Prompt and isolated photons in 8.16 TeV $p$+Pb collisions with ATLAS

**Prompt and Isolated Photons**

- Prompt photons originate in initial hard quark-quark and quark-gluon scattering
- Sensitive to parton densities and potential initial modification
- Insensitive to final state medium effects
- Can function as a standard candle with which strongly interacting probes, such as jets, may be compared

Requiring photons to be isolated suppresses the contribution from radiative processes and vector meson decays in jets.

- Reject photons with excess energy within a cone of R = 0.3
- Isolation energy for “Tight” identified photons compared with that from “Non-tight” selection that specifically enhances backgrounds

**Extrapolated p+p Reference**

- $p$+Pb system is boosted by a rapidity of 0.465 relative detector frame
- No $pp$ data exists at 8.16 TeV with boost

- Construct extrapolated reference by bootstrapping off published ATLAS 8 TeV $p$+p cross section results [JHEP 08 (2016) p. 005]
- Photon cross sections are calculated in JETPHOX for both collision systems
- Correction factors determined as the ratio of the 8.16 TeV boosted system to the 8 TeV center of momentum frame
- Factors are then applied multiplicatively to the published 8 TeV results

The figure shows these factors as a function of photon $p_T$ from both JETPHOX and Pythia8 as a comparison.

**Photon Cross Sections**

Prompt isolated photon cross sections with systematic uncertainties in yellow, compared to predictions from JETPHOX with the EPPS16 nPDF set

- Photon $R_{pPb}$ using extrapolated 8 TeV $p$+p data as reference
- Little to no modification at mid and forward ($p$-going) rapidities
- Slight suppression backward ($Pb$-going). This is consistent with expectations from the nuclear isospin asymmetry
- No observed preference for the two nPDF set comparisons within errors
- Slightly disfavor modification from initial state energy loss models