

Investigating the onset and path-length dependence of energy loss with hard probes in light ions at ATLAS

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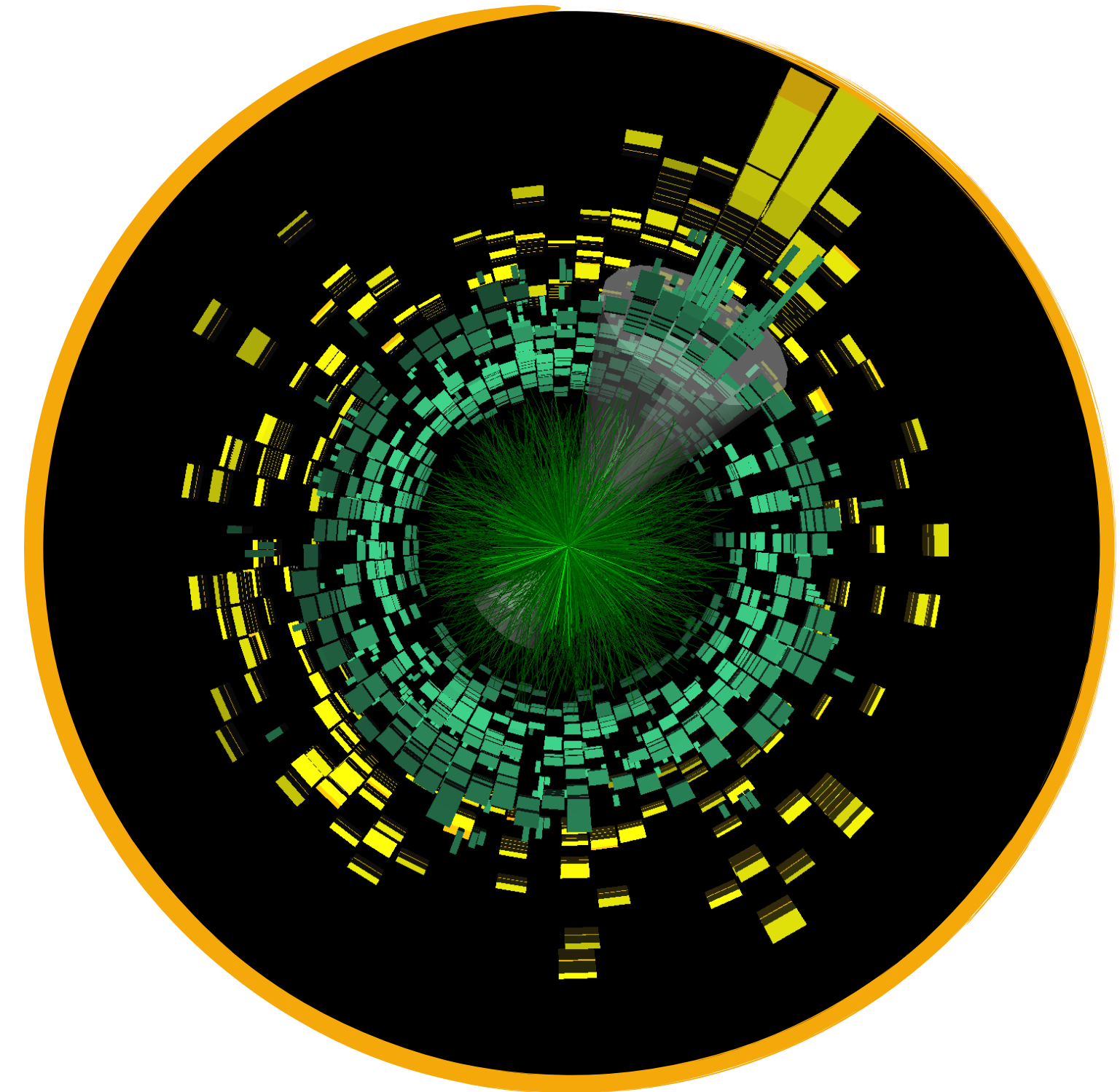
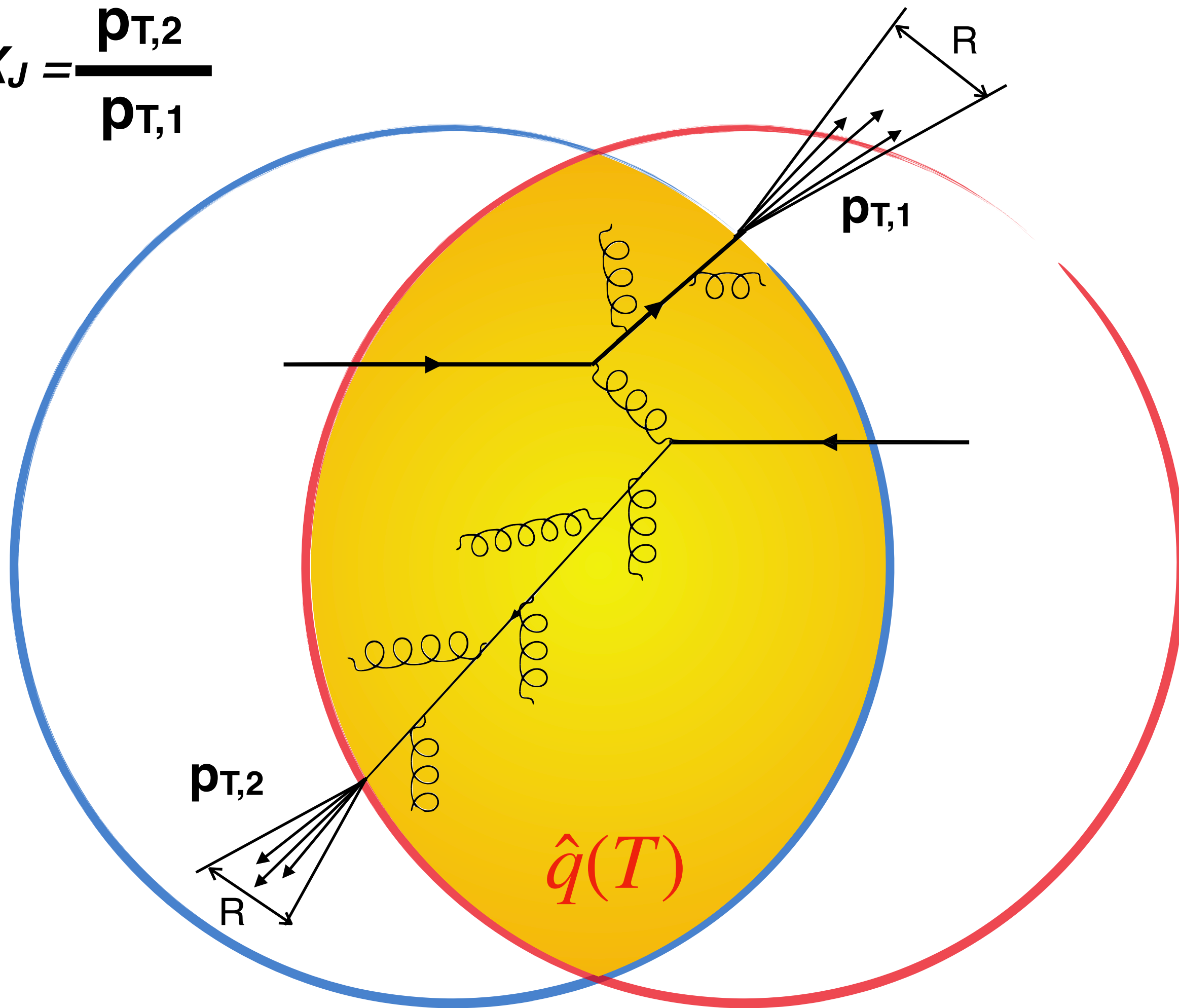
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Dijet momentum imbalance: a direct view of quenching

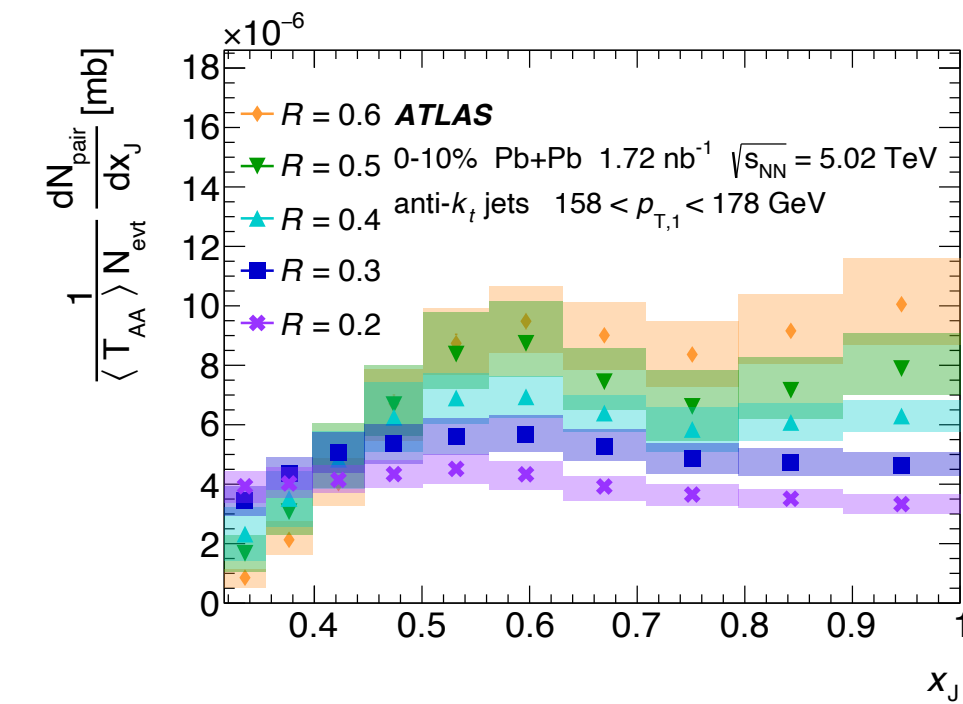
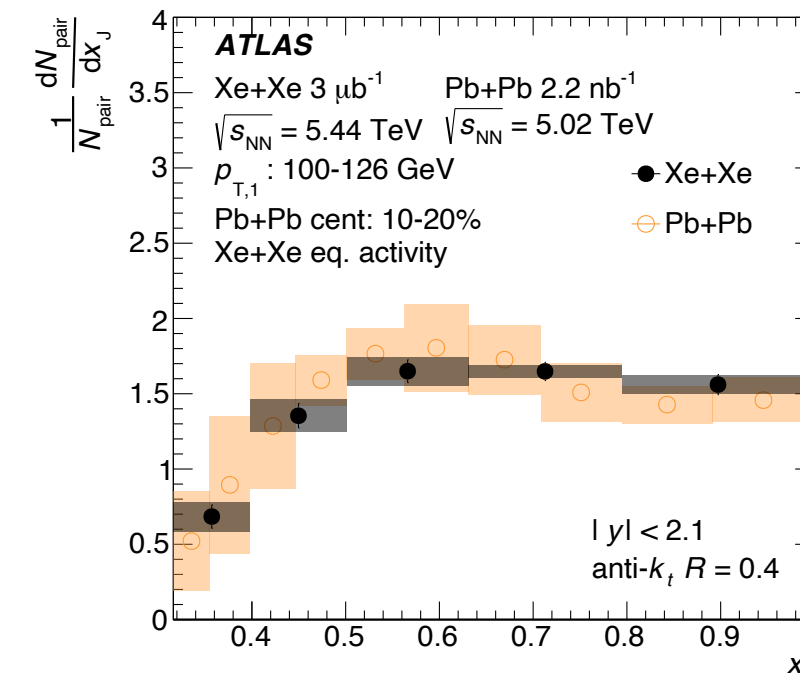
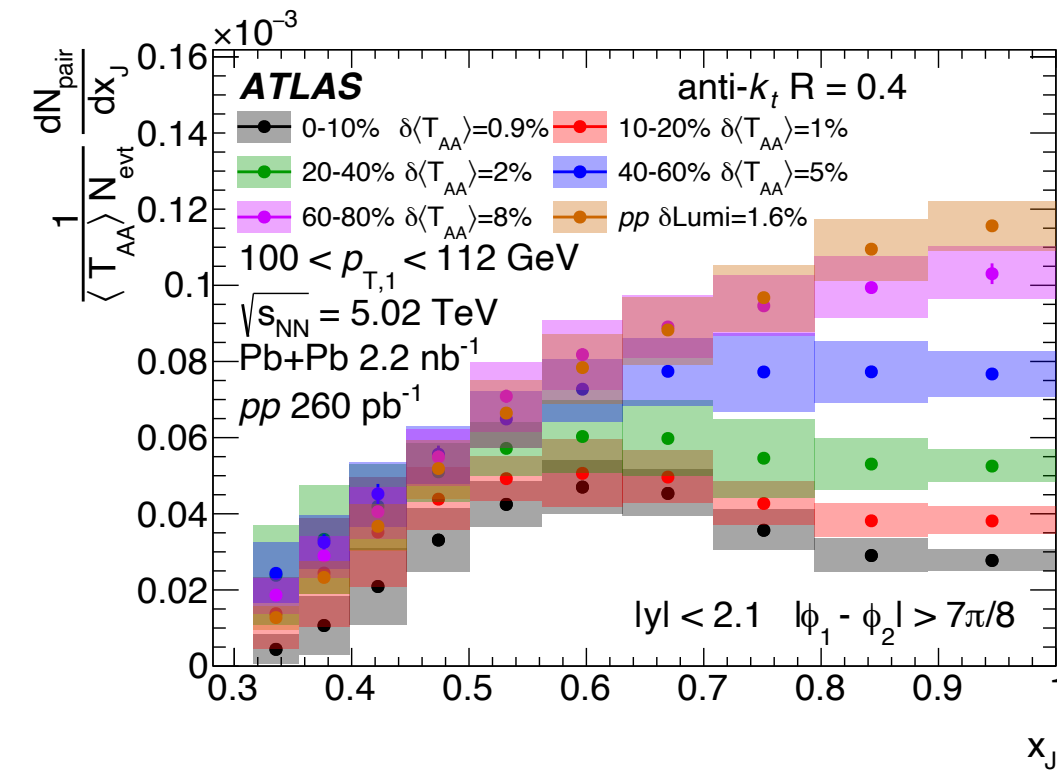
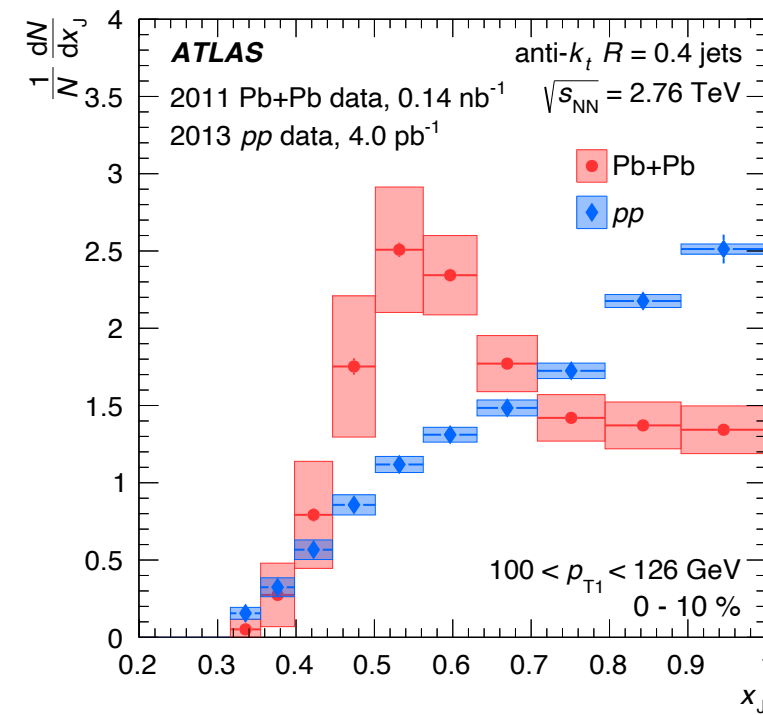
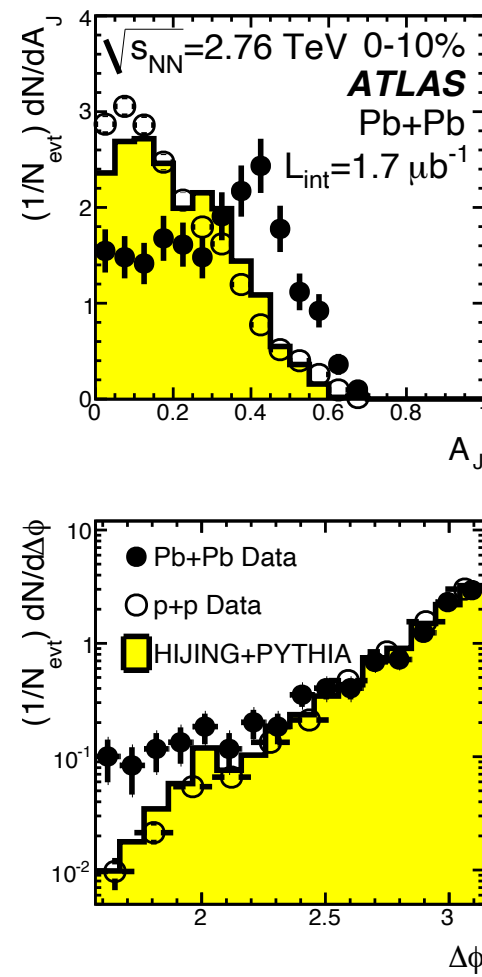
initial parton kinematics constrained by the
dijet requirement

$$X_J = \frac{p_{T,2}}{p_{T,1}}$$

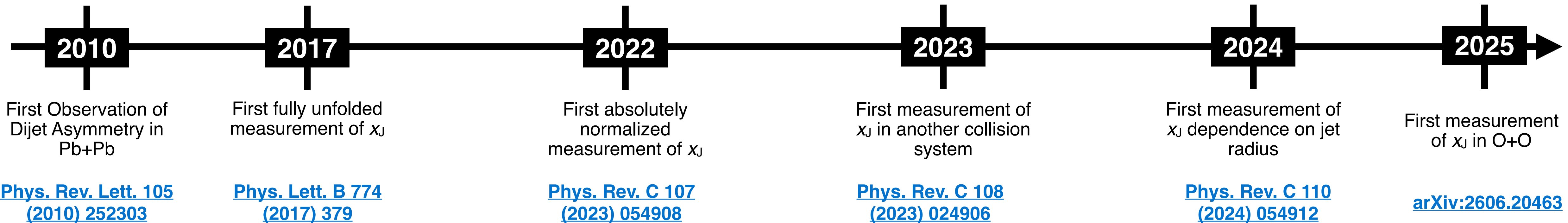


Modification of the **dijet momentum balance**
directly **probes the medium properties**

comprehensive collection of dijet measurements

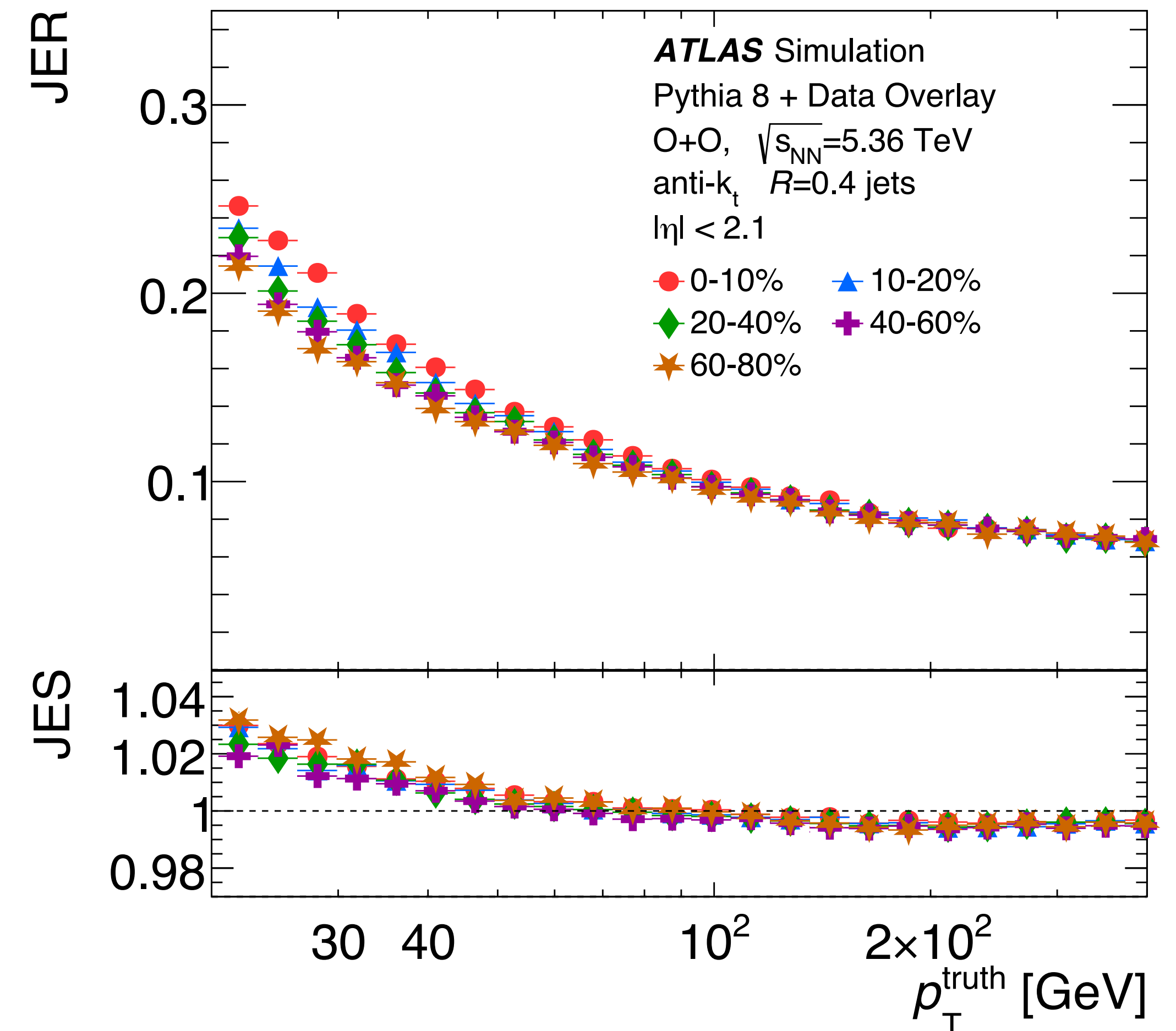


This
Talk!

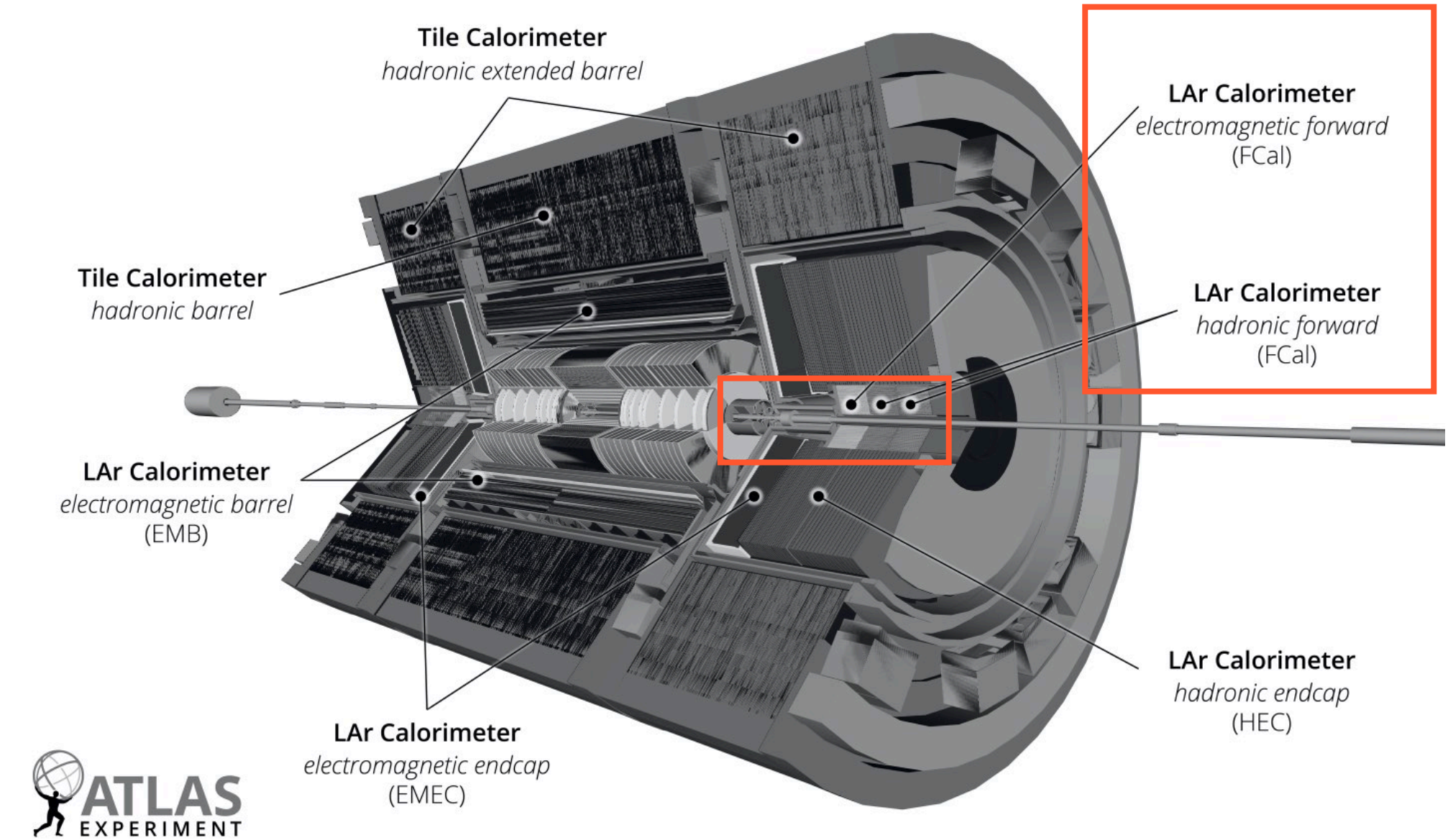
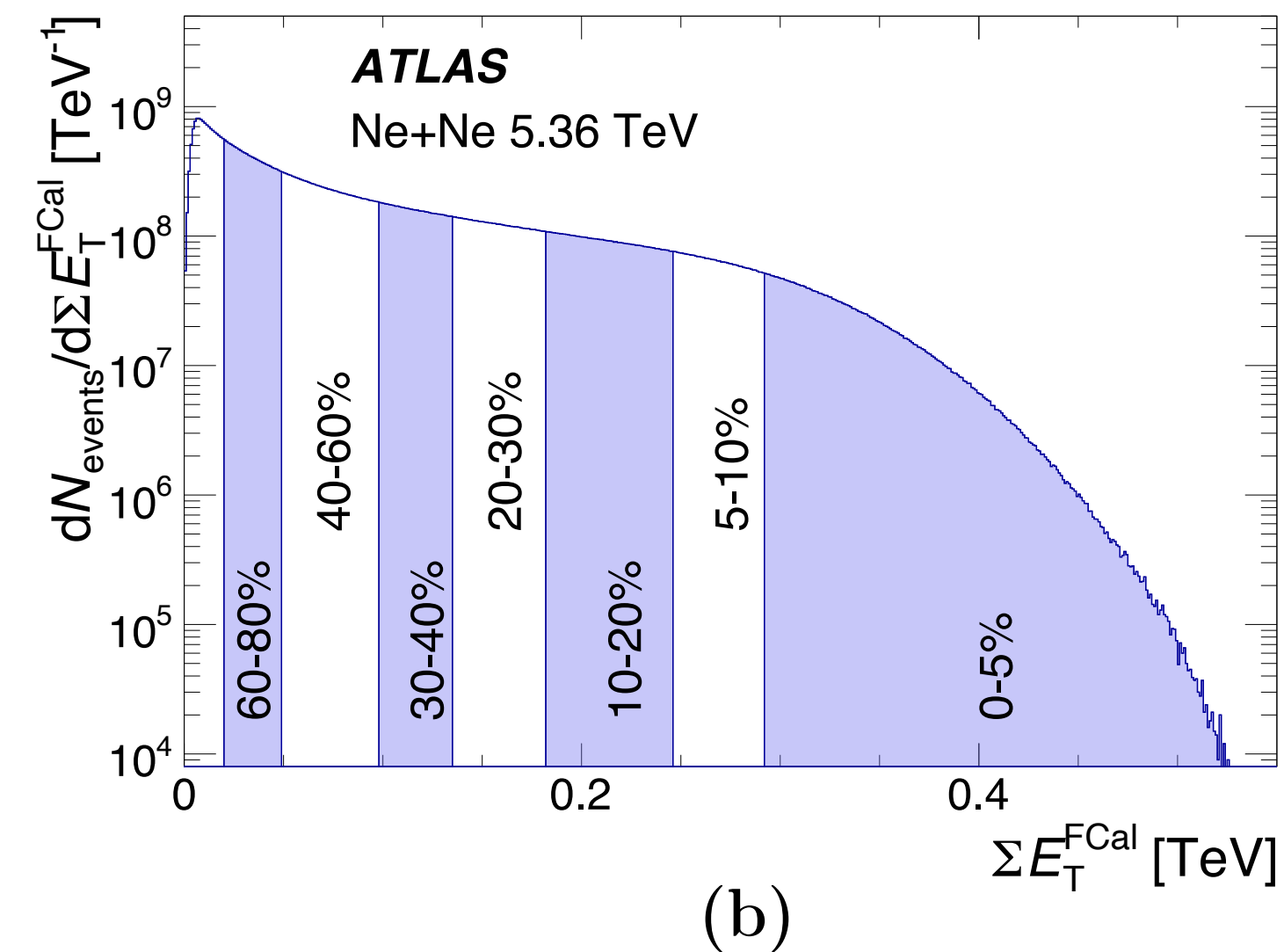
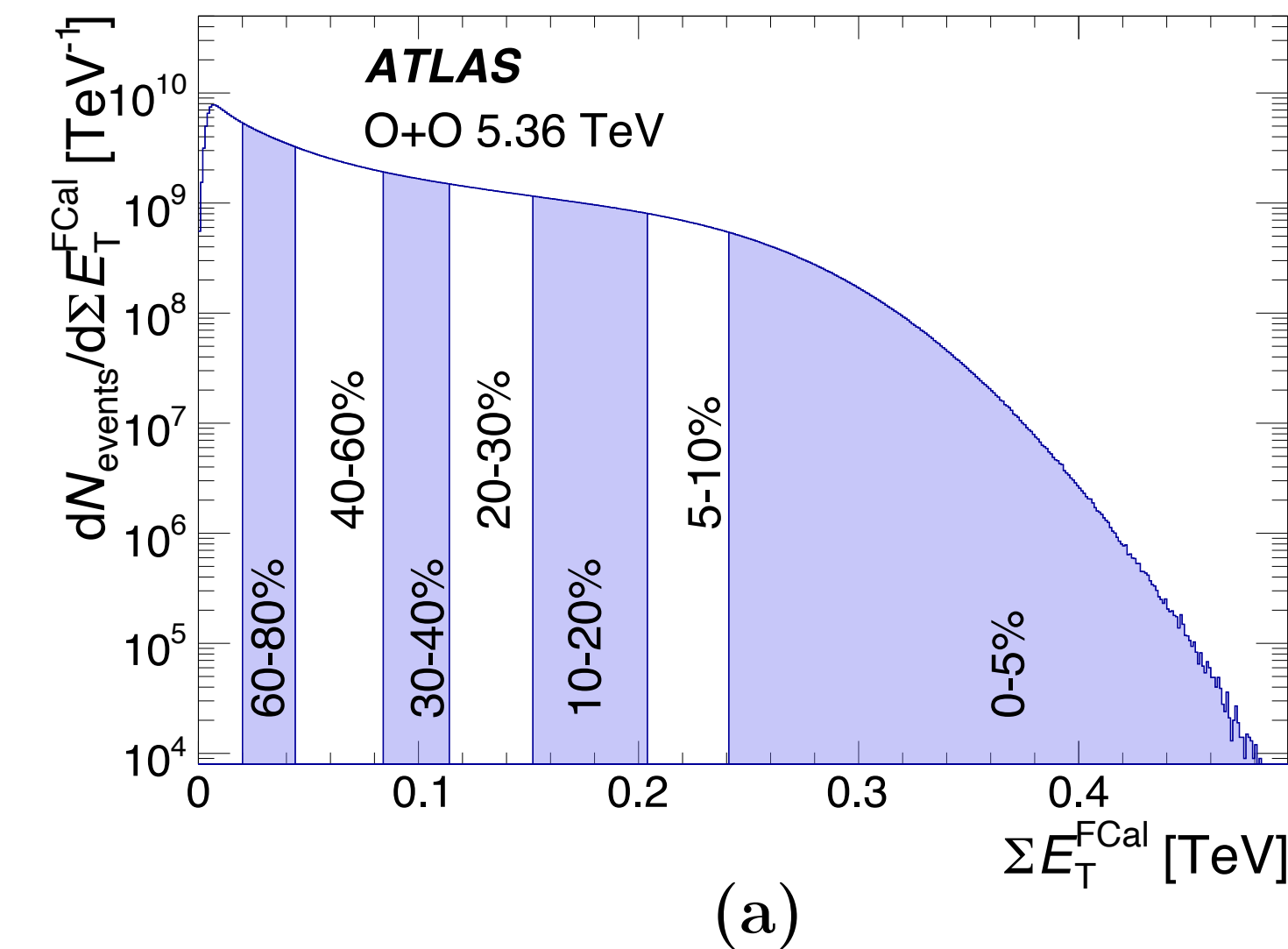


jet performance & analysis definition

- measure the highest p_T $R = 0.4$ dijets in the event
- require $\Delta\phi > 7\pi/8$ & $|\eta| < 2.1$
- leading jets from 63 – 251 GeV
 - in PbPb collisions leading jets are > 100 GeV
- 2D Bayesian unfolding in p_{T1} - p_{T2} and project onto x_J
- identical method and jet selection as in PbPb and XeXe analysis
 - however, smaller UE in OO allow us to push to lower jet p_T than in larger collision systems



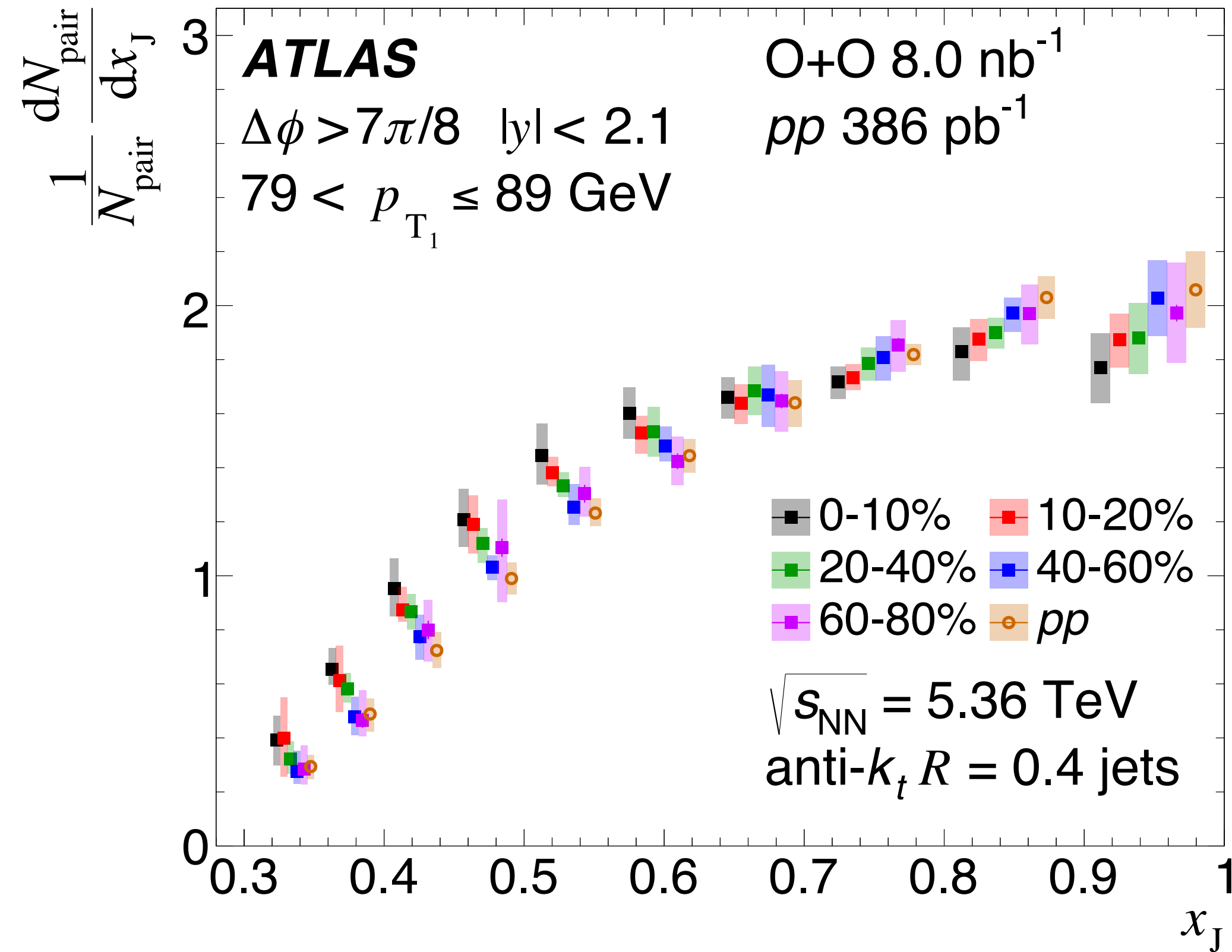
centrality in OO & NeNe



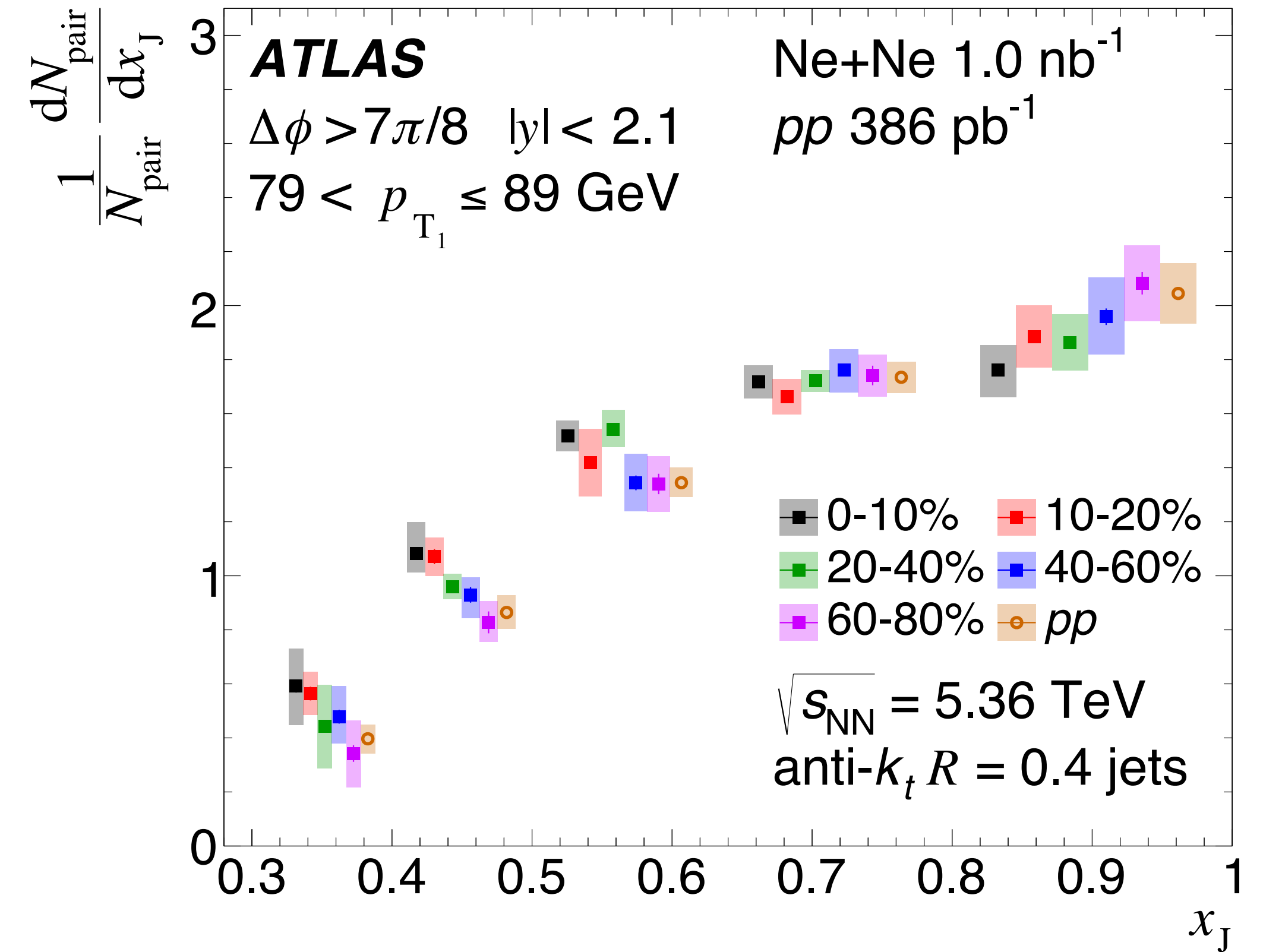
- $\langle \mu \rangle = 0.2$
- events with multiple vertices rejected
- centrality defined using transverse energy (E_T) in the FCal ($3.2 < |\eta| < 4.9$)

dijets OO & NeNe

OO



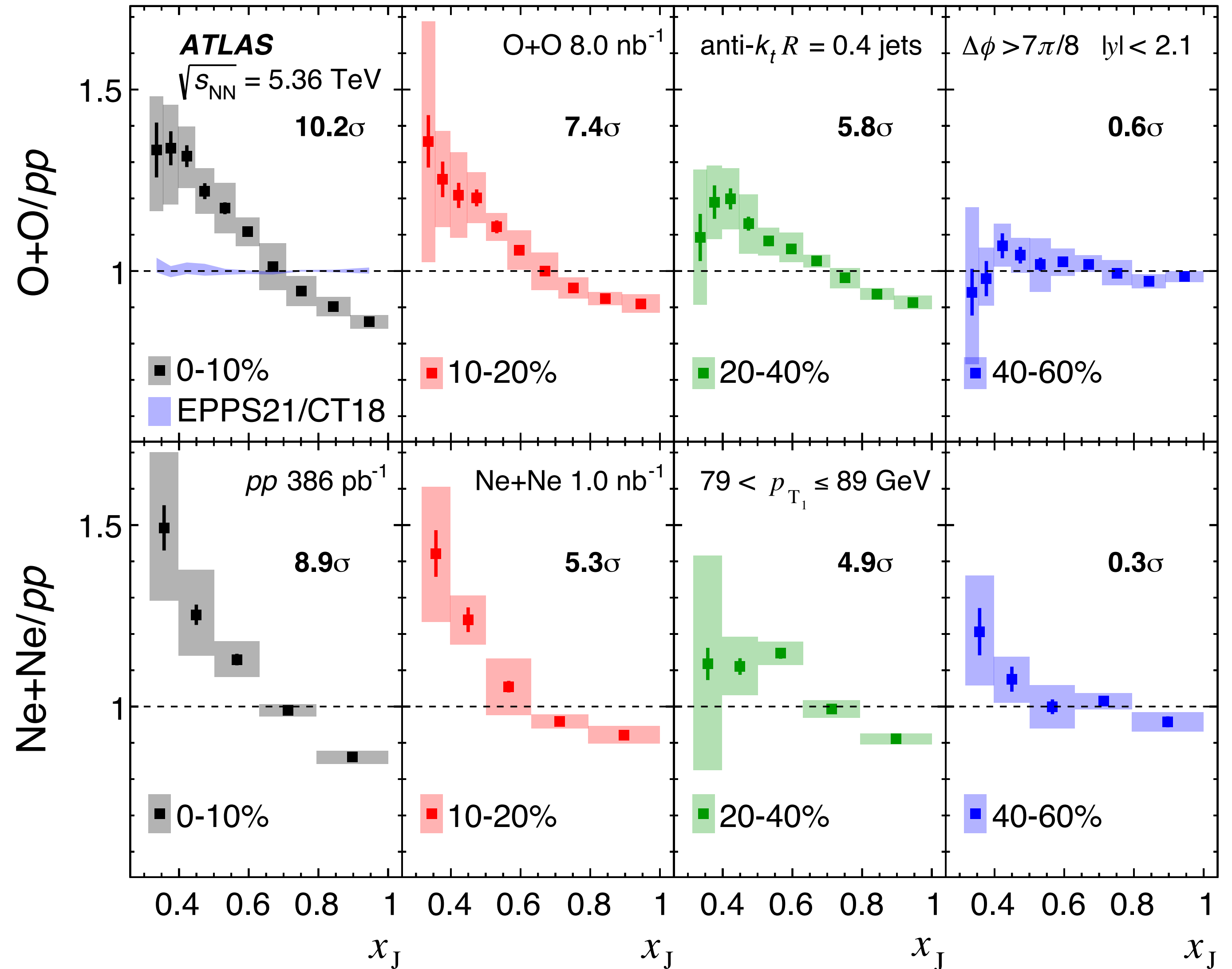
NeNe



evolution of the x_J distribution from **central collisions** to **pp collisions**

ratio to pp

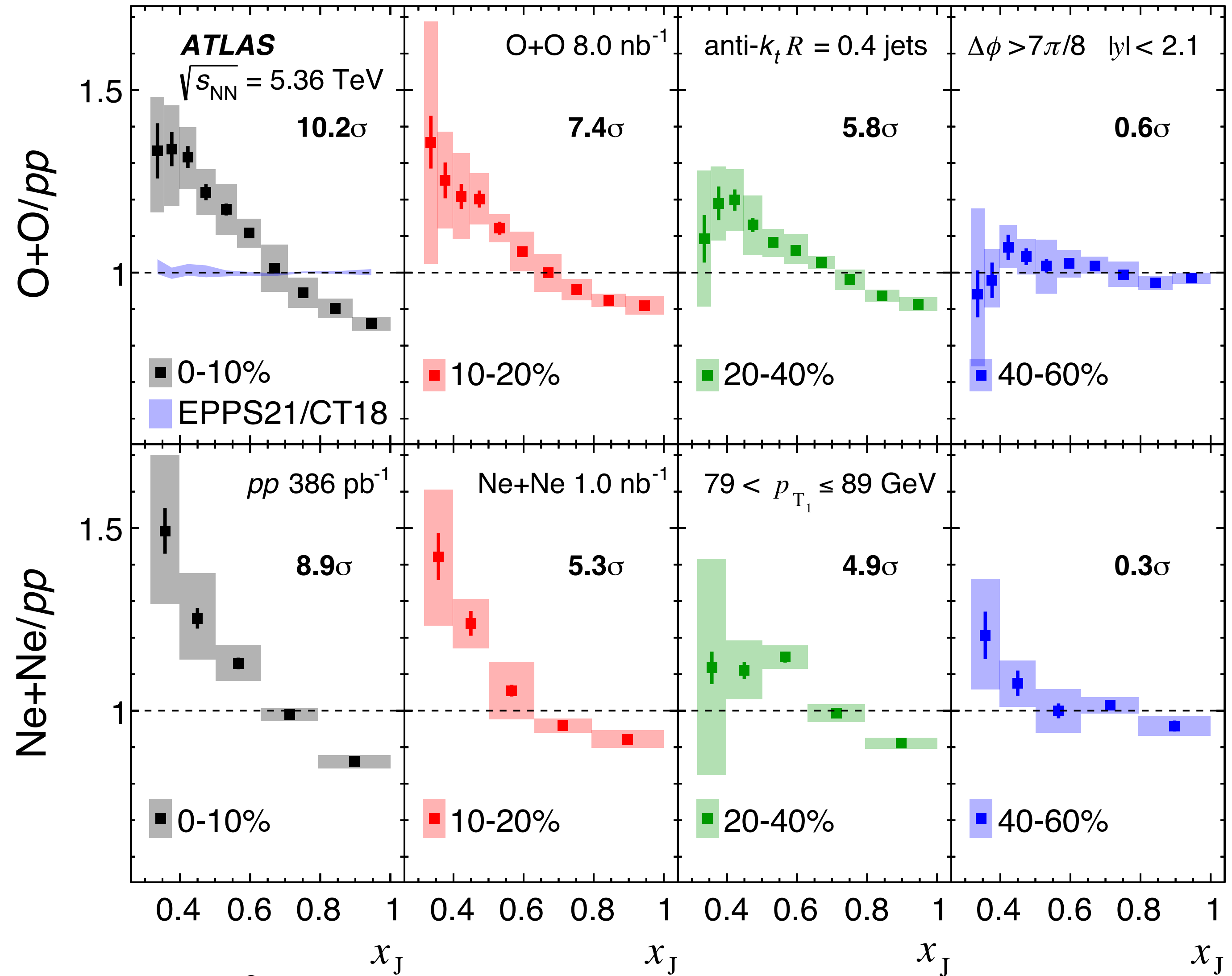
- modification compared to pp
- enhancement of low x_J and suppression of large x_J
- magnitude increases toward more central collisions



observation of modification

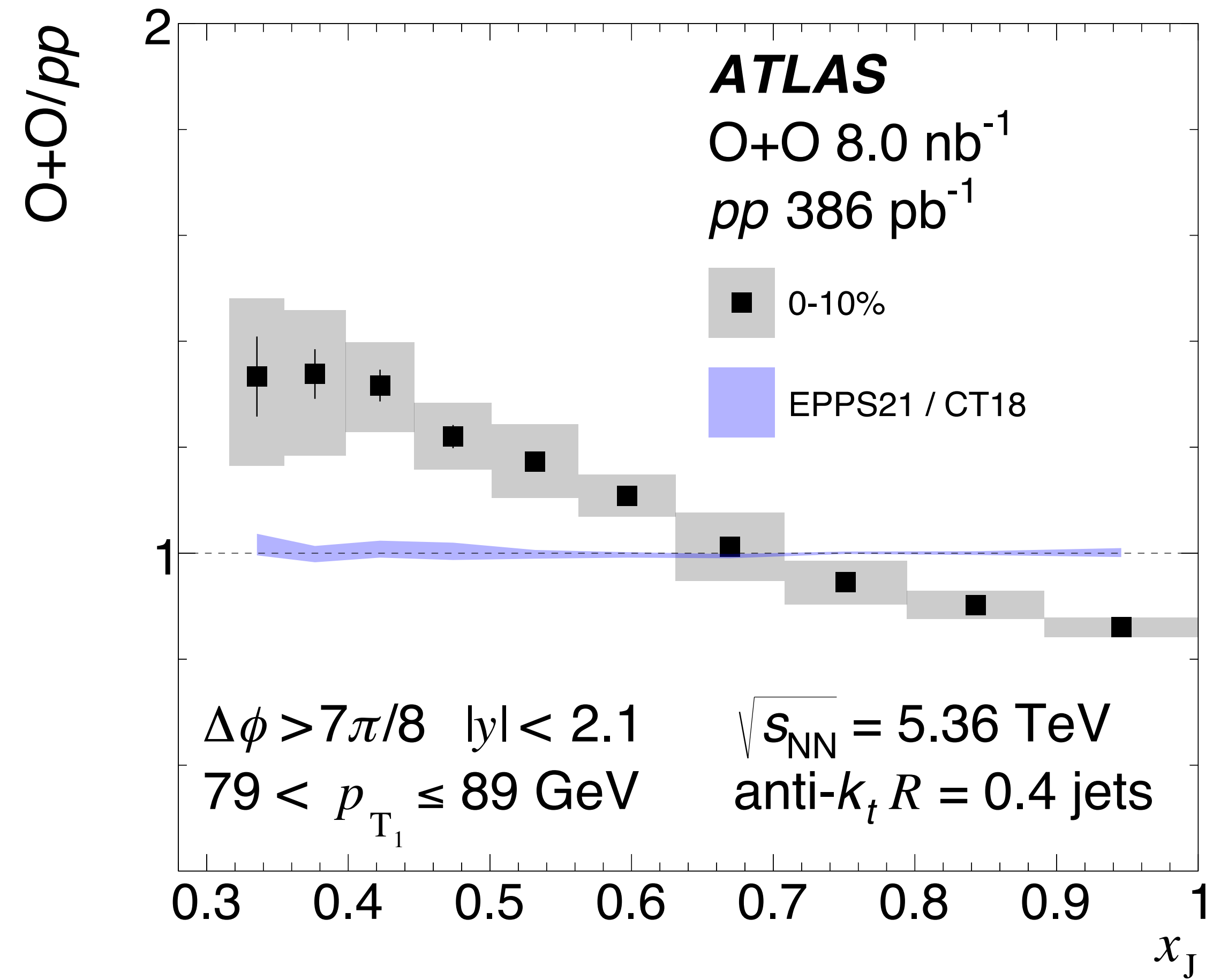
All Centralities O+O Significance					
p_{T_1} [GeV]	0–10%	10–20%	20–40%	40–60%	60–80%
[63, 71]	9.8	2.5	6.3	1.4	0.0
[71, 79]	6.4	6.8	4.0	0.0	0.0
[79, 89]	10.2	7.4	5.8	0.6	0.0
[89, 100]	9.3	5.1	5.3	0.0	0.0
[100, 112]	7.3	7.4	1.0	0.0	0.0
[112, 126]	5.5	4.5	2.1	0.4	0.0
[126, 141]	5.2	1.8	0.1	0.0	0.0
[141, 251]	4.7	3.2	0.0	0.0	0.0

All Centralities Ne+Ne Significance					
p_{T_1} [GeV]	0–10%	10–20%	20–40%	40–60%	60–80%
[63, 71]	11.5	6.6	4.3	1.3	0.4
[71, 79]	9.2	4.8	2.8	1.1	0.3
[79, 89]	8.9	5.3	4.9	0.3	0.0
[89, 100]	6.2	6.0	4.3	0.7	0.0
[100, 112]	6.3	3.6	3.3	0.0	0.0
[112, 126]	6.7	1.5	2.3	0.0	0.0
[126, 141]	4.0	1.6	1.8	0.0	0.0
[141, 251]	4.3	3.2	0.9	0.0	0.0

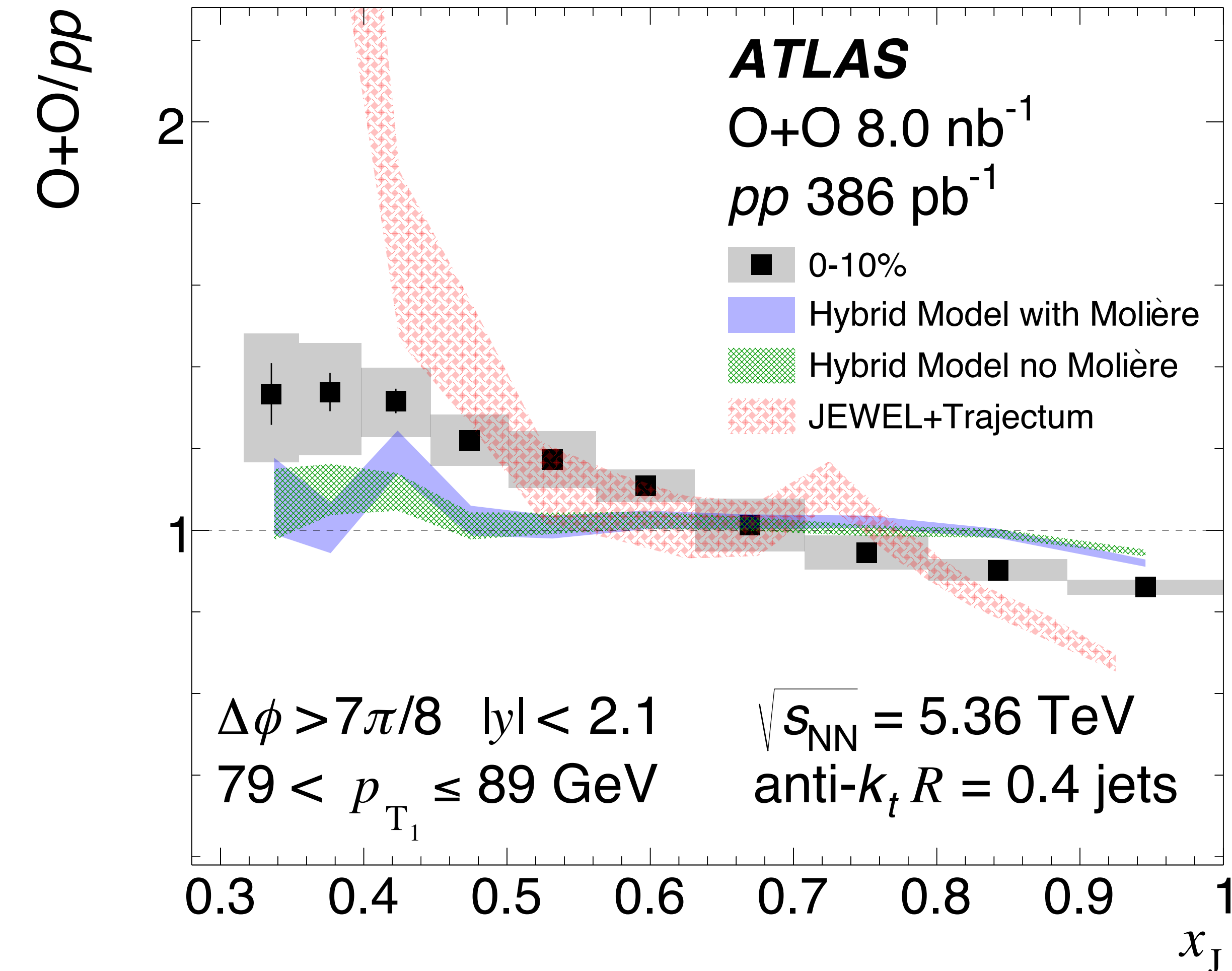


effect of nuclear PDFs

- effect of nuclear PDFs never more than 5% and is much smaller than the modification observed
- EPPS21 shown but also checked nCTEQ15 and saw the same results



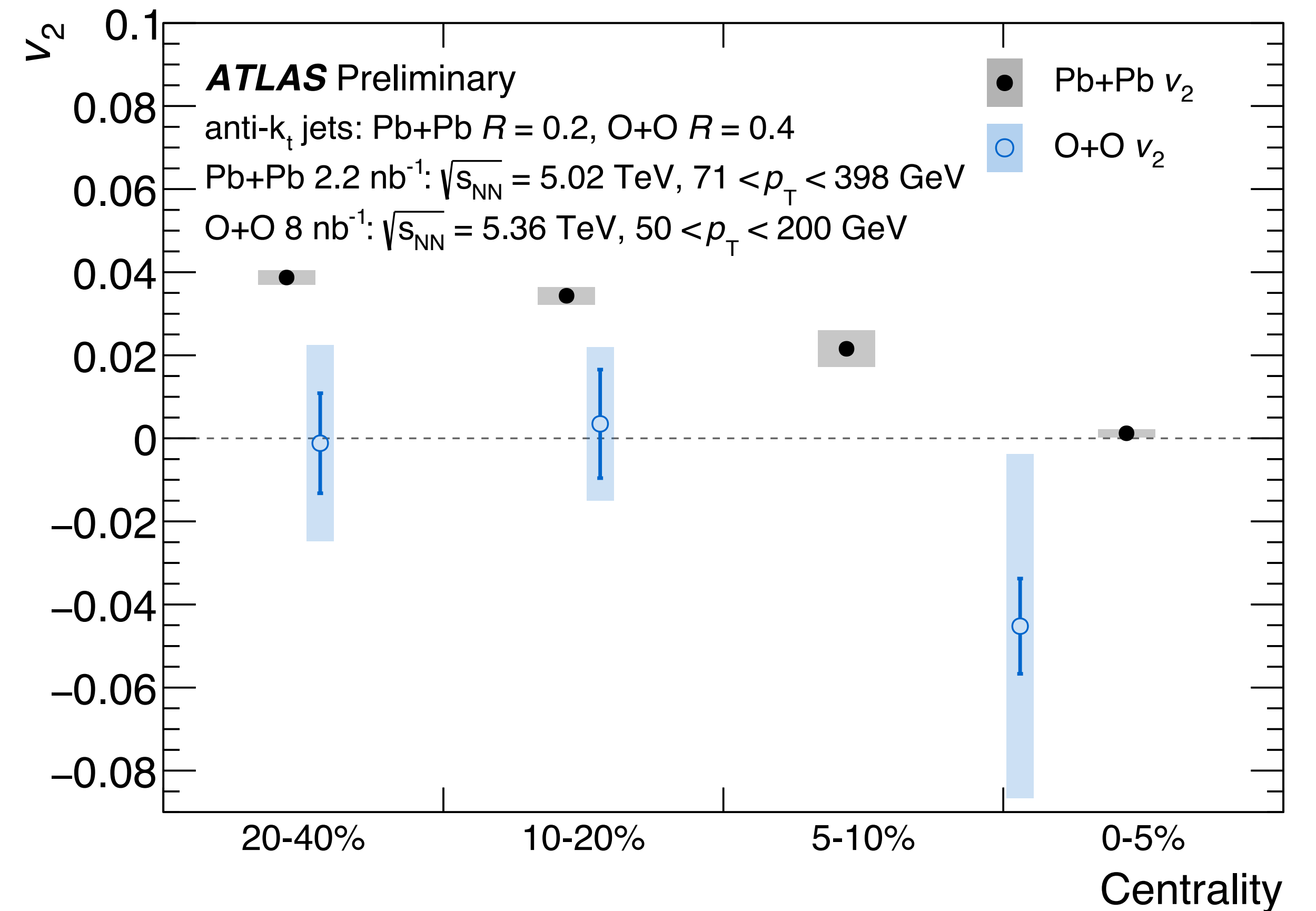
jet quenching models



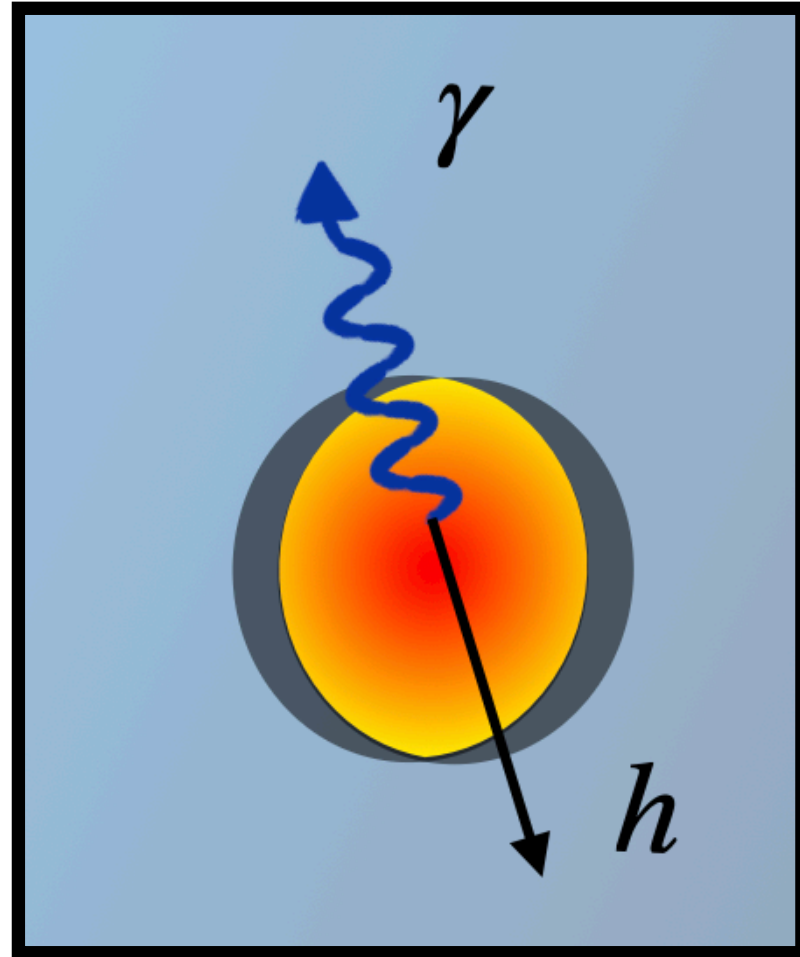
- qualitative agreement with available jet quenching models
- JEWEL (w/o recoils) predicts a stronger centrality dependence than the data
- Hybrid model expects a weaker centrality dependence

jet v_N

- no significant jet v_N signal jet
- large systematics from non-flow correlations in a very small system
- working on improvements now

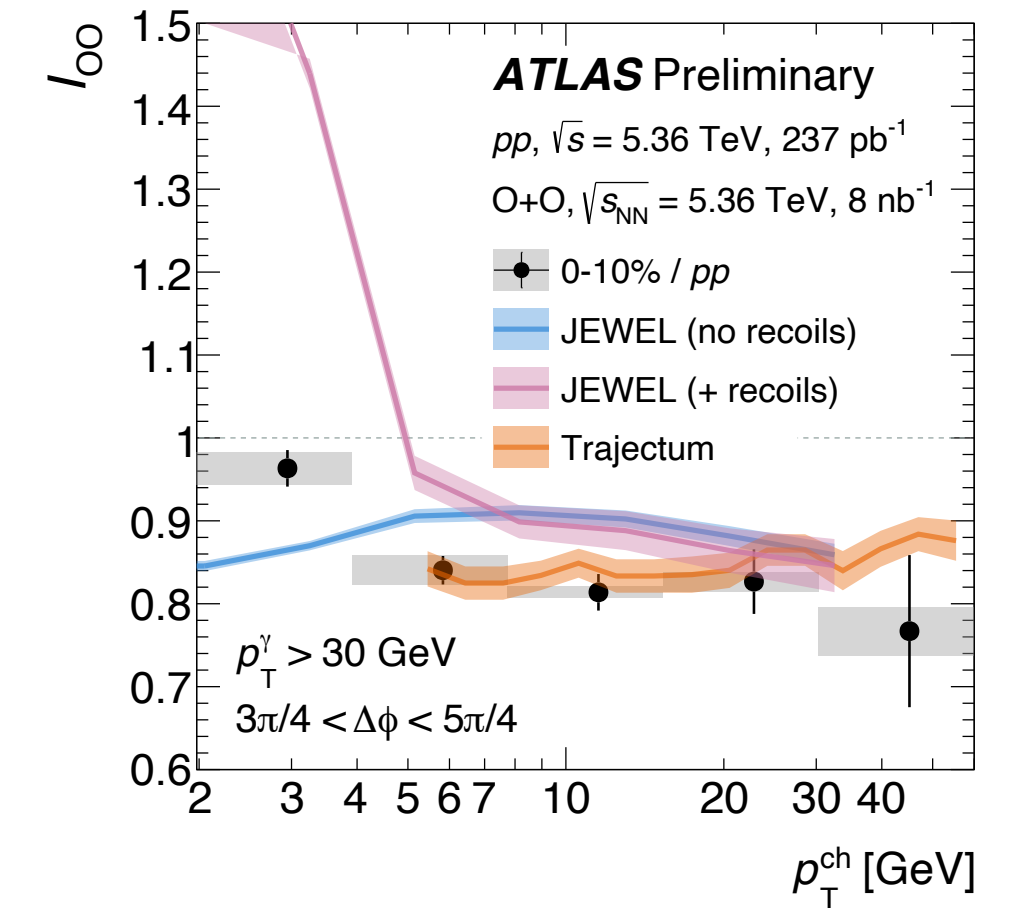
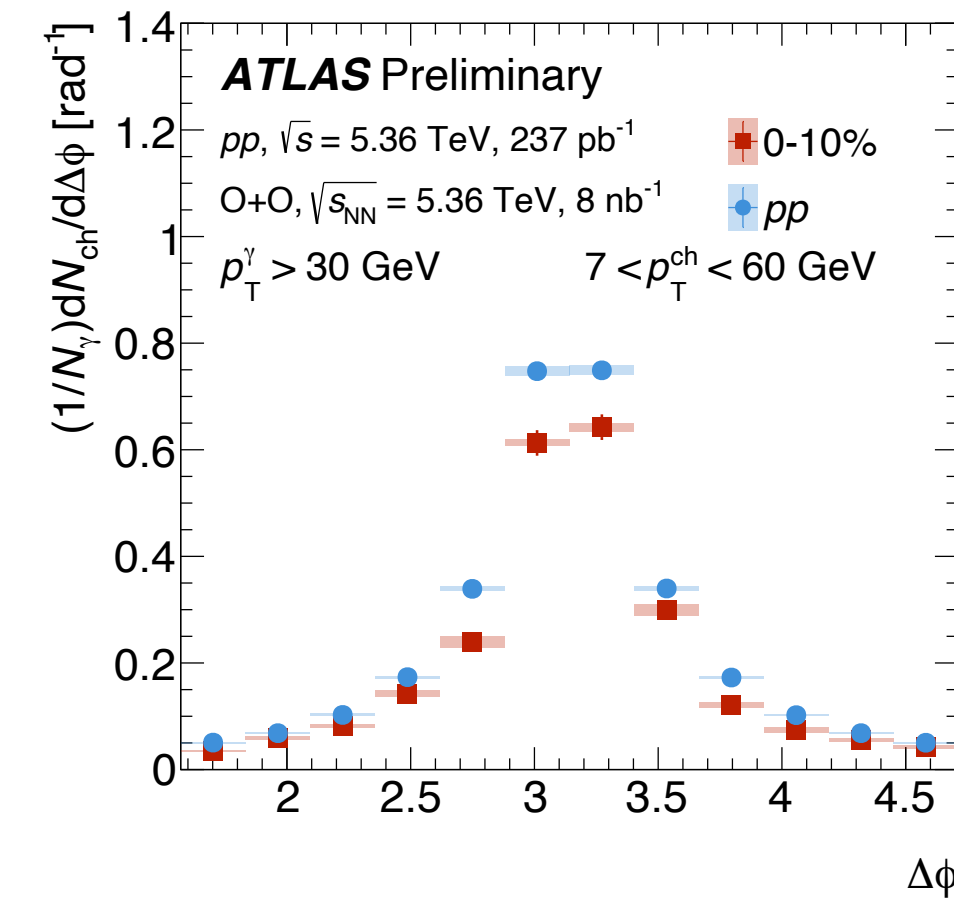


γ -hadron correlations in OO

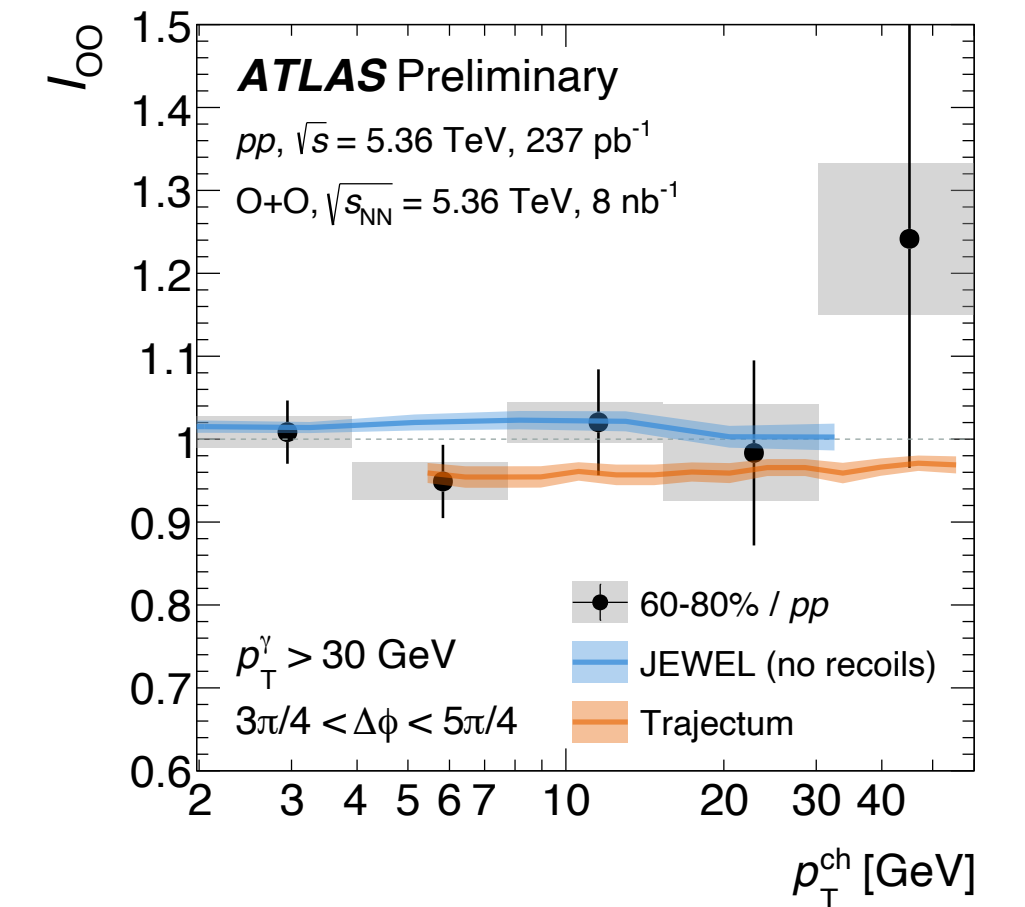
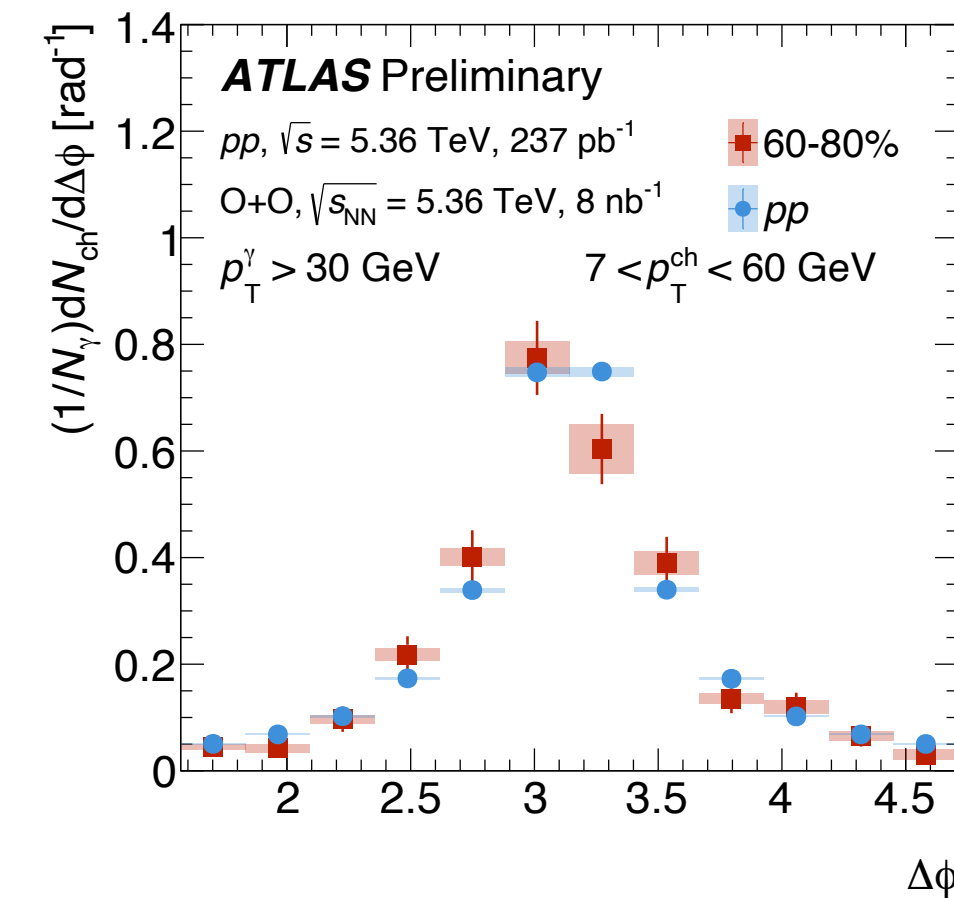


*clear signs of
suppression of hadrons
opposite photon in
central OO collisions*

- per photon normalization simplifies determining centrality
- qualitative agreement with quenching models



0-10%



60-80%

where next?

- observation of the modification of the dijet momentum balance distribution in OO & NeNe collisions
 - *the hard probes program in OO at ATLAS has yielded exciting new results and a new system in which to study jet quenching*
- broadening this program to new nuclei provides a clear way to explore the path length dependence of jet quenching
 - *stay tuned for new results from existing OO & NeNe datasets!*

all ATLAS HI results: <https://twiki.cern.ch/twiki/bin/view/AtlasPublic/HeavyIonsPublicResults>

backup