

Z boson production in Pb+Pb and pp collisions at $\sqrt{s}_{NN}=5.02$ TeV with ATLAS at the LHC

Motivation

Measurement of the Z boson production in heavy-ion collisions provides a test of the binary collision scaling of hard processes suggested by the Glauber model and reveals possible modifications of Parton Distribution Functions. Changes in particle production compared to pp collisions are characterized by the nuclear modification factor in a given centrality class, $R_{AA}(y)$:

$$R_{AA}(y) = \frac{1}{\langle T_{AA} \rangle} \frac{1/N_{evt} dN_{PbPb}/dy}{d\sigma_{pp}/dy}.$$

Analysis

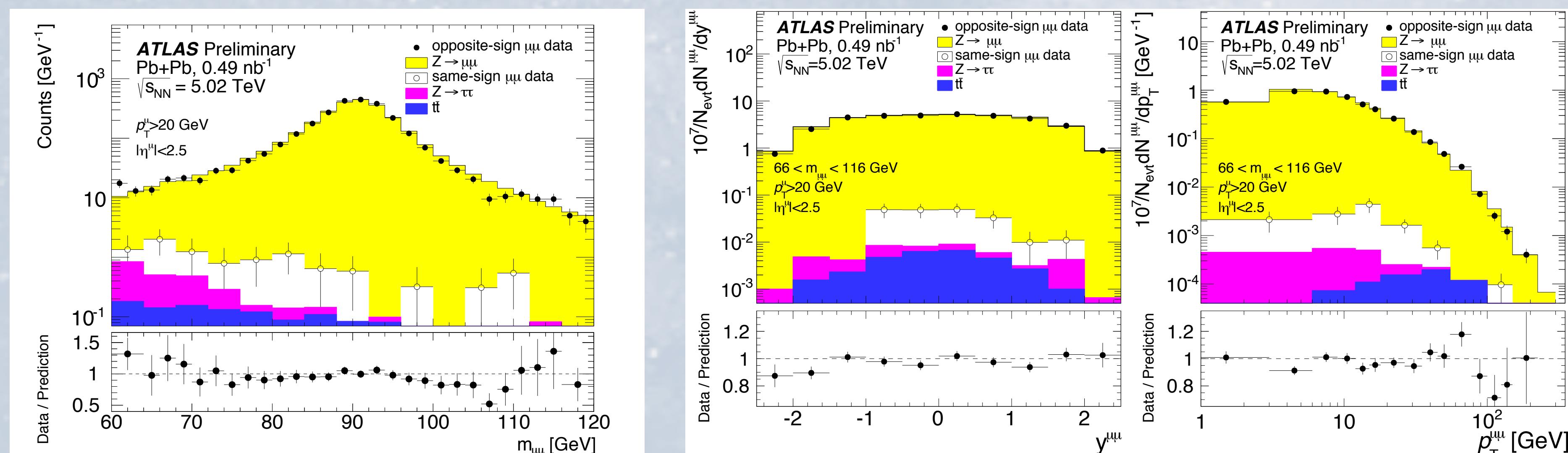
Dataset and simulation

- 2015 Pb+Pb sample of 0.49 nb^{-1}
- 2015 pp sample of 25 pb^{-1}
- signal and background MC
 - POWHEG + Pythia
 - CT10 PDF set
 - isospin combinations (signal only)
 - MinBias data overlay

Analysis selection

- Pile-up rejection
- High-level muon trigger
- Muon selection:
 - $p_T^\mu > 20 \text{ GeV}, |\eta^\mu| < 2.5$
 - high quality muons
- Pair selection:
 - $66 < m_{\mu\mu} < 116 \text{ GeV}$
 - opposite sign muons

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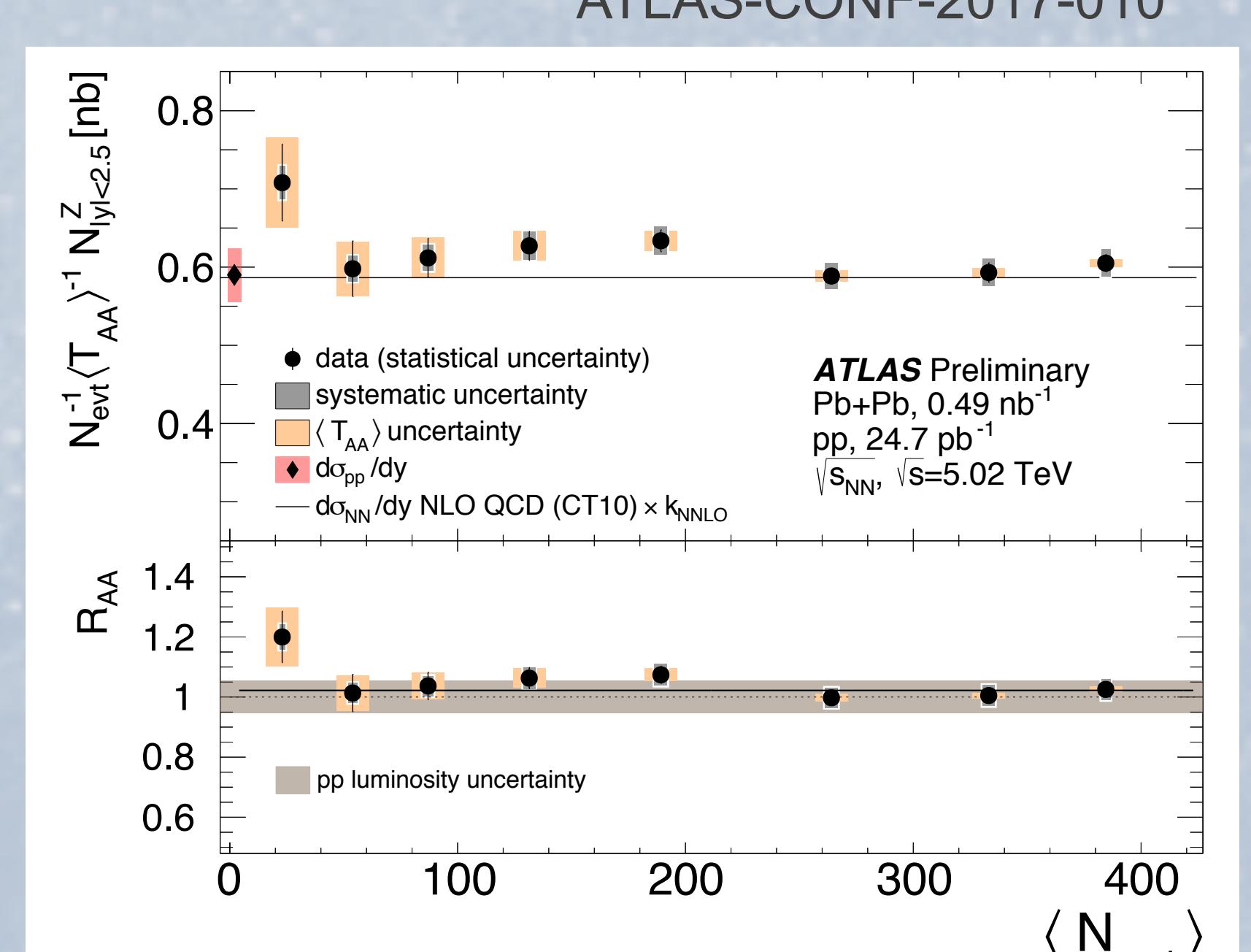
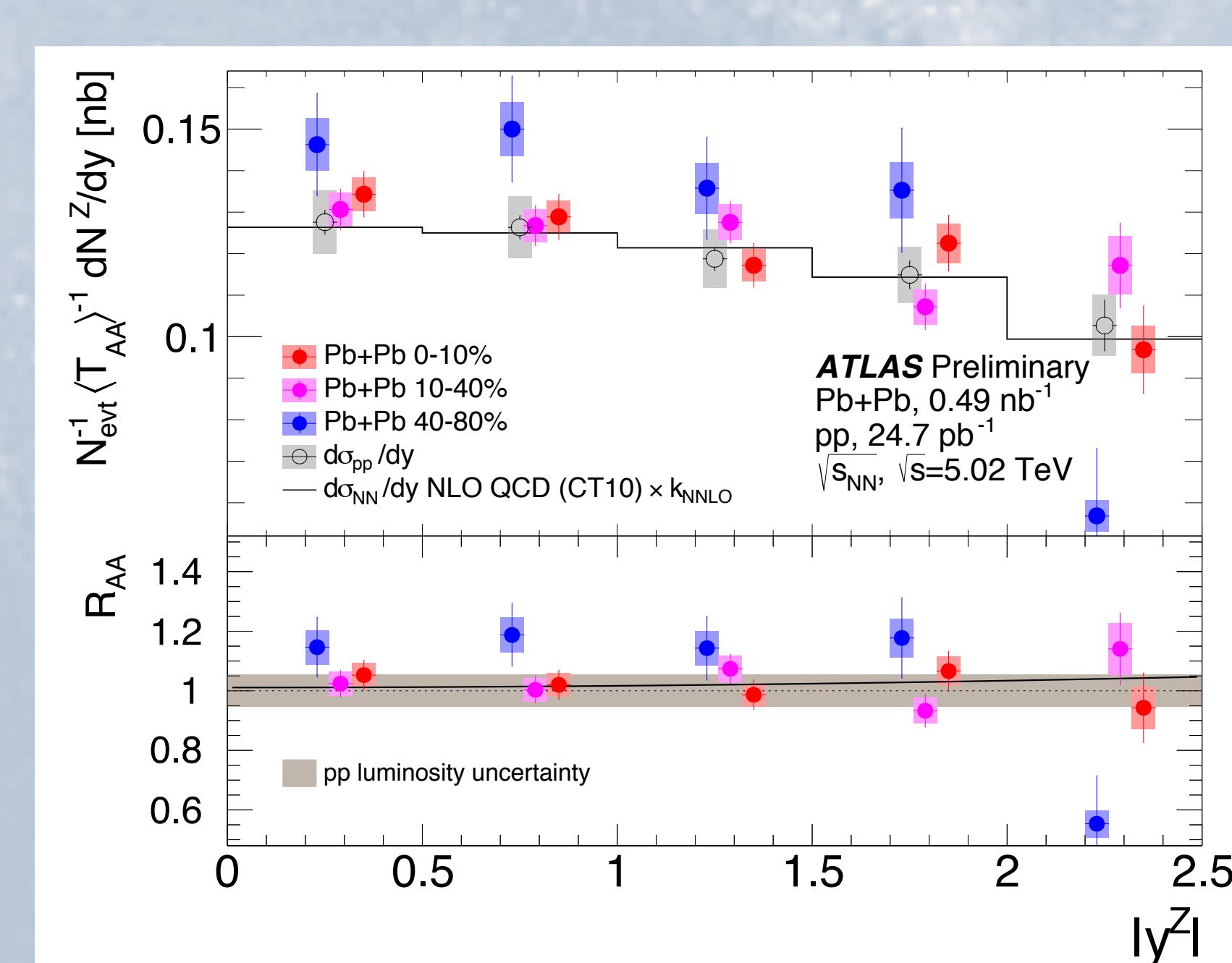
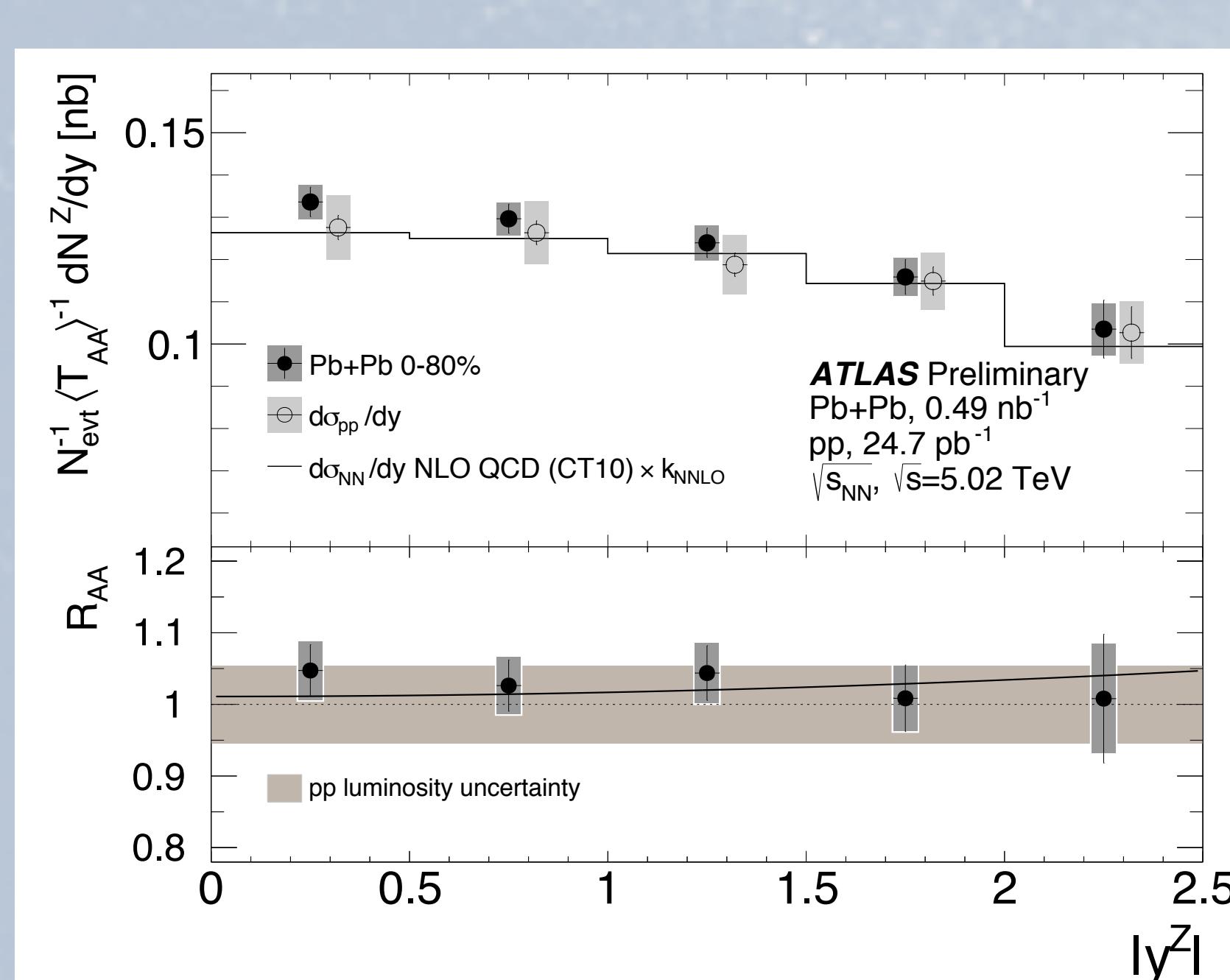
Corrections

- Background subtraction
 - EW: $t\bar{t}, Z \rightarrow \tau\tau$
 - QCD: same sign Z boson pairs
- Detector acceptance and efficiency
 - $|y^Z| < 2.5, 66 < m_{\mu\mu} < 116 \text{ GeV}$
 - trigger efficiency
 - muon reconstruction efficiency
- Data corrected in p_T^Z, y^Z and centrality

Systematics

- Muon reconstruction (3-6%)
- Muon trigger (1-2%)
- Centrality determination (1-8%)
- Background (<0.1%)

Results



Yields per minimum bias event of Z bosons as a function of rapidity for 0-80% centrality interval consistent with model predictions.

Per-event yield of Z bosons as a function of rapidity for 0-10%, 10-40% and 40-80% centrality intervals. Peripheral bin 1.5 sigma higher while other bins consistent with predictions.

Per-event yield of Z bosons as a function of number of participants, N_{part} . Data in a good agreement with model prediction.

