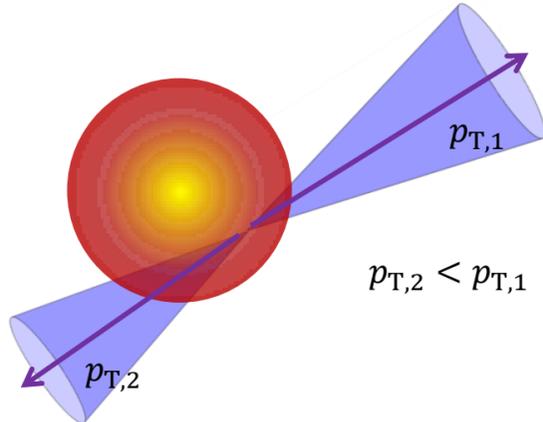


Motivation:

- Jets are known to lose energy while traversing the Quark Gluon Plasma
- Modifications to transverse momentum balance of di-jet pairs in Pb+Pb versus pp collisions can provide direct insight on the path length dependence to energy loss.
- It has been observed at $\sqrt{s_{NN}} = 2.76$ TeV that di-jet pairs lose unequal amounts of energy for leading jets with p_T up to 200 GeV in 0-10% central collisions

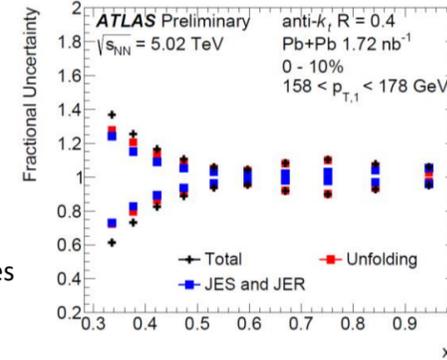


Measurement:

- Directly measure the two-dimensional leading, subleading transverse momentum ($p_{T,1}, p_{T,2}$) distribution of the leading dijet pair with $\Delta\phi_{12} > 7\pi/8$ and both $|\eta_1|$ and $|\eta_2| < 2.1$
- Two dimensional Bayesian unfolding accounts for migration in both the leading and sub-leading jet p_T
- The unfolded ($p_{T,1}, p_{T,2}$) distribution projected to the Di-jet momentum balance: $x_j = \frac{p_{T,2}}{p_{T,1}}$
- Results displayed are normalized per di-jet pair in a given $p_{T,1}$ region: $\frac{1}{N_{\text{pair}}} \frac{dN_{\text{pair}}}{dx_j}$

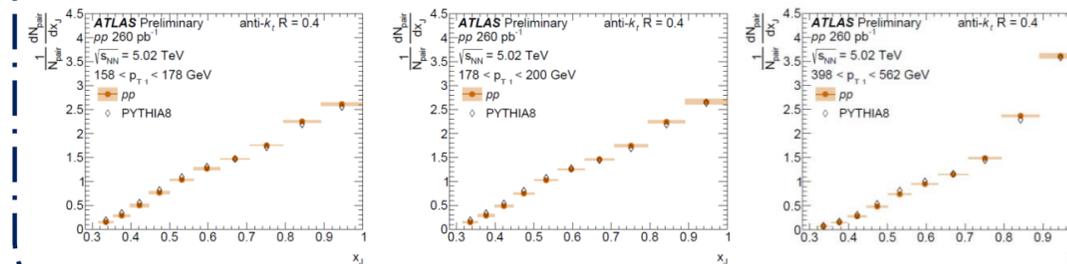
Sources of Systematic Uncertainties:

- Uncertainties on the Jet Energy Scale (JES) and Jet Energy Resolution (JER)
- Uncertainties introduced due to the **Unfolding** procedure
 - Sensitivity to the prior
 - Unfolding Non-Closure
 - Sensitivity to minimum reconstructed p_T^{jet} which goes into the analysis (nominal 44 GeV)



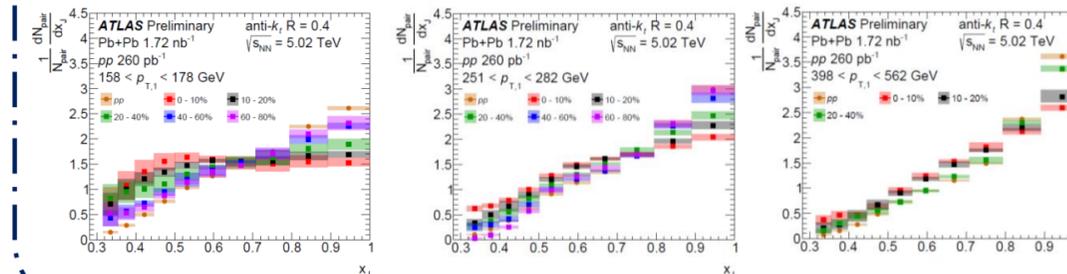
Results: pp Comparison to PYTHIA8

- Observe good agreement with the PYTHIA8 (A14 Tune) generator for $158 < p_{T,1} < 562$ GeV



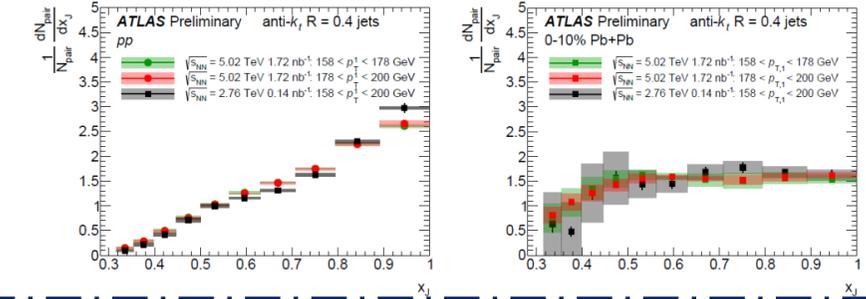
Results: Centrality Dependence

- $158 < p_T^1 < 178$ GeV in central Pb+Pb is consistent with flat $x_j > 0.5$
- Peripheral Pb+Pb is consistent with pp at $p_{T,1} = 251$ GeV
- Central Pb+Pb has clear modification from pp out to $p_{T,1} = 562$ GeV



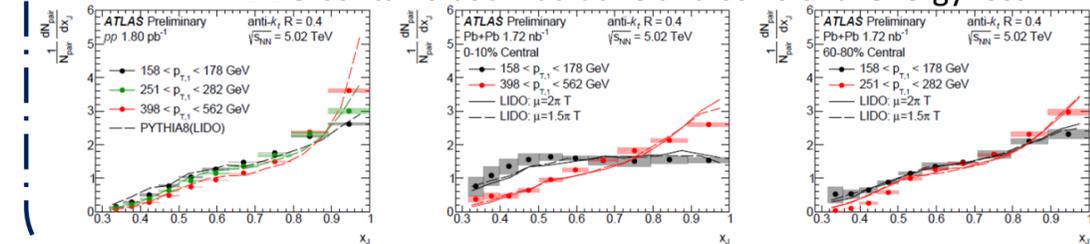
Results: Comparison 2.76 TeV

- In pp collisions the x_j distribution shows a relative depletion of symmetric dijets at 5.02 TeV compared to 2.76 TeV
- Results in Pb+Pb at 5.02 TeV are consistent within uncertainties to those measured at 2.76 TeV



Results: Theory Comparison

- PYTHIA8 tune used in LIDO over-predicts symmetric jets in pp collisions
- LIDO predictions observe agreement across both centrality and $p_{T,1}$
 - Overestimate the contribution of symmetric jets at high $p_{T,1}$
 - LIDO contains both radiative and collisional energy loss



Conclusions:

Through the significant modification of the momentum balance in central Pb+Pb compared to pp collisions we observe clear evidence of asymmetric energy loss within the QGP up to 562 GeV in leading jet p_T . These measurements provide new, high p_T , information about the role of fluctuations and path length in energy loss.

