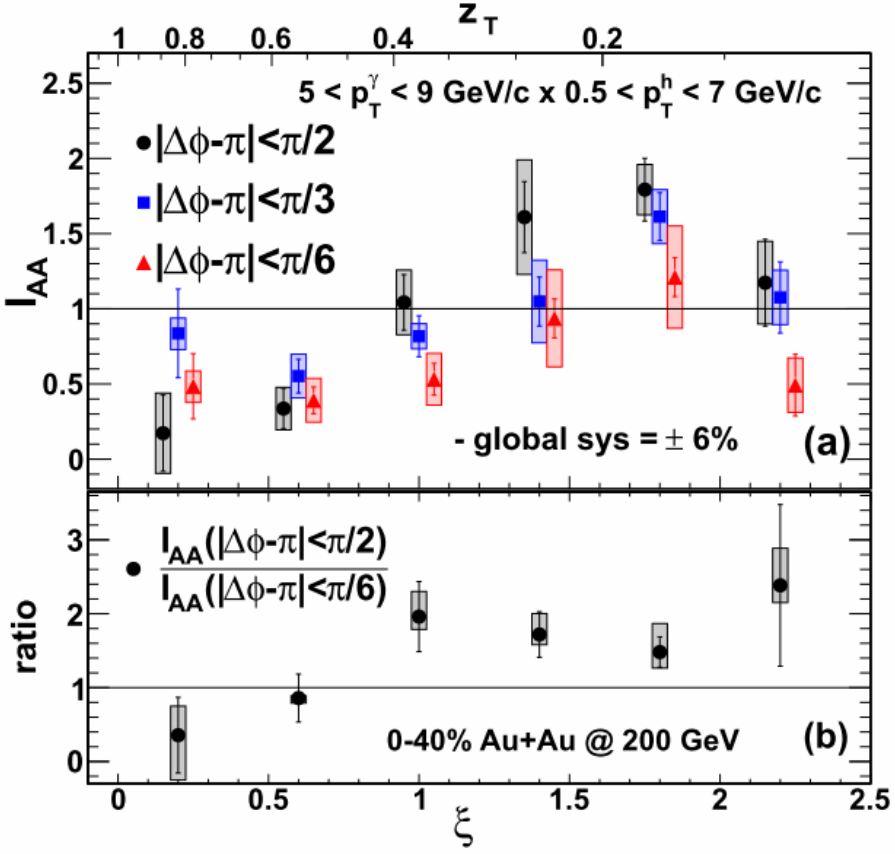
Alan Dion,
19/May, heavy Flavor



Jet quenching and re-distribution of the lost-energy in A+A at LHC and RHIC

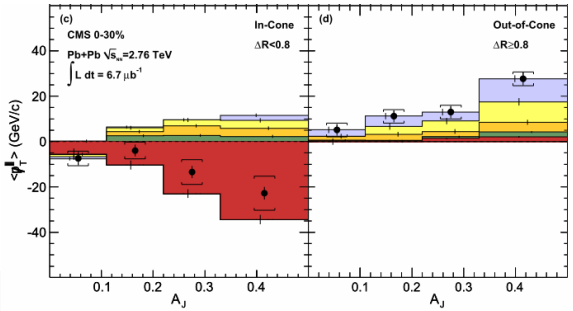


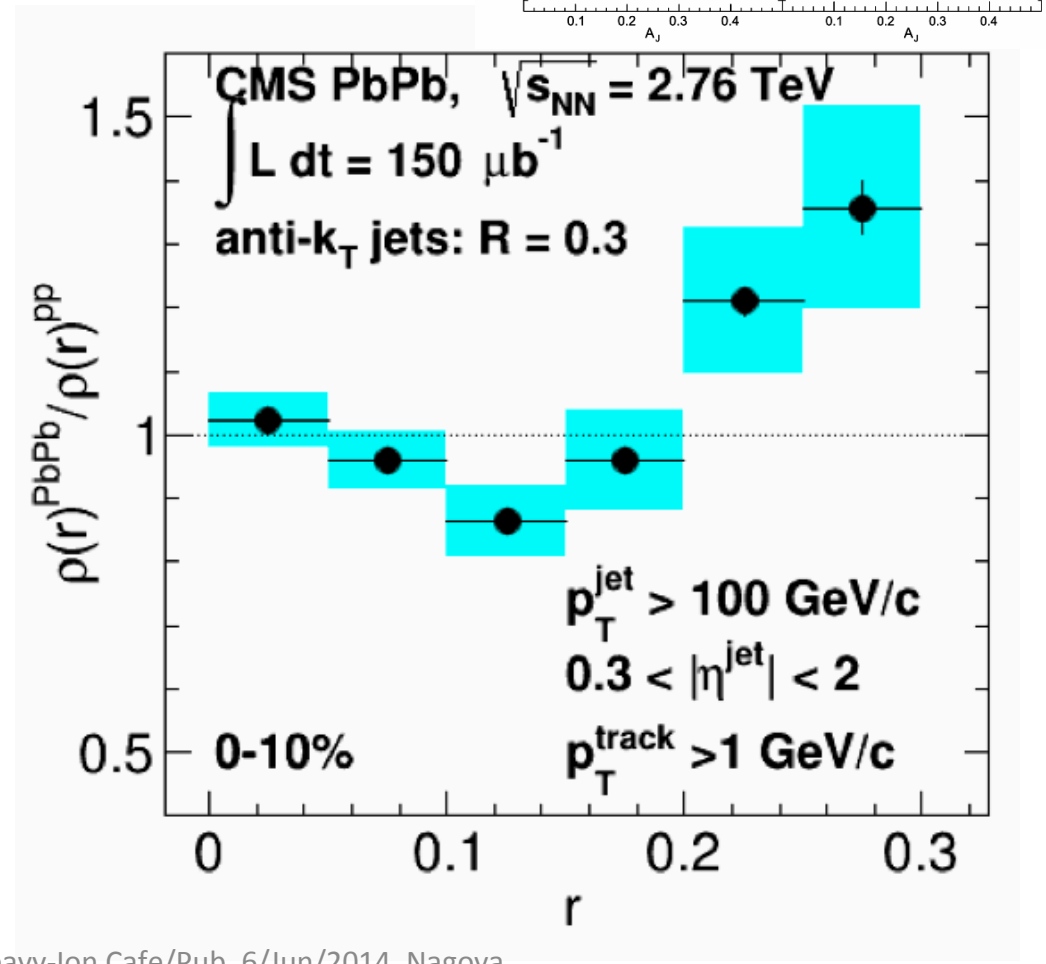
Joern Putschke, 21/May, Jets

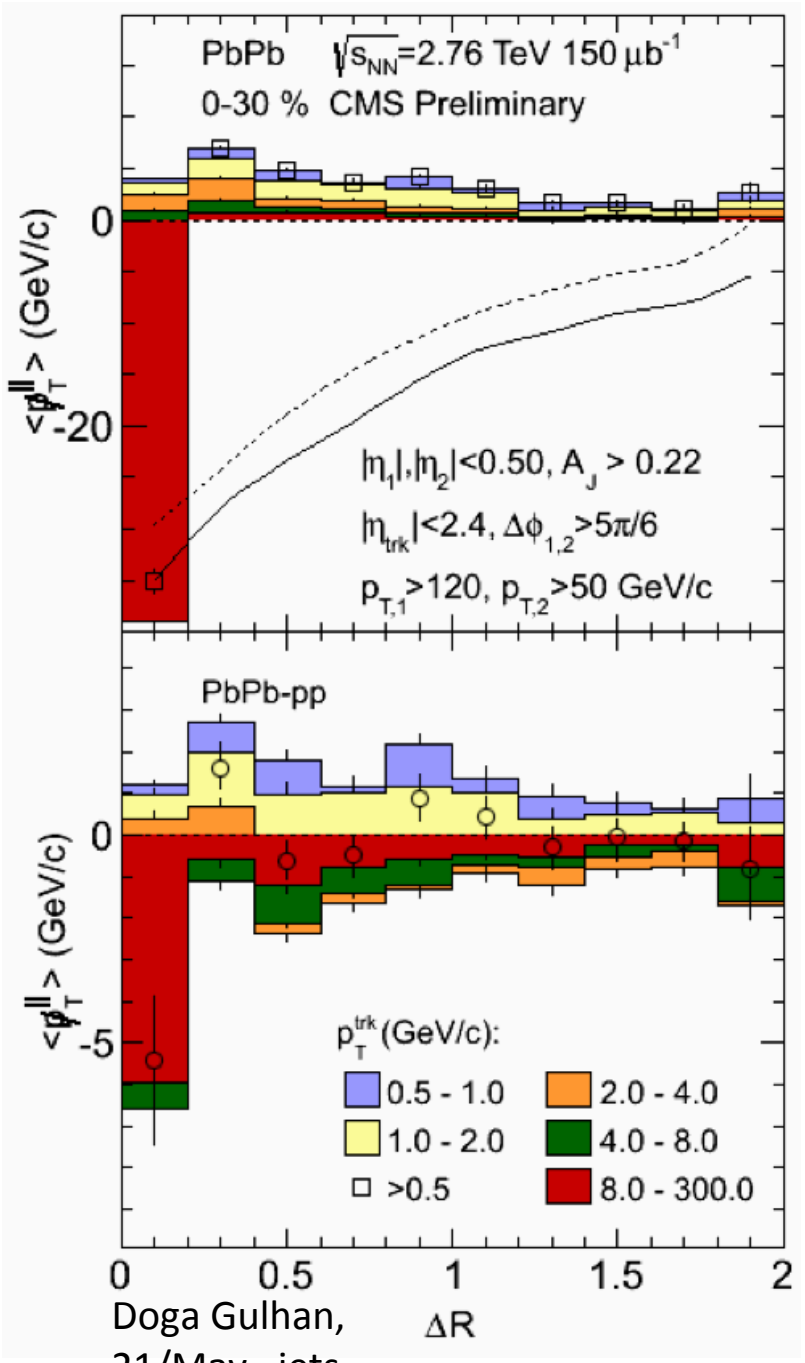


PRL 111, 032301 (2013)

Detailed (ΔR,p_T) distributions of the lost energy at LHC



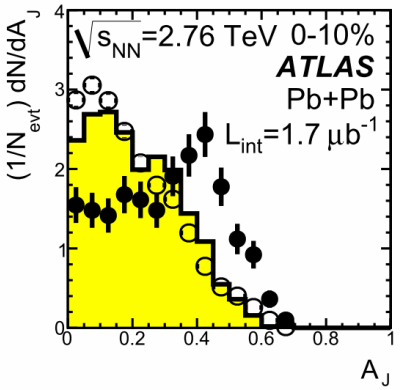


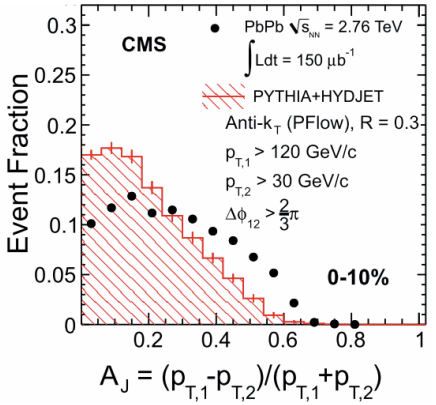


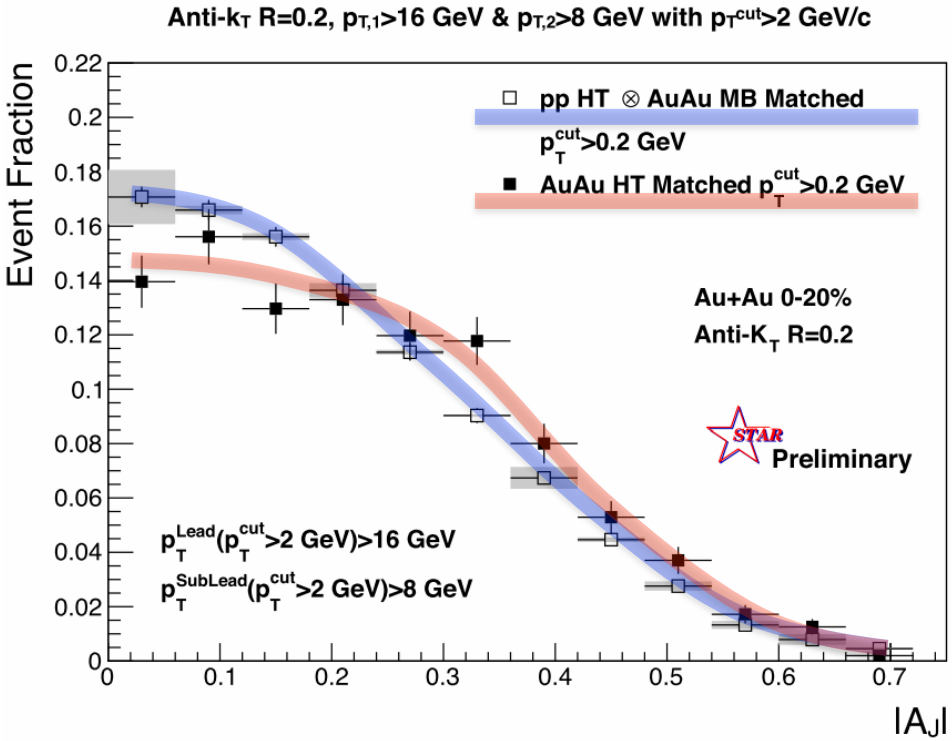
Doga Gulhan, 21/May, jets

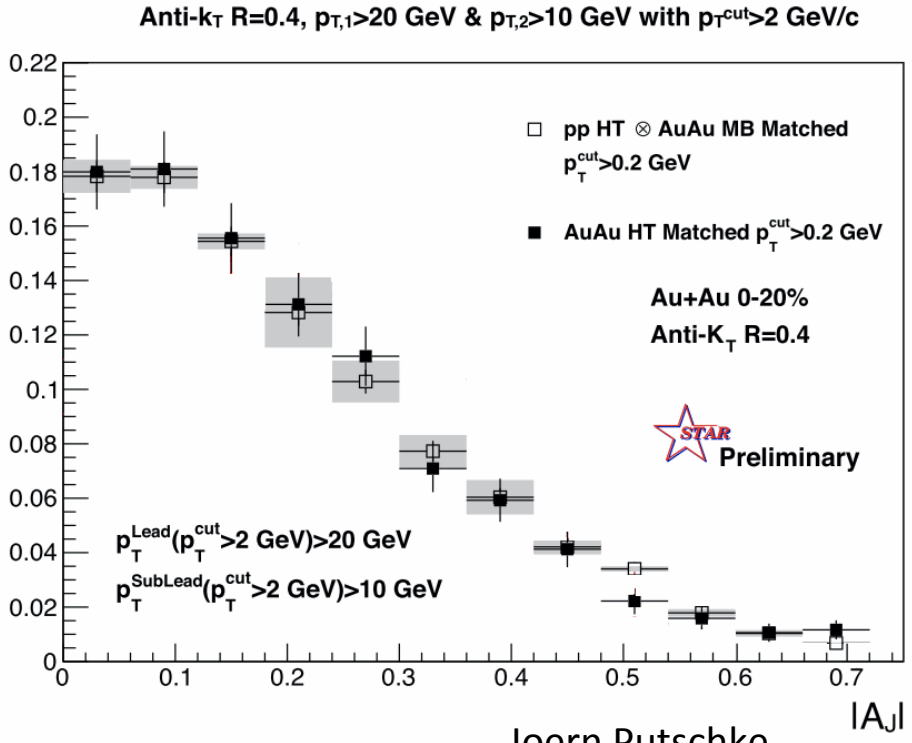
Jet quenching at RHIC (A_J distribution)

- lower jet energy than LHC
- smaller effect than LHC
- larger effect with smaller jet cone
- visible modification from pp





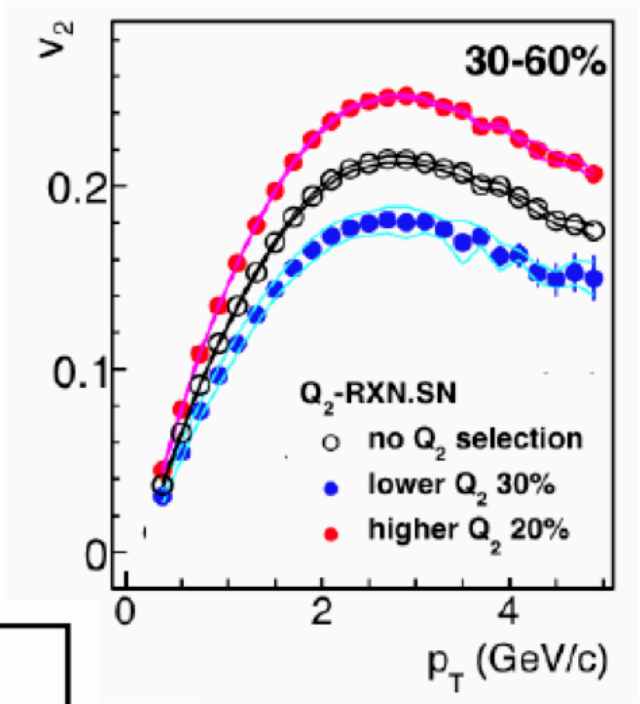


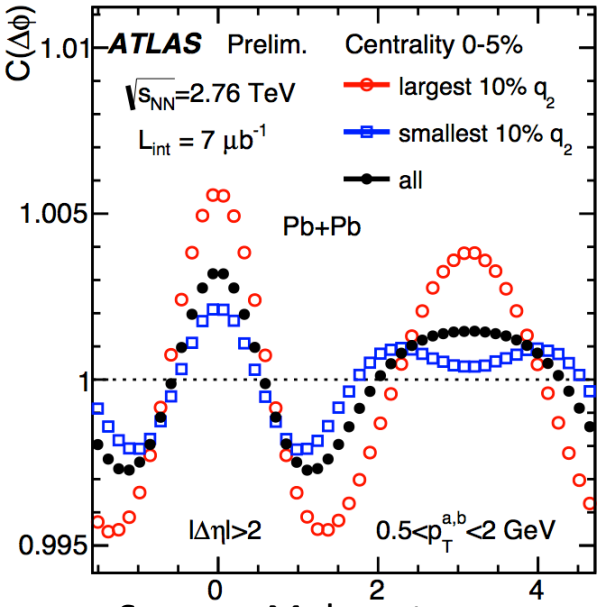


Joern Putschke,
21/May, Jets

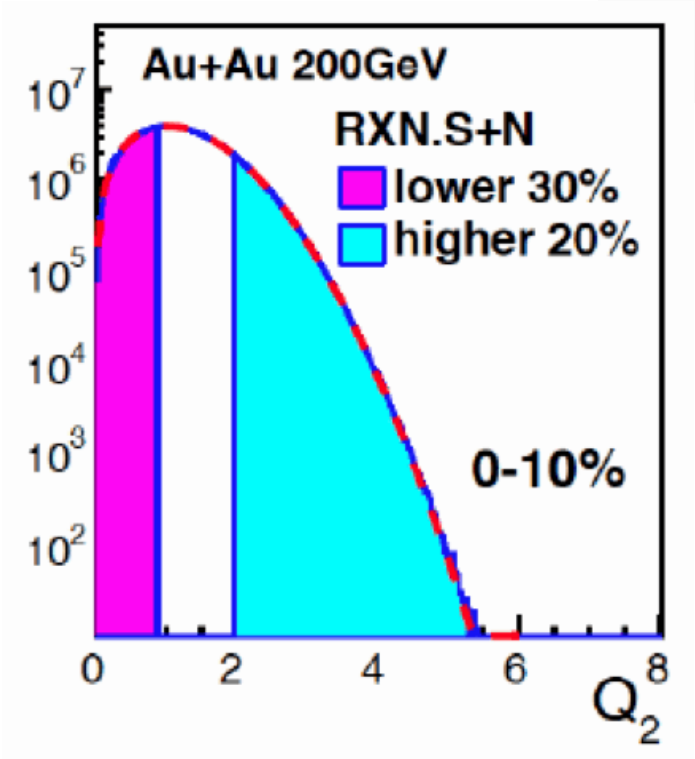
Event Shape Engineering by Flow-Vector Q_2 selection

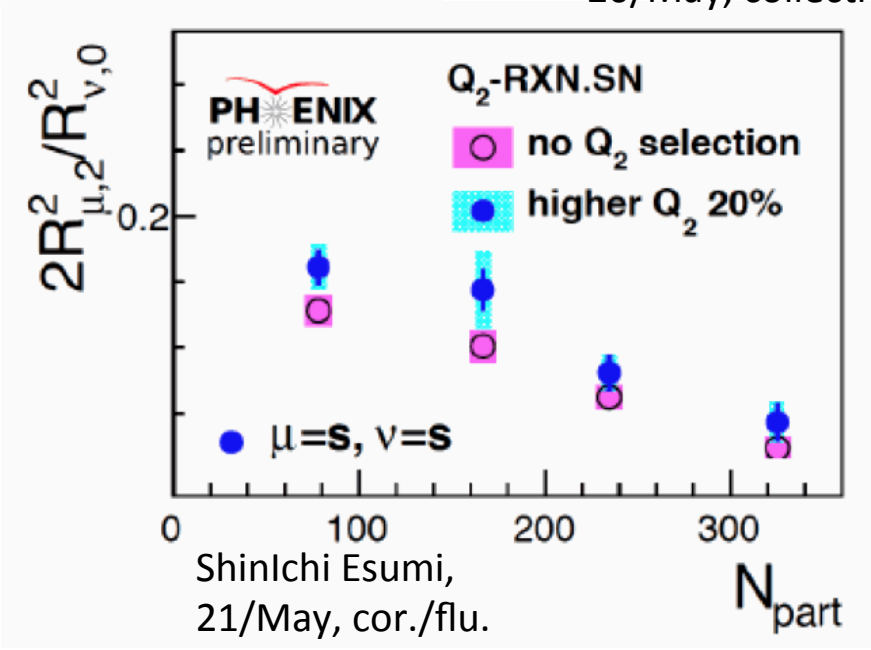
$\varepsilon_2^{\text{initial}} - v_2 - \varepsilon_2^{\text{final}}$





Soumya Mohapatra,
20/May, collective

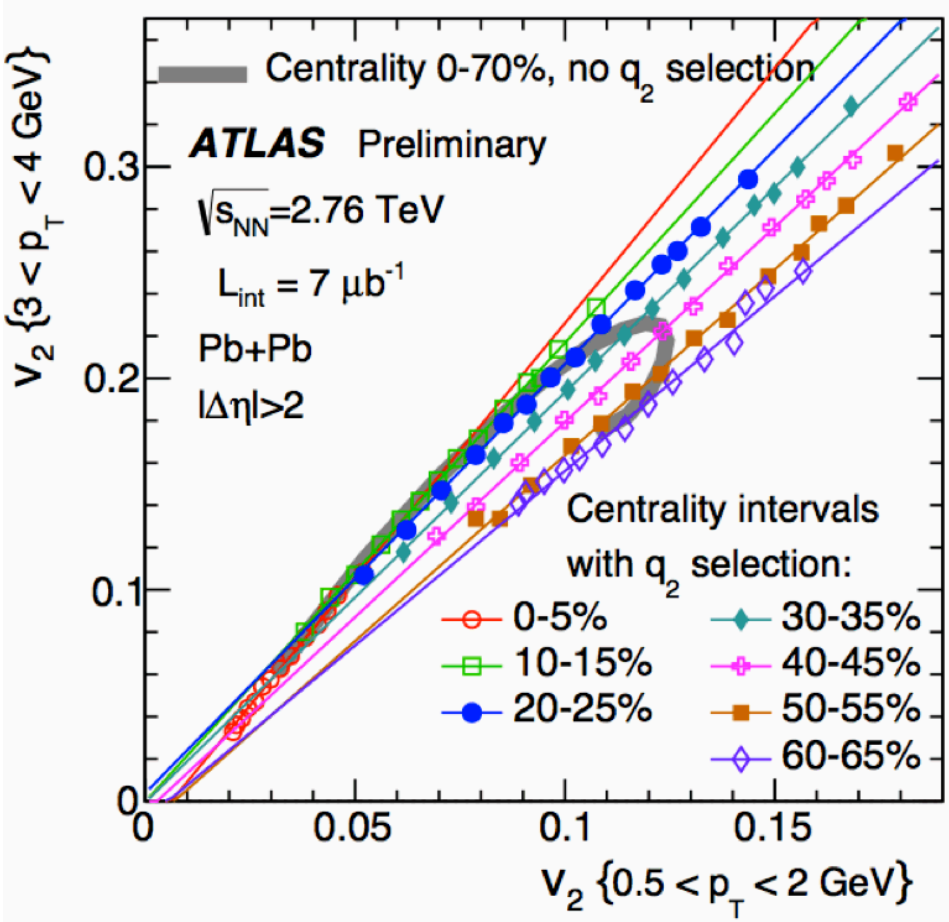


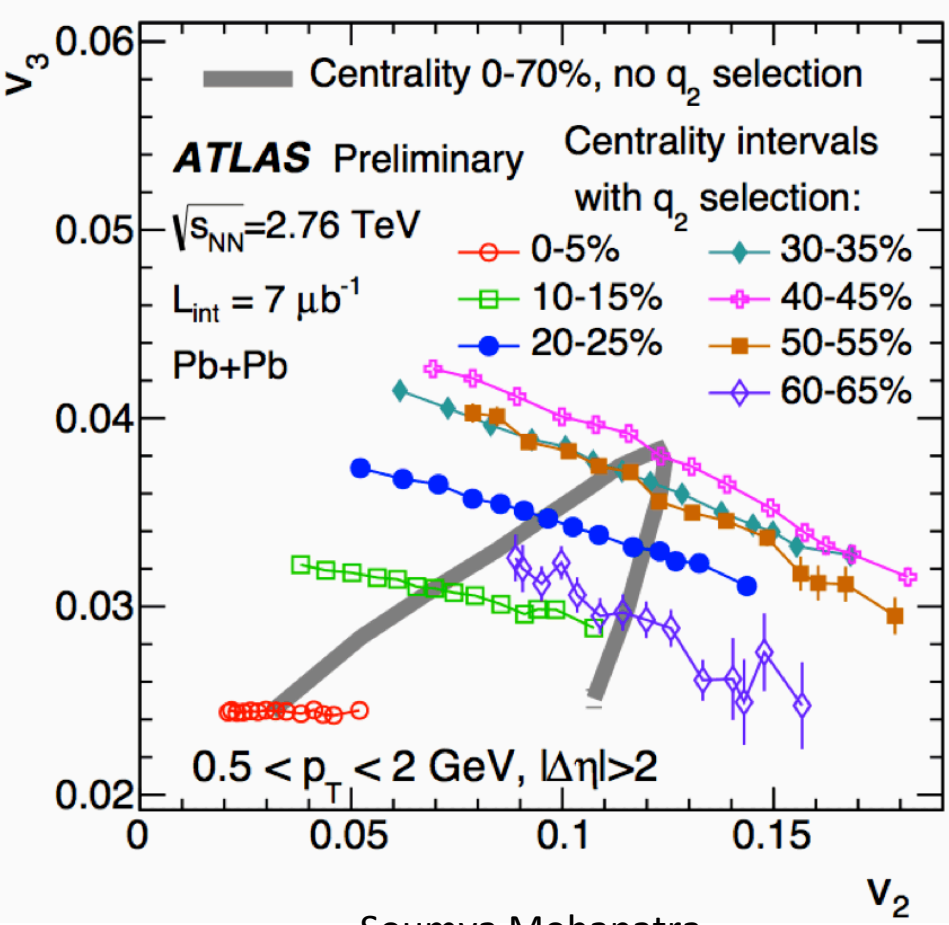


ShinIchi Esumi,
21/May, cor./flu.

$v_2^{(\text{Low pT})} - v_2^{(\text{high pT})}$ correlation

$v_2 - v_3$ correlation



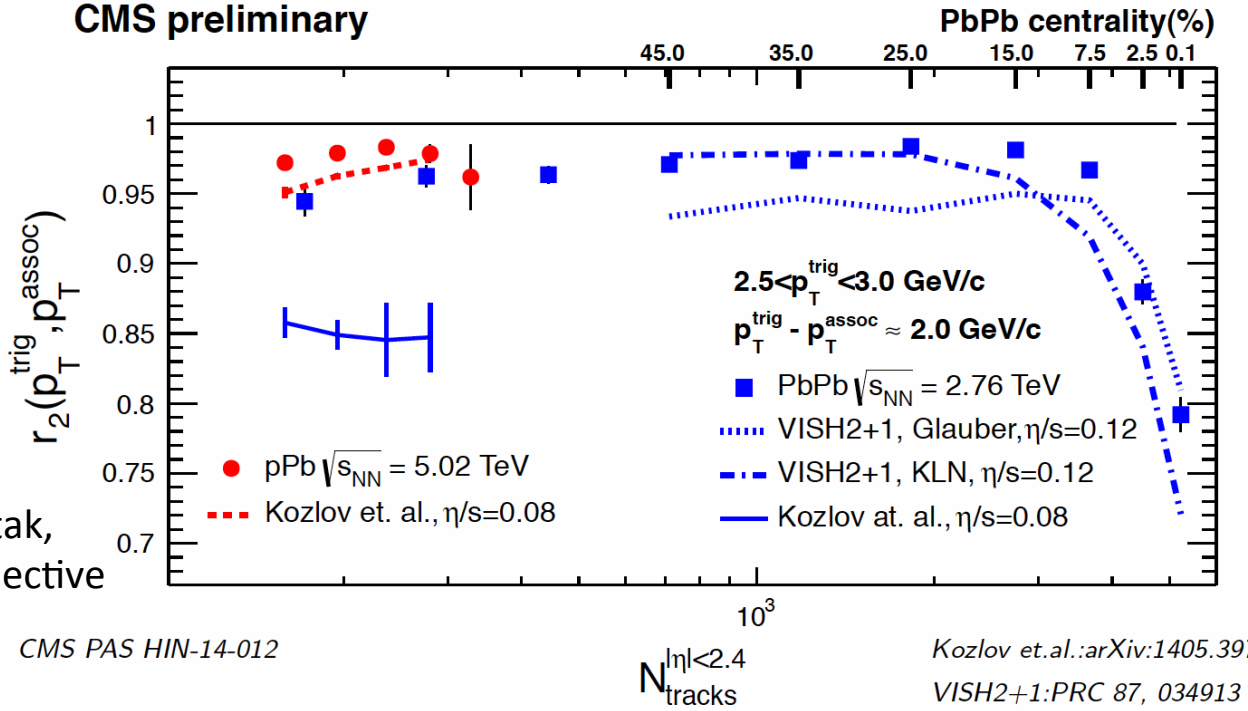


Soumya Mohapatra, 20/May, collective

p_T dependent flow fluctuation

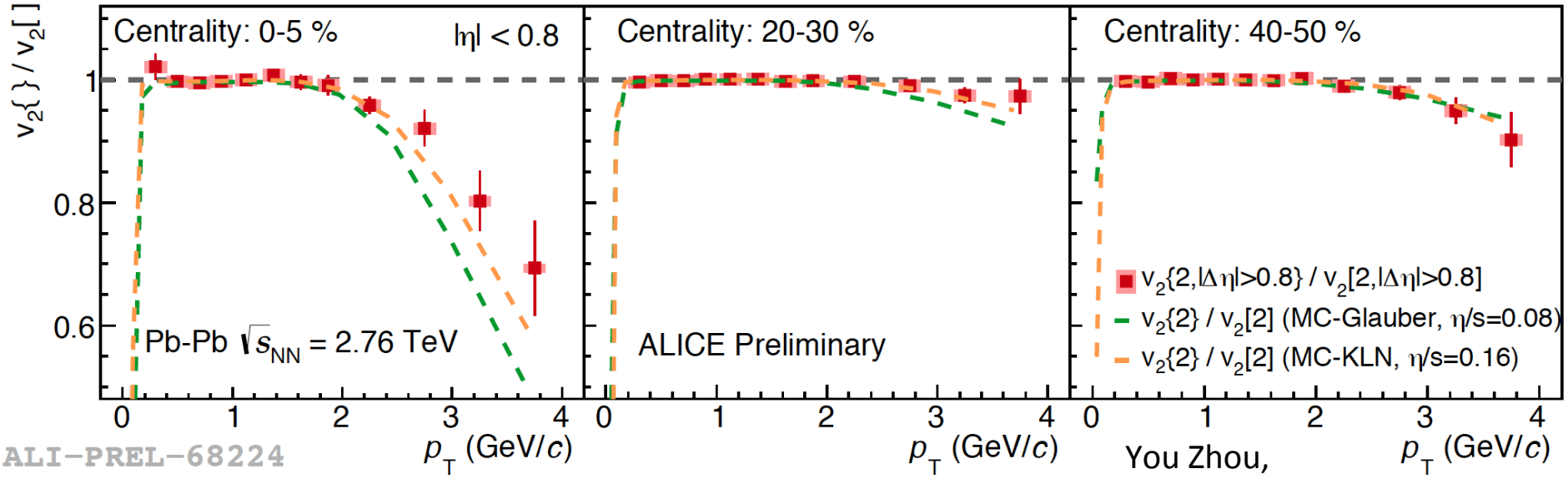
amazing similarity
in hydro-models
especially at mid-pT
and in central…

Damir Devetak,
20/May, collective



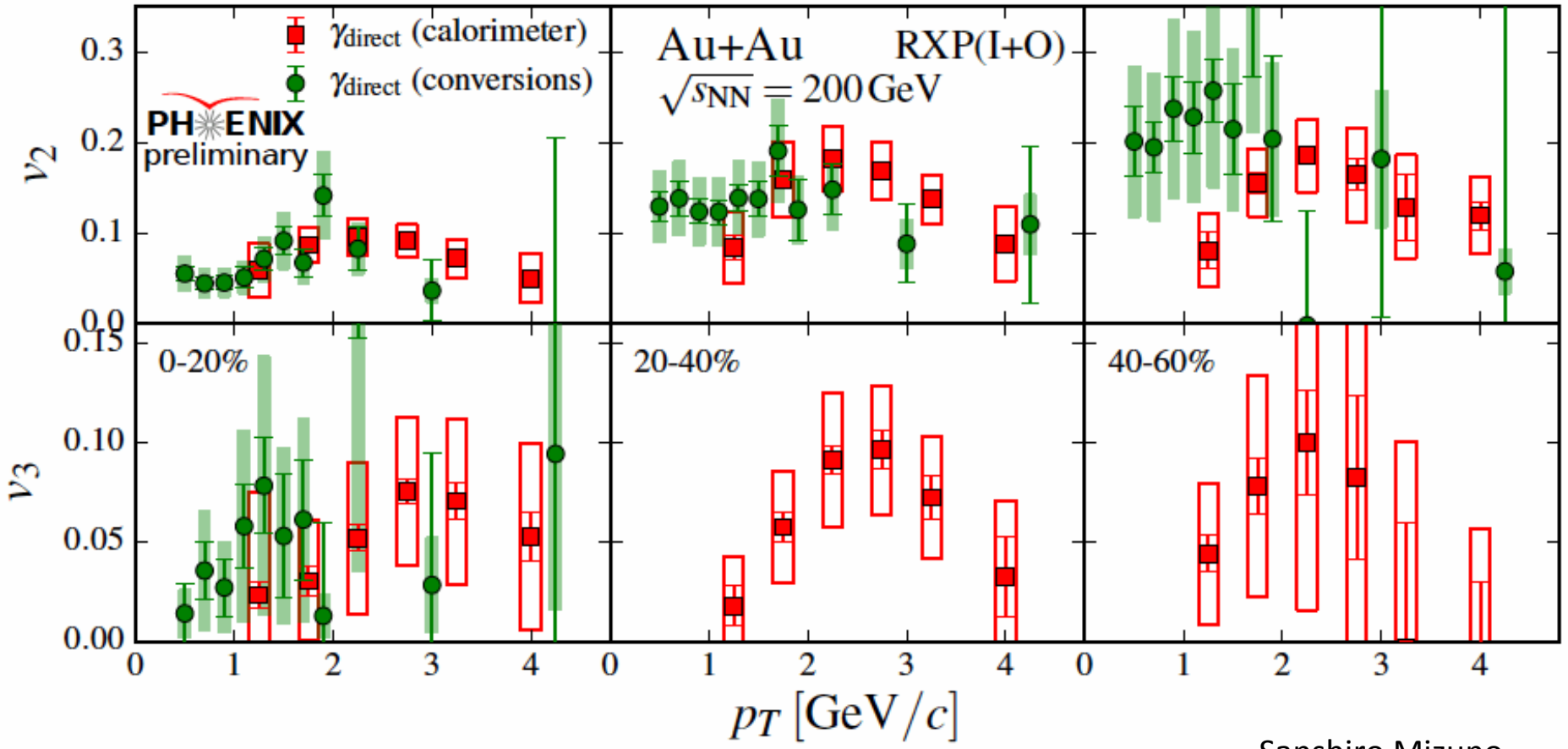
CMS PAS HIN-14-012

Kozlov et.al.:arXiv:1405.3976
VISH2+1:PRC 87, 034913 (2013)



You Zhou,
20/May, collective

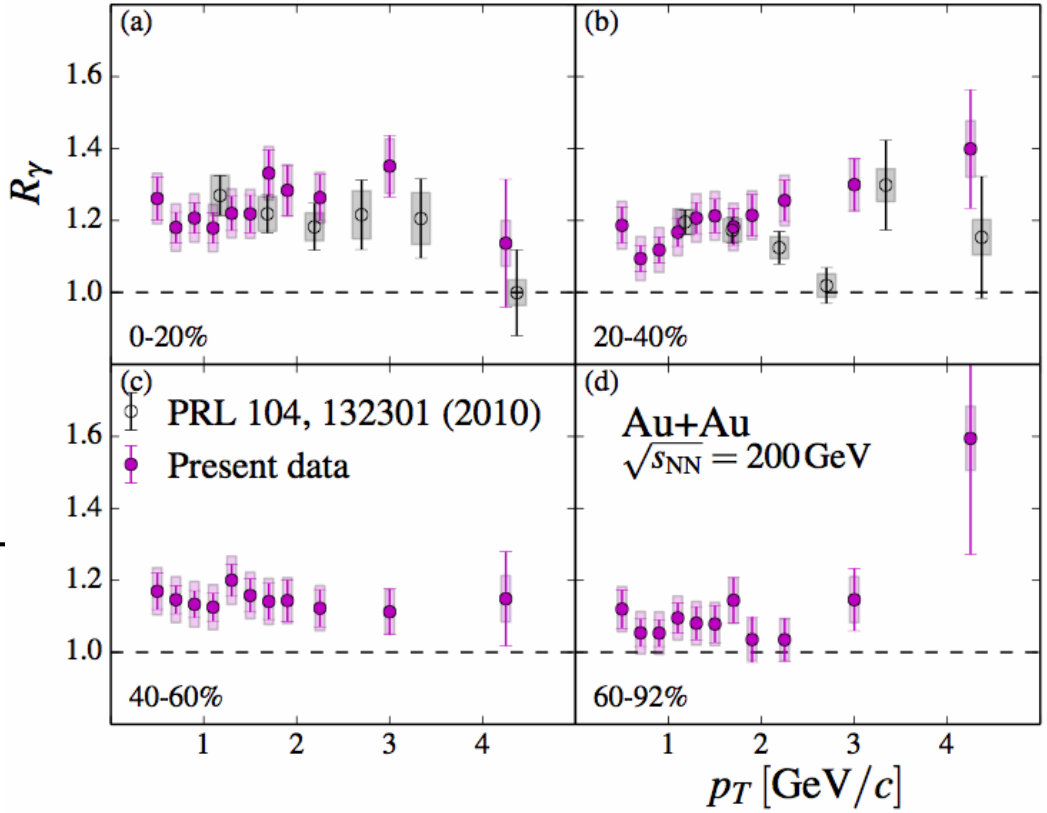
Direct (thermal) photon v_2 and v_3



Sanshiro Mizuno,
19/May, ele./mag.

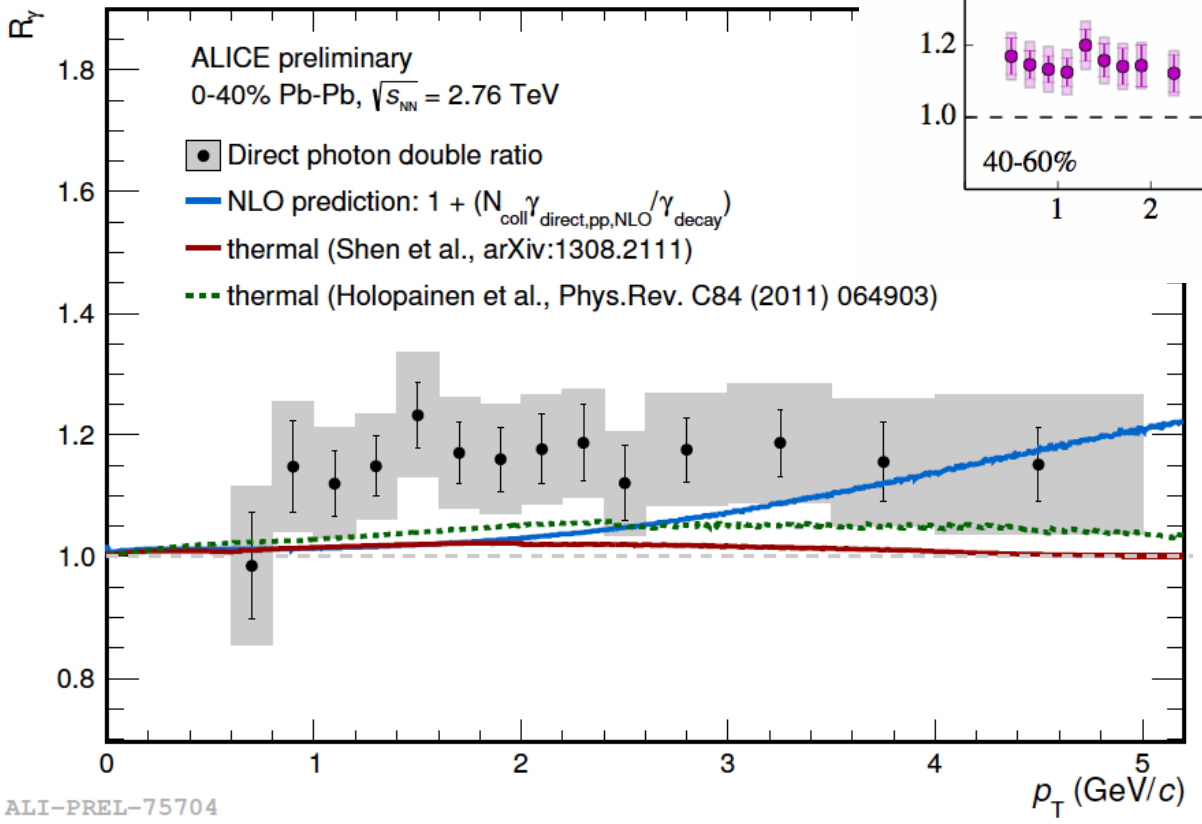
flatter p_T dependence of v_2 at low p_T
Non-zero v_3 for low p_T thermal photon

R_{gamma} comparison
between RHIC and LHC



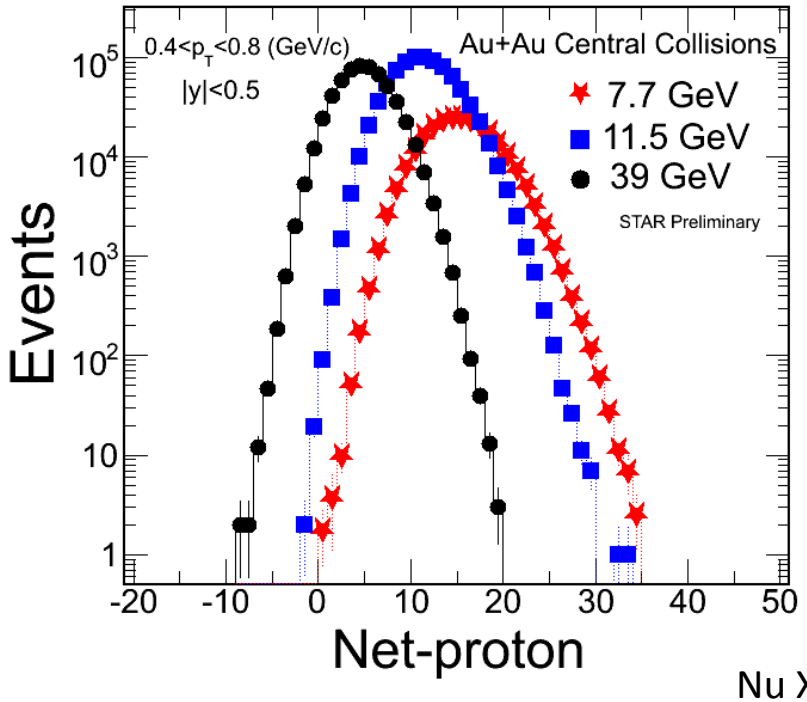
PHENIX arXiv:1405.3940

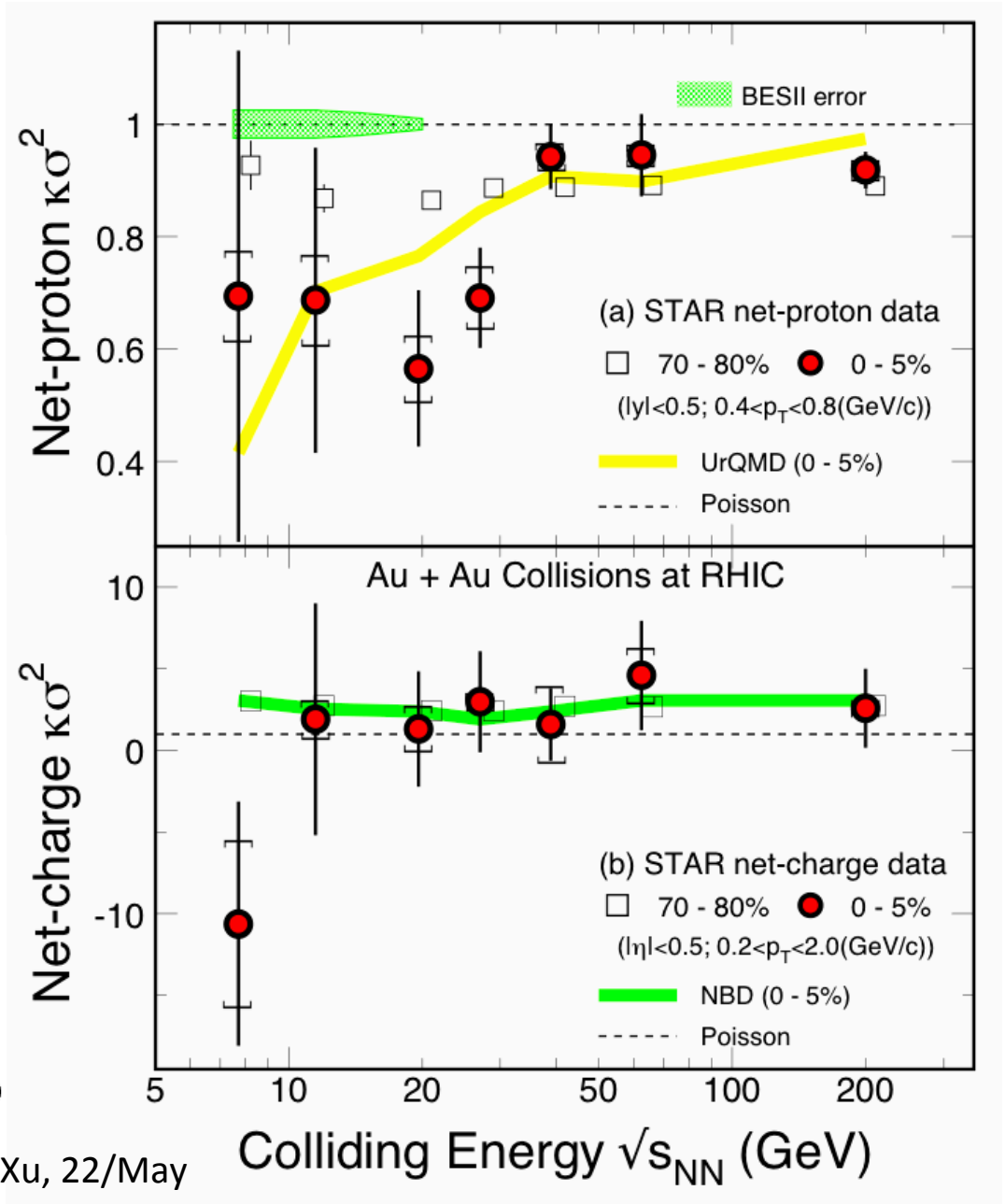
Friederike Bock,
19/May, ele./mag.



Sanshiro Mizuno,
19/May, ele./mag.

Beam energy dependence of net-proton, net-charge distribution

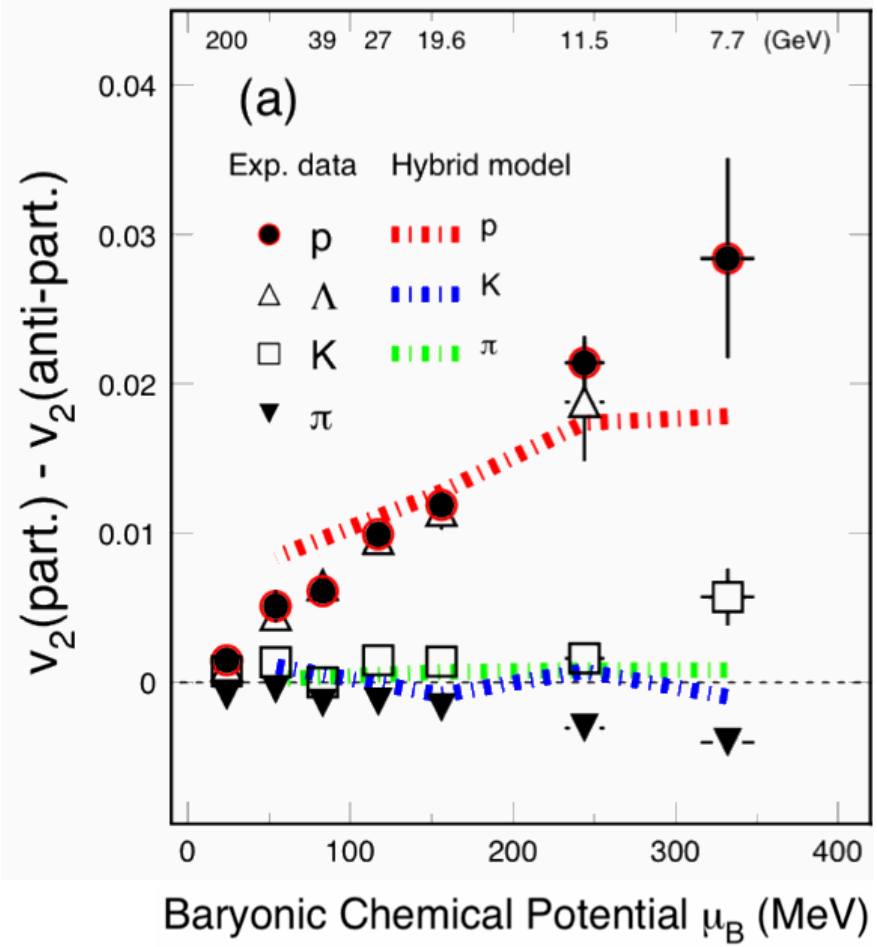


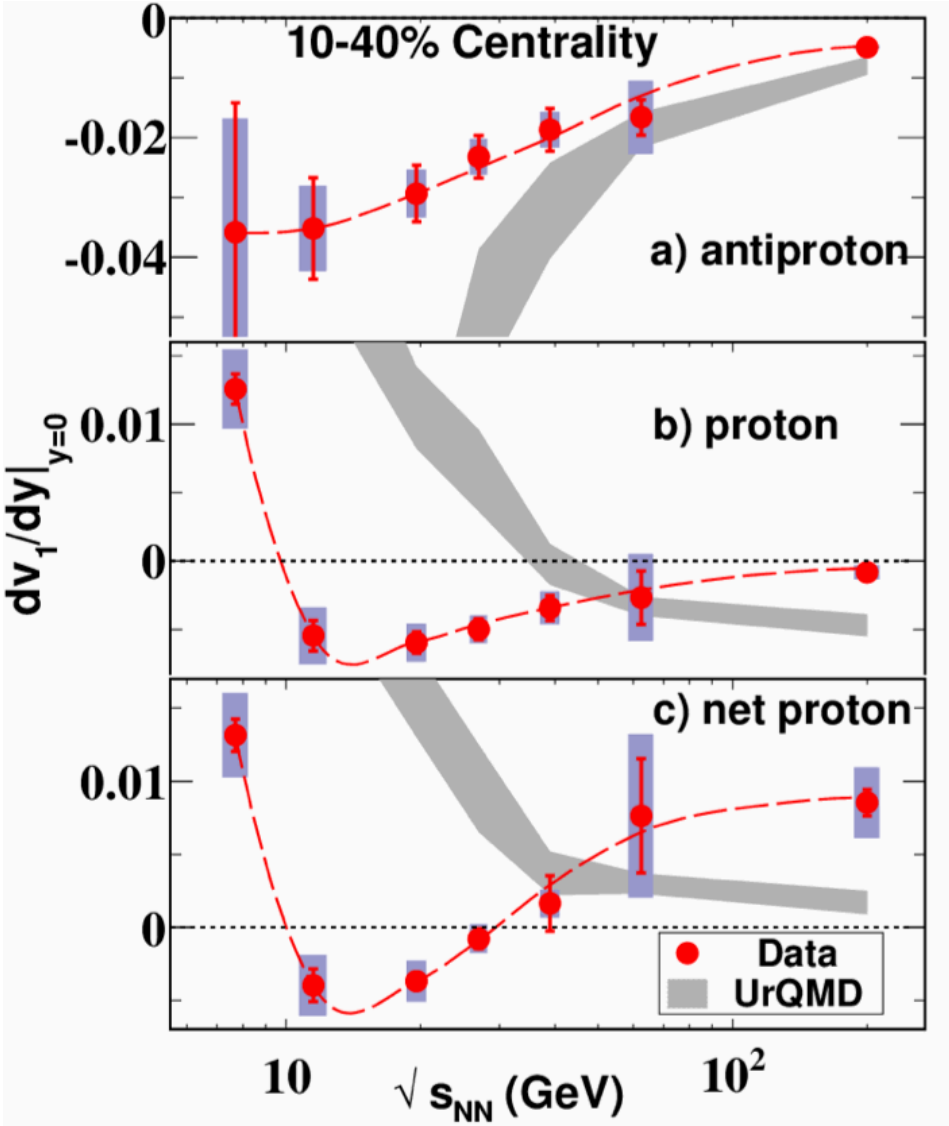


Nu Xu, 22/May

Beam energy dependence of v_1 and v_2

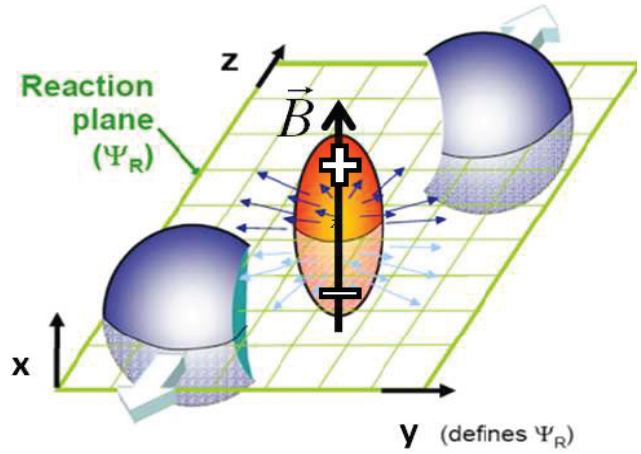
PRL112, 162301(2014), arXiv:1401.3043

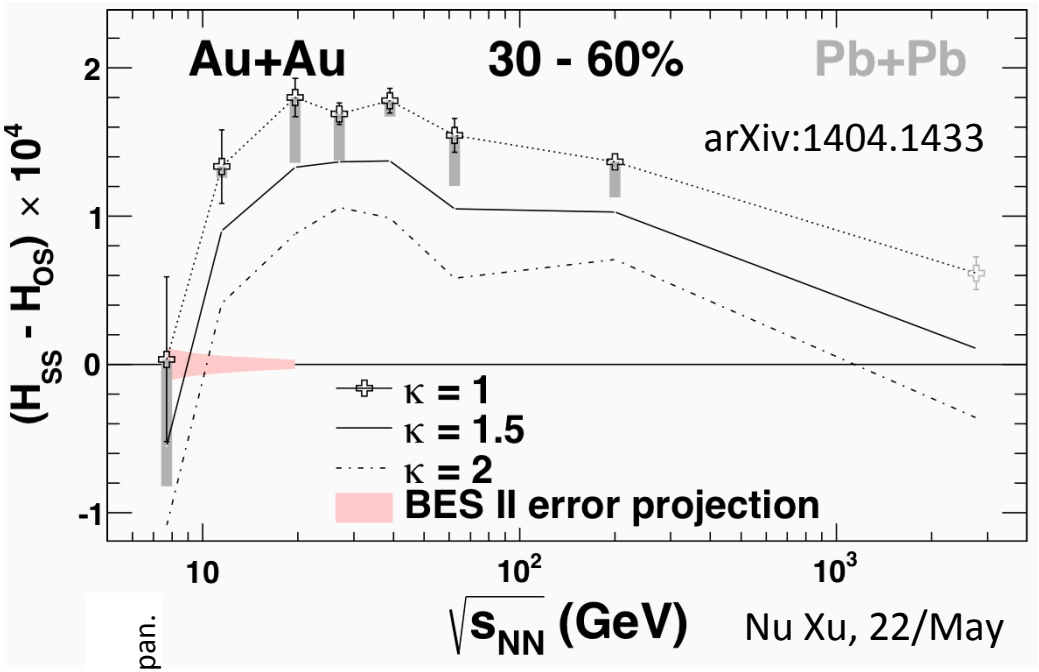


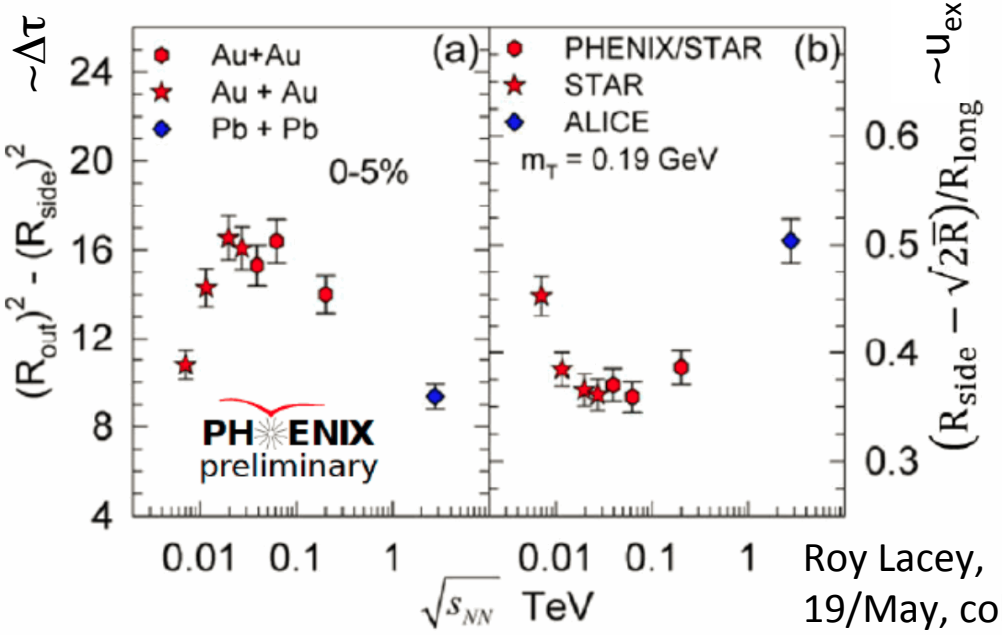


Nu Xu, 22/May

Beam energy dependence of charge asymmetry, HBT, v_2

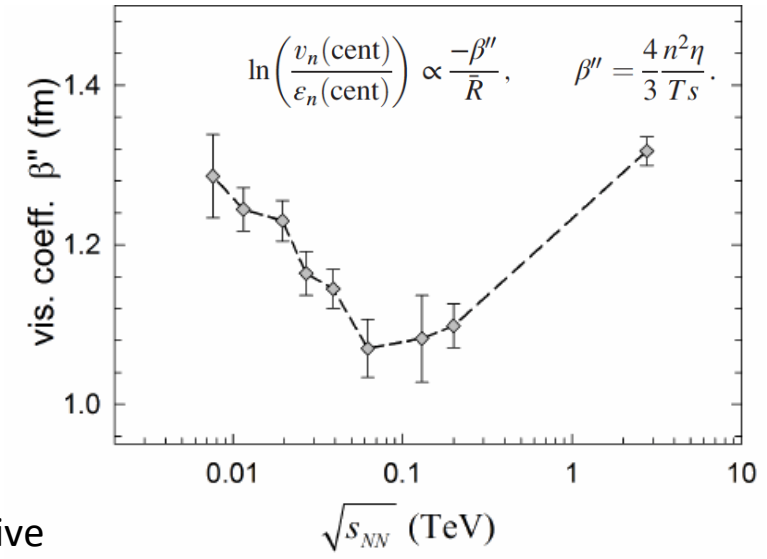






Roy Lacey, 19/May, collective

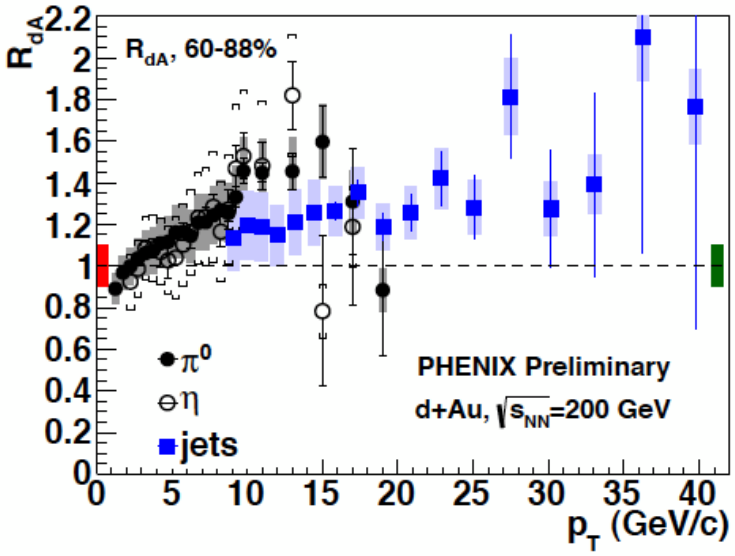
PRL 112, 082302 (2014)

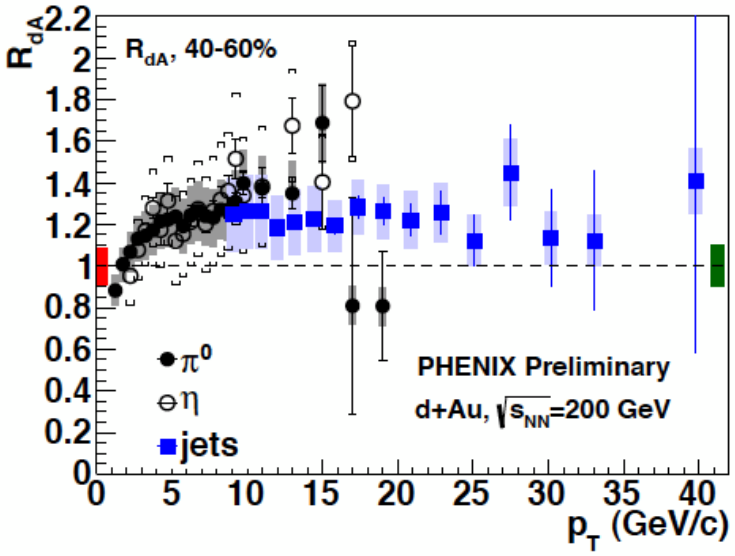


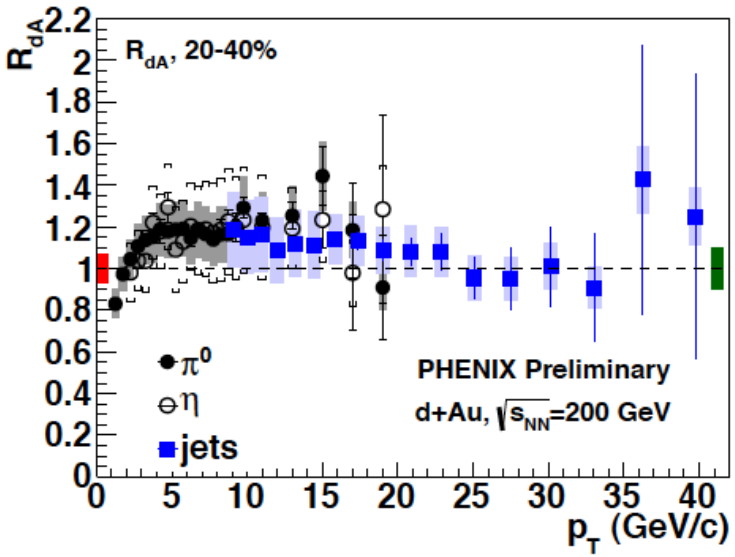
Summary

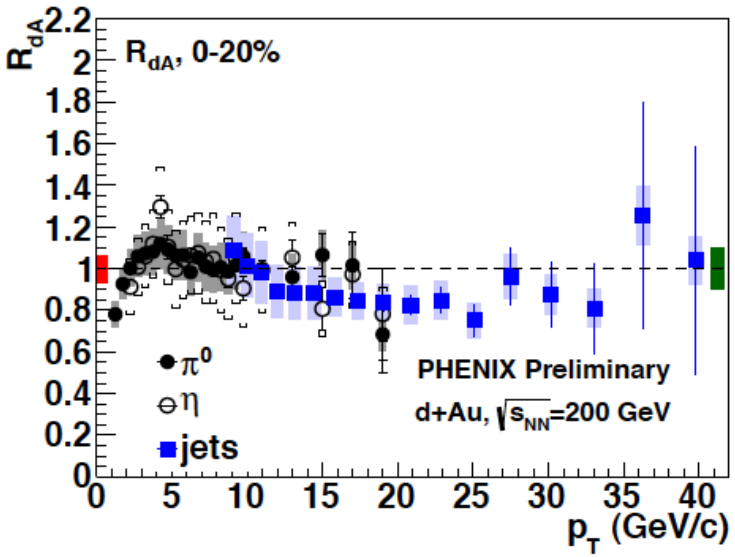
- pPb at LHC, dAu at RHIC
- HF, jet, flow and fluctuation
- energy scan

RHIC-PHENIX --- R_{dAu} of π^0 and jet ---





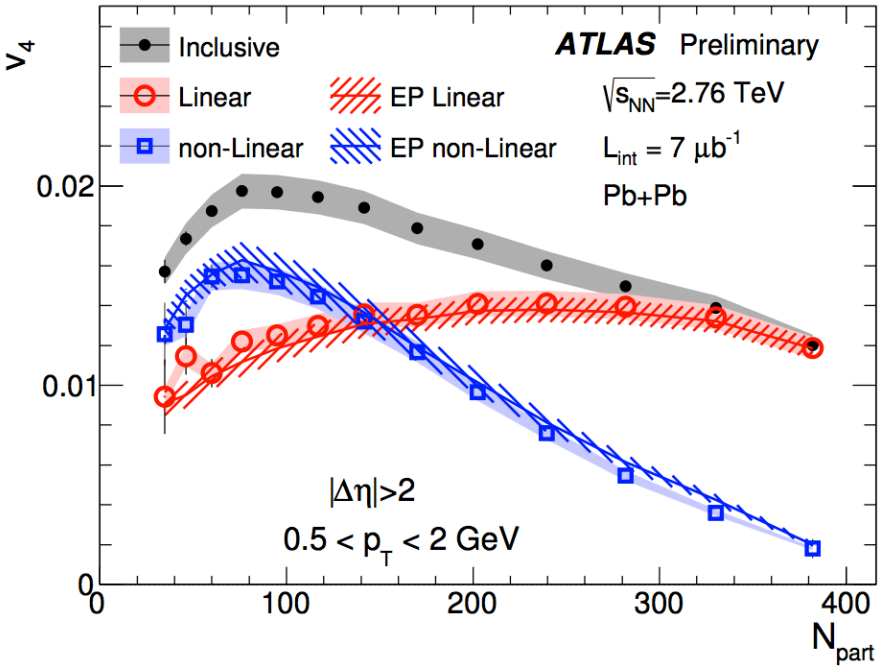


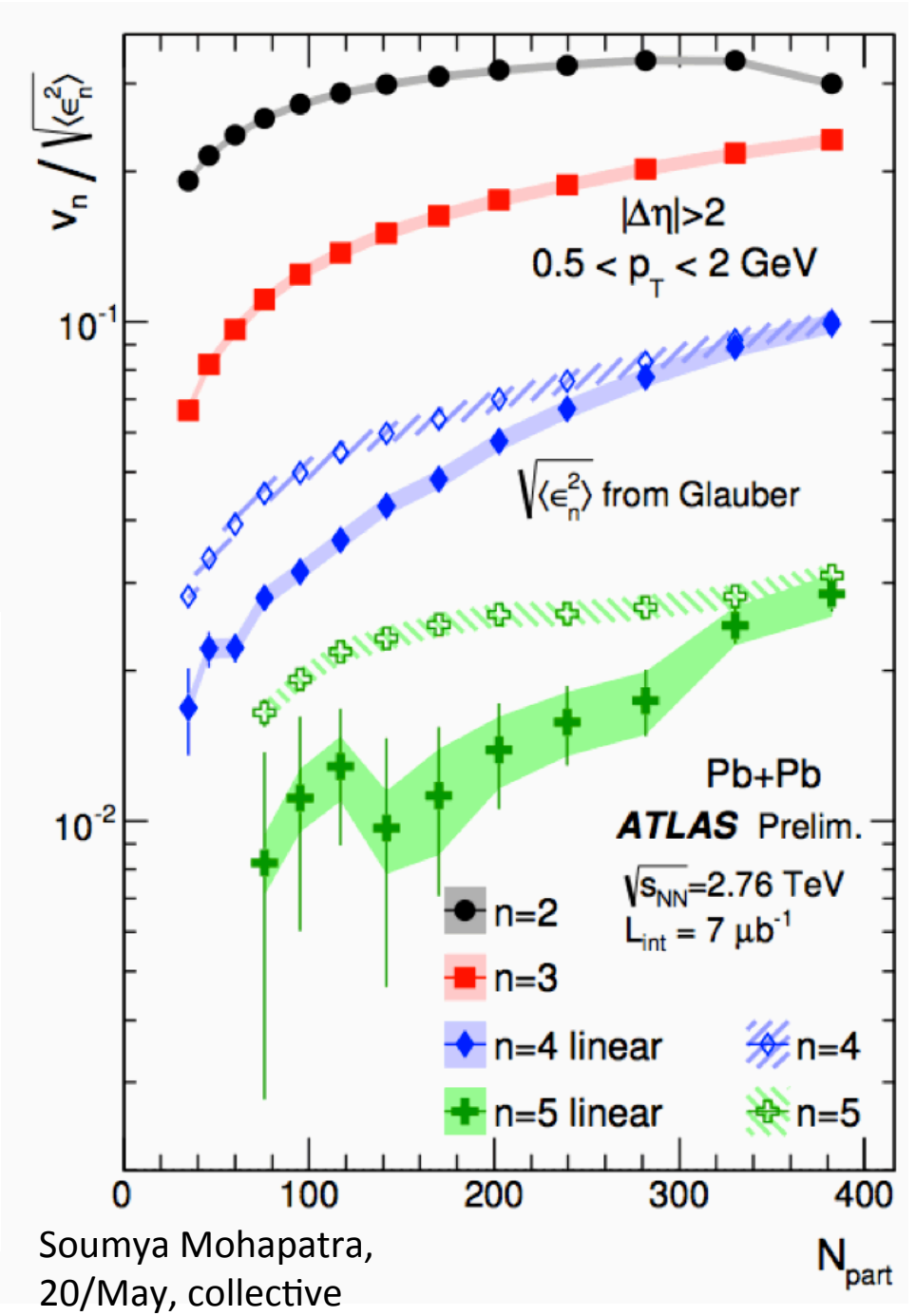


Disentangling the lower order contribution on v_n

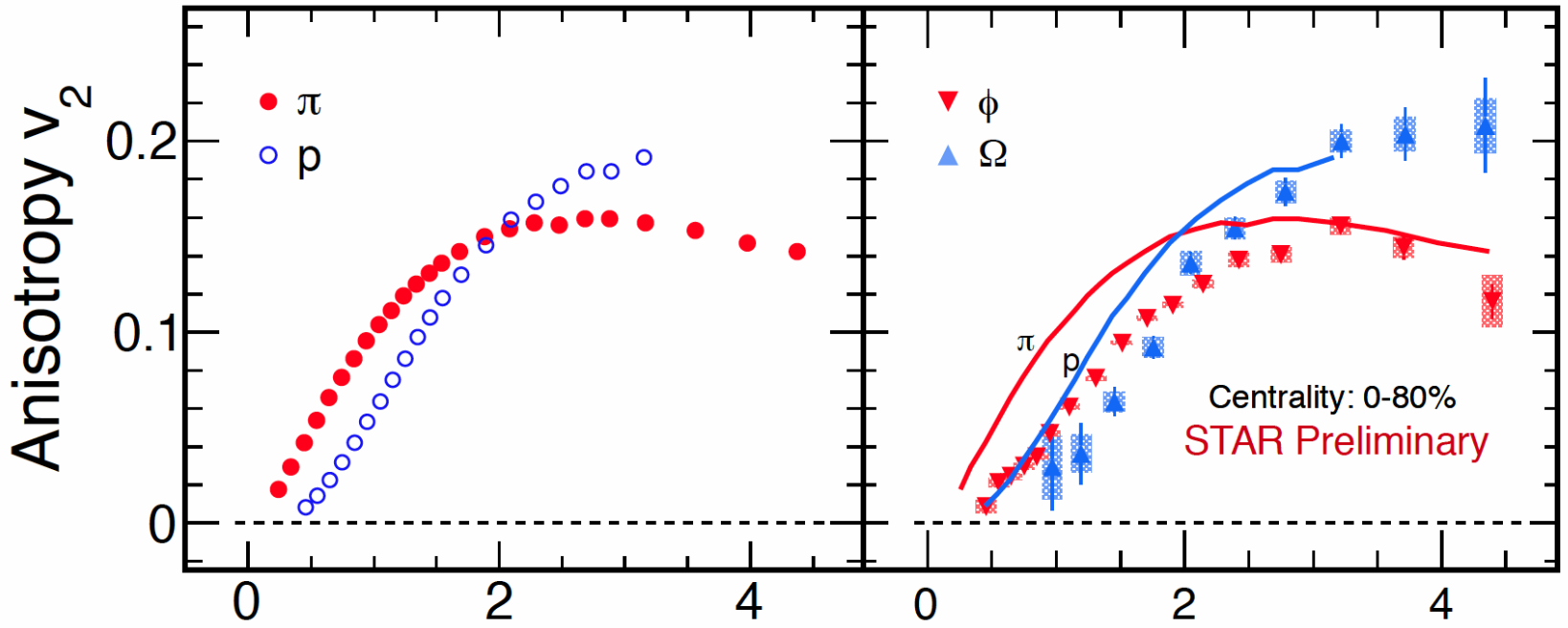
$$v_4 = \sqrt{c_0^2 + c_1^2 v_2^4}$$

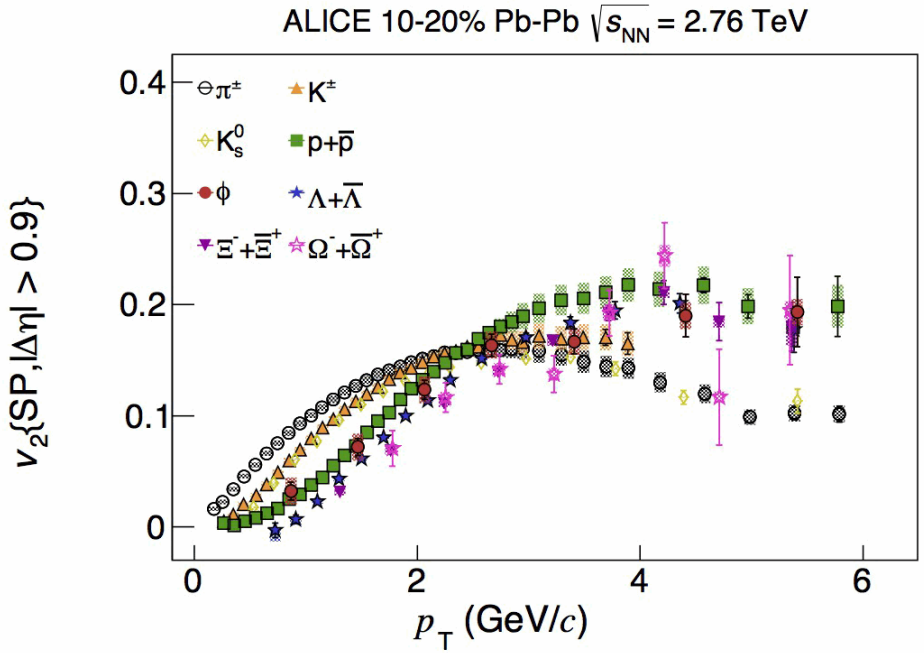
$$v_5 = \sqrt{c_0^2 + (c_1 v_2 v_3)^2}$$

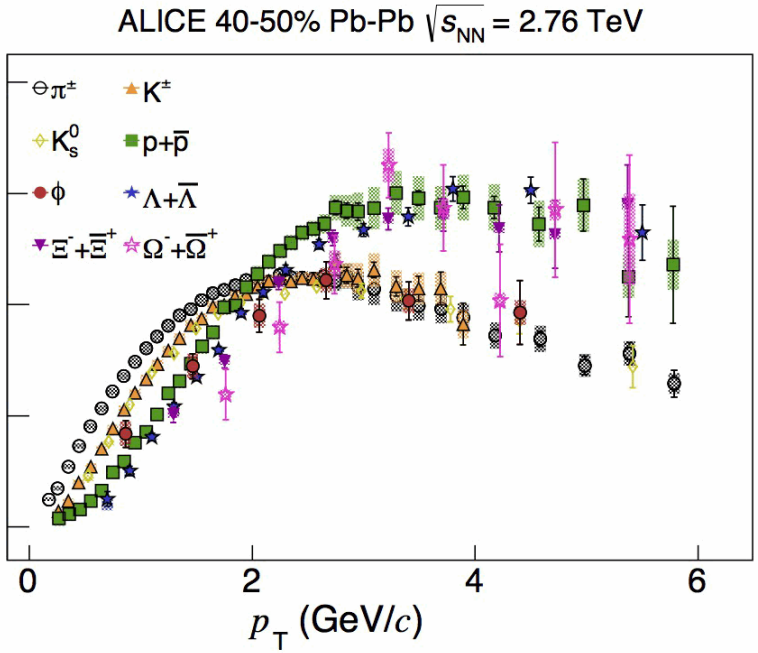


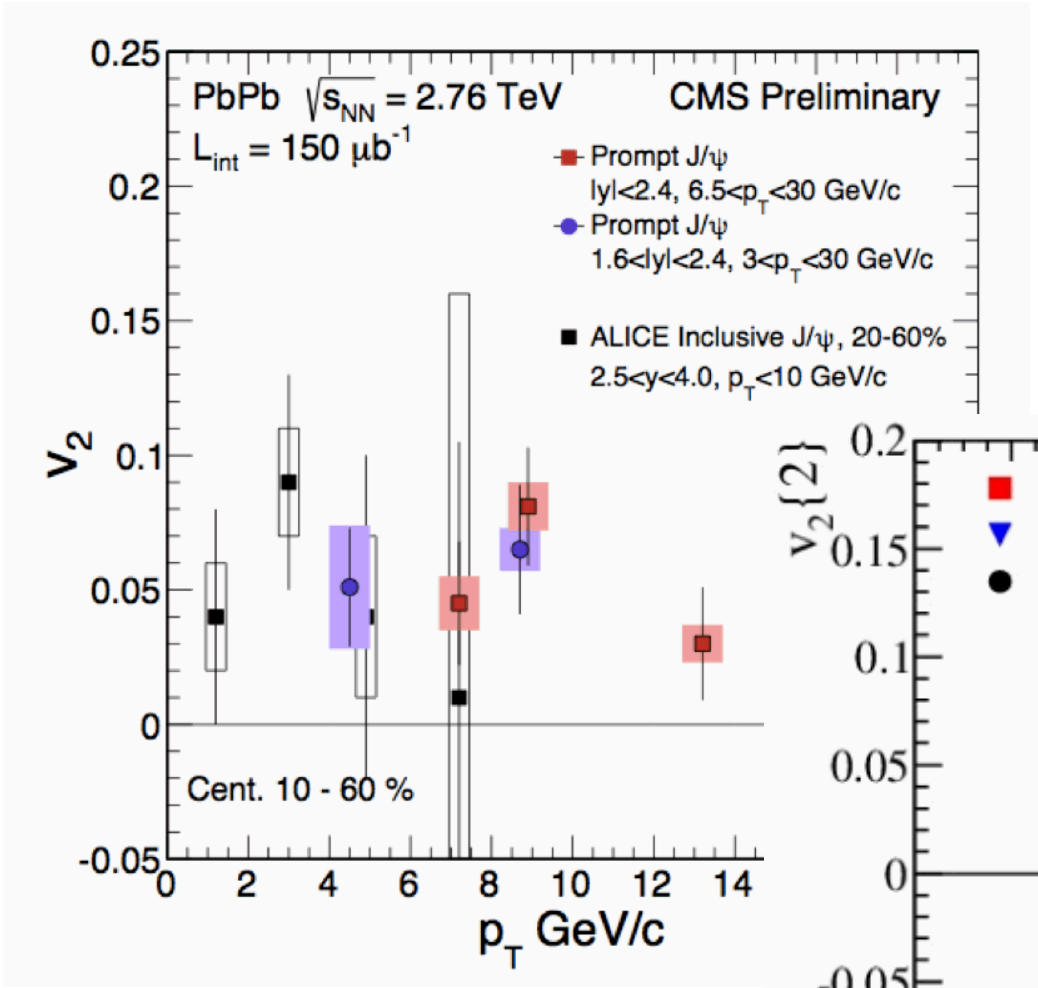


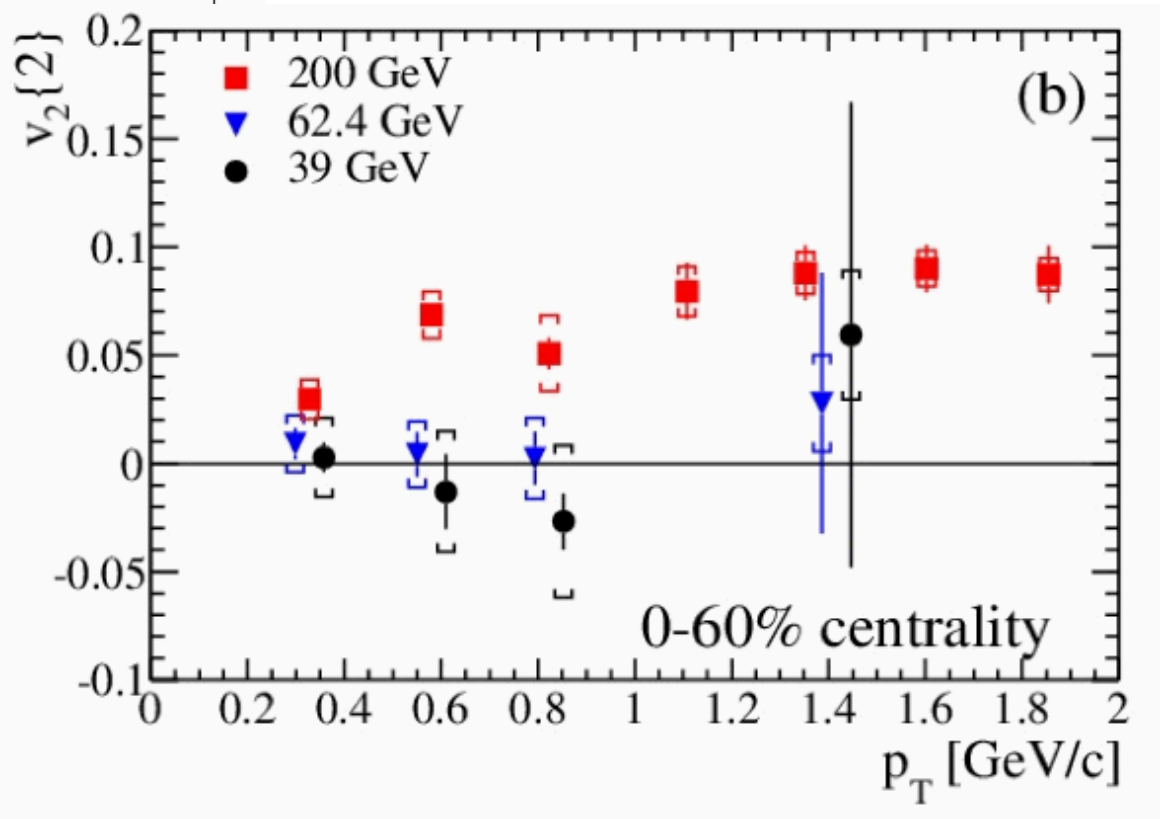
Soumya Mohapatra, 20/May, collective

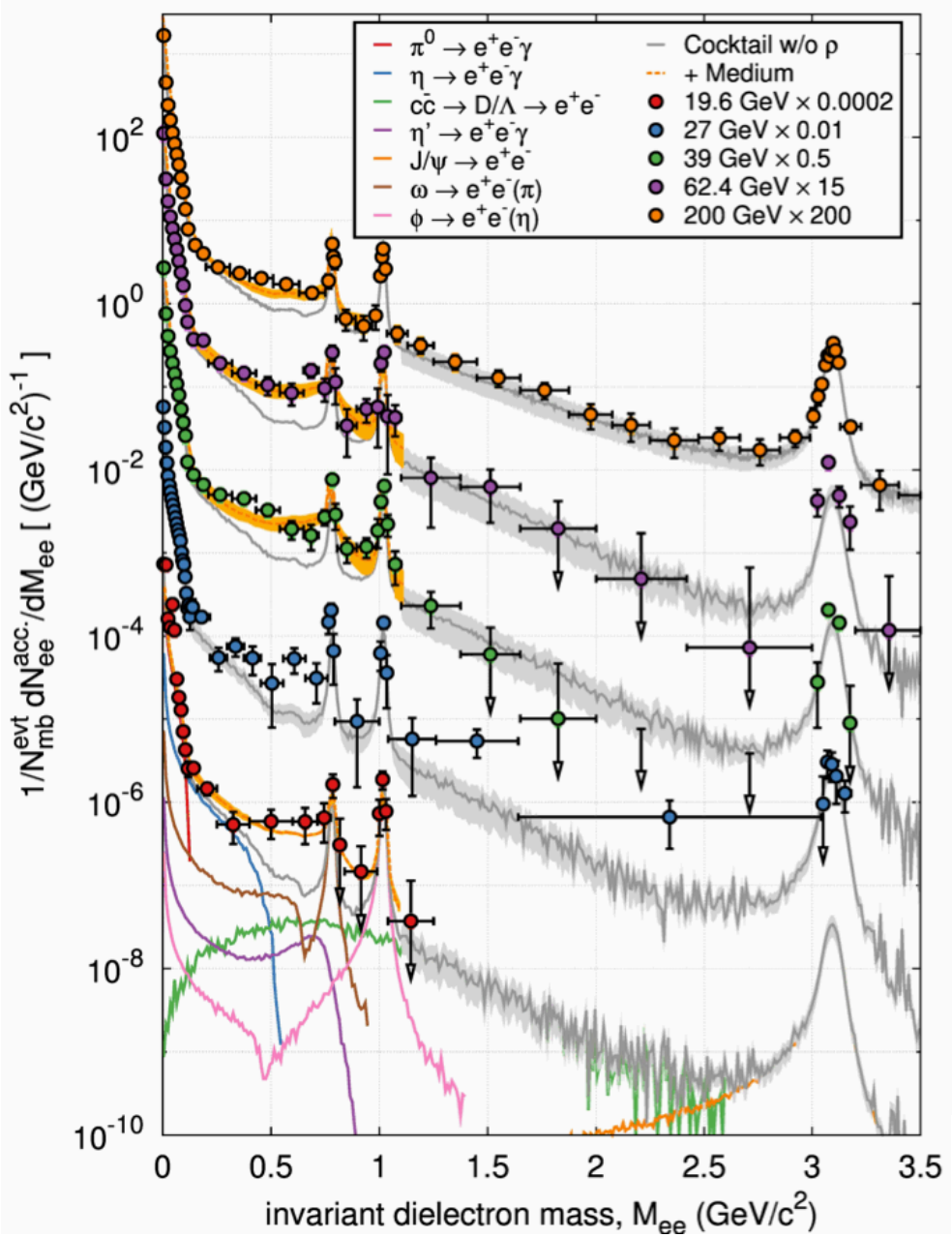

Anisotropy v_2
π
p
φ
Ω
Centrality: 0-80%
STAR Preliminary


ALICE 10-20% Pb-Pb $\sqrt{s_{NN}}$ = 2.76 TeV
v_2{SP,|Δη| > 0.9}
p_T (GeV/c)


ALICE 40-50% Pb-Pb $\sqrt{s_{NN}}$ = 2.76 TeV
p_T (GeV/c)

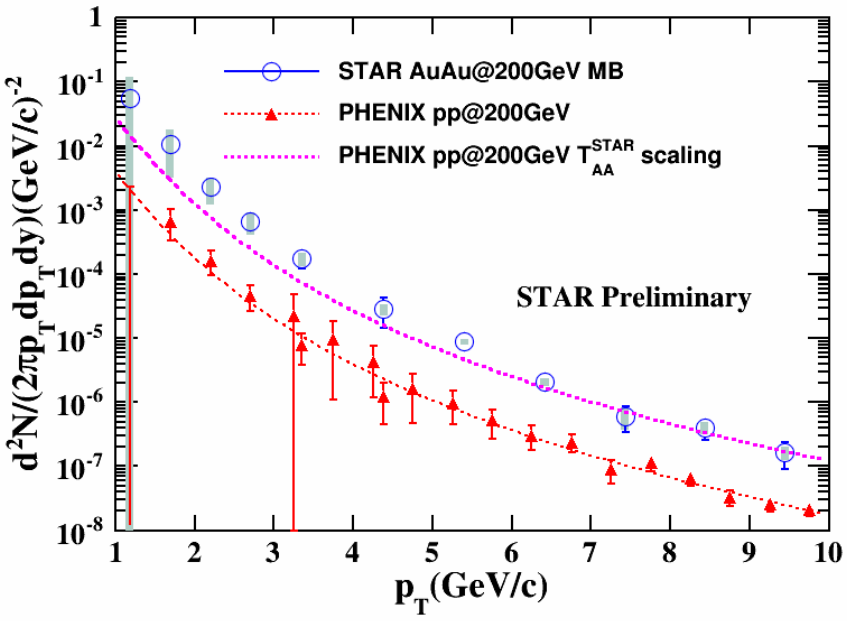

PbPb $\sqrt{s_{NN}}$ = 2.76 TeV
CMS Preliminary
L_{int} = 150 μb^{-1}
Prompt J/ψ
|y|<2.4, 6.5<p_T<30 GeV/c
Prompt J/ψ
1.6<|y|<2.4, 3<p_T<30 GeV/c
ALICE Inclusive J/ψ, 20-60%
2.5<y<4.0, p_T<10 GeV/c
Cent. 10 - 60 %
v_2
p_T GeV/c


$v_2\{2\}$
200 GeV
62.4 GeV
39 GeV
(b)
0-60% centrality
p_T [GeV/c]



$M_{ee}^{inv.}$ spectra and Direct $\gamma^{thermal}$

Chi Yang,
19/May, ele./mag.



Patrick Huck,
19/May, ele./mag.