Jet fragmentation measurements in $p+$Pb collisions with ATLAS

- A Study of jet internal structure shows a modification of fragmentation functions in central HI collisions.
  - Can we use $p+$Pb collisions as a reference for Pb+Pb collisions?
  - How much modification is coming from initial nPDF effects?

Inclusive jet rate in $p+$Pb collisions is only slightly enhanced.

Enhancement of charged spectra at high $p_T$ is suggestive of modification of jet internal structure.
Fragmentation functions

- Tracking efficiency corrected fragmentation function (FF) defined as:

\[ D(z) \equiv \frac{1}{N_{\text{jet}} \varepsilon} \frac{1}{\Delta z} \Delta N_{\text{ch}}(z) , \text{ where } z = \frac{p_{T}^{\text{ch}}}{p_{T}^{\text{jet}}} \cos \Delta R \]

- Fragmentation function are unfolded using 2D Bayesian unfolding in \( z \) and jet \( p_T \).

Significant differences between MC models.

FF in \( pp \) well described by NLO QCD calculations (arXiv:1506.01415).

No \( pp \) data at 5.02 TeV.

The reference was built by extrapolation of the 2.76 TeV FF using PYTHIA 6 and HERWIG++.

Different MC models have similar \( \sqrt{s} \) evolution.
Comparison of $p$+Pb data to extrapolated $pp$ reference

Lines: the $R_{D(z)}$ evaluated using extrapolation with HERWIG++

- An evidence for an enhancement of $R_{D(z)}$ in the $z$ region 0.3-0.8.
- Correspond to the same range in $p_T$ where the inclusive charged particle spectrum in $p$+Pb collisions is enhanced.
- 5.02 TeV $pp$ reference data are essential for final conclusion.