

Collider X Talk:

Measurements of charged particle spectra
and nuclear modification factor in p+Pb
collisions with the ATLAS detector.

ATLAS-CONF-2014-029

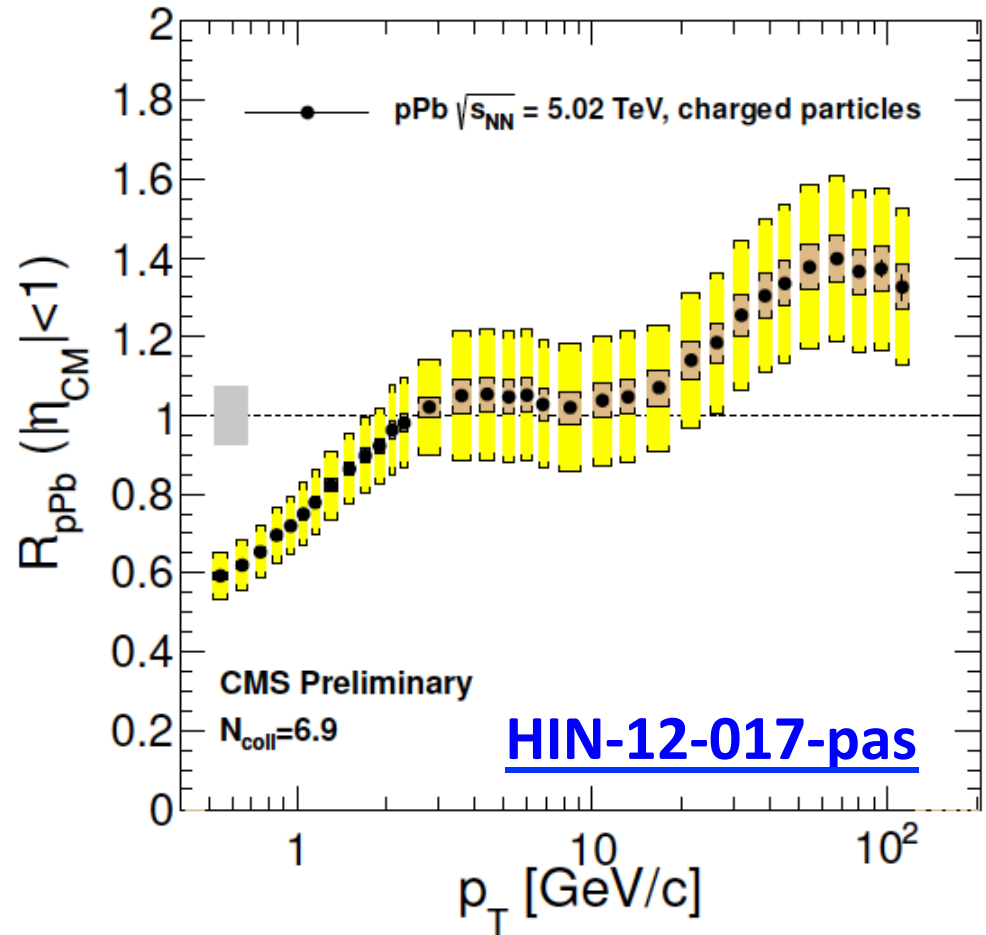
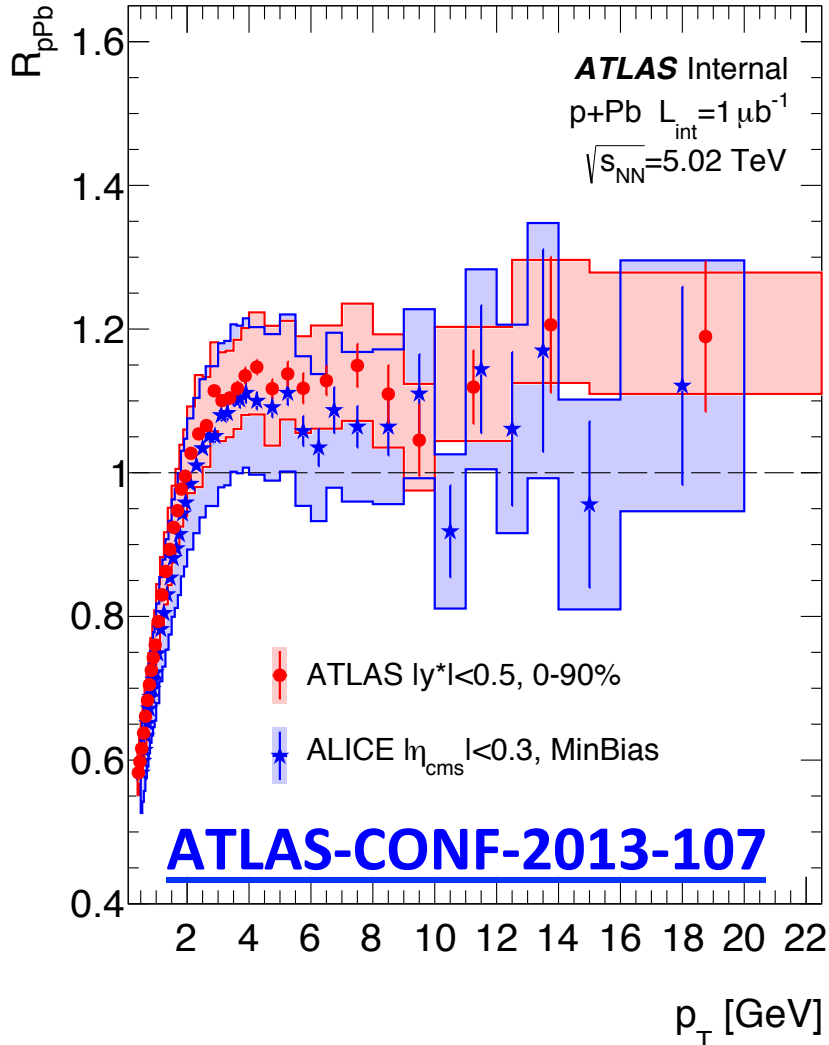
Evgeny Shulga



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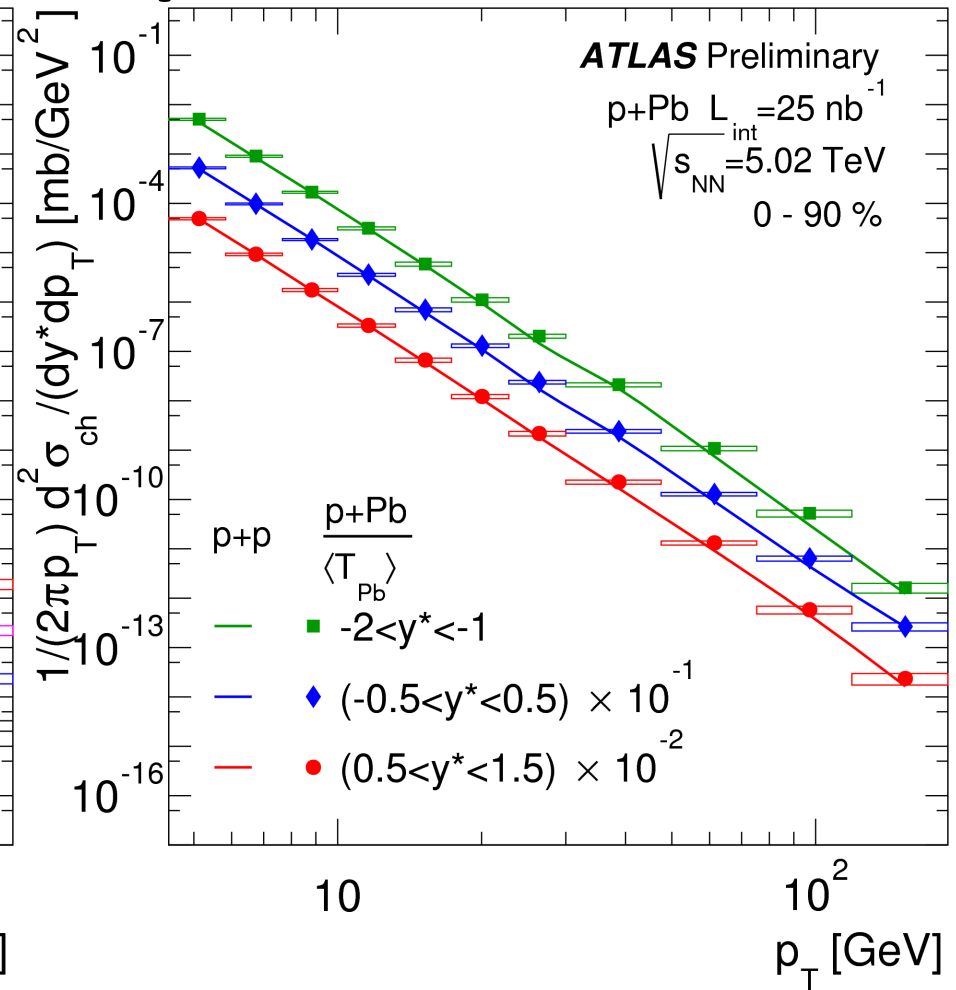
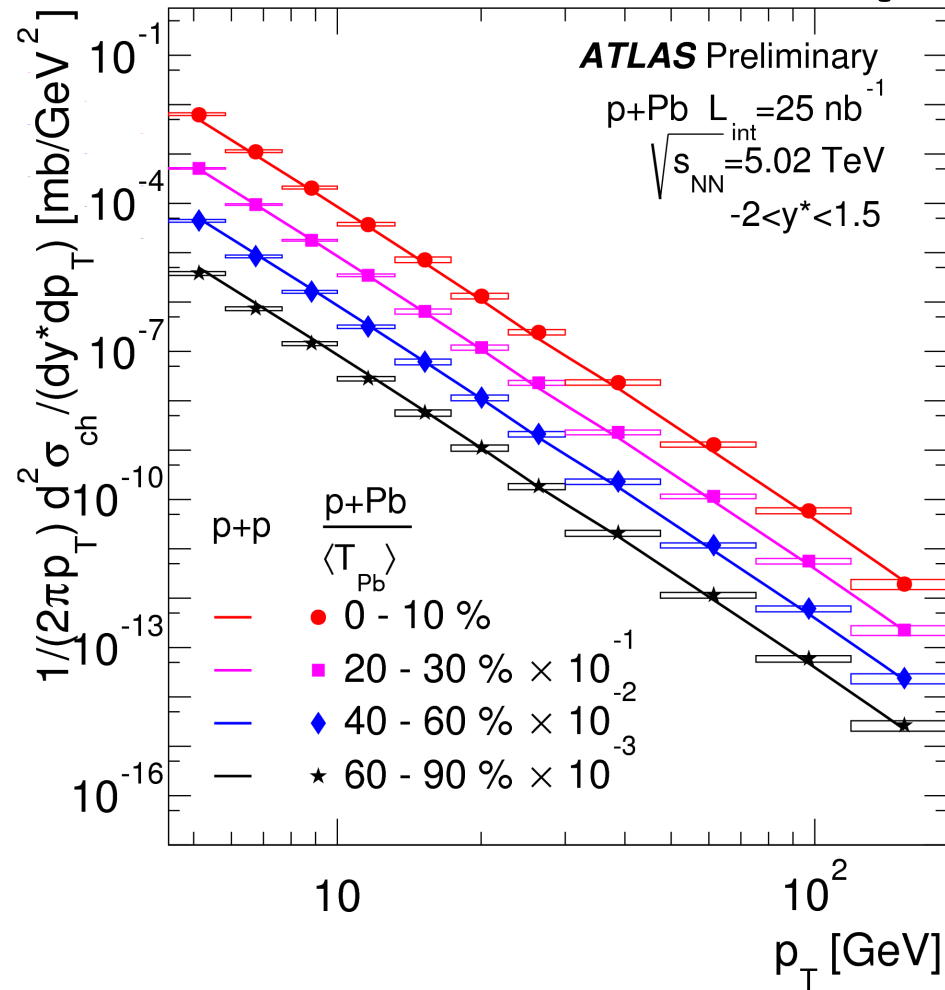


Earlier results



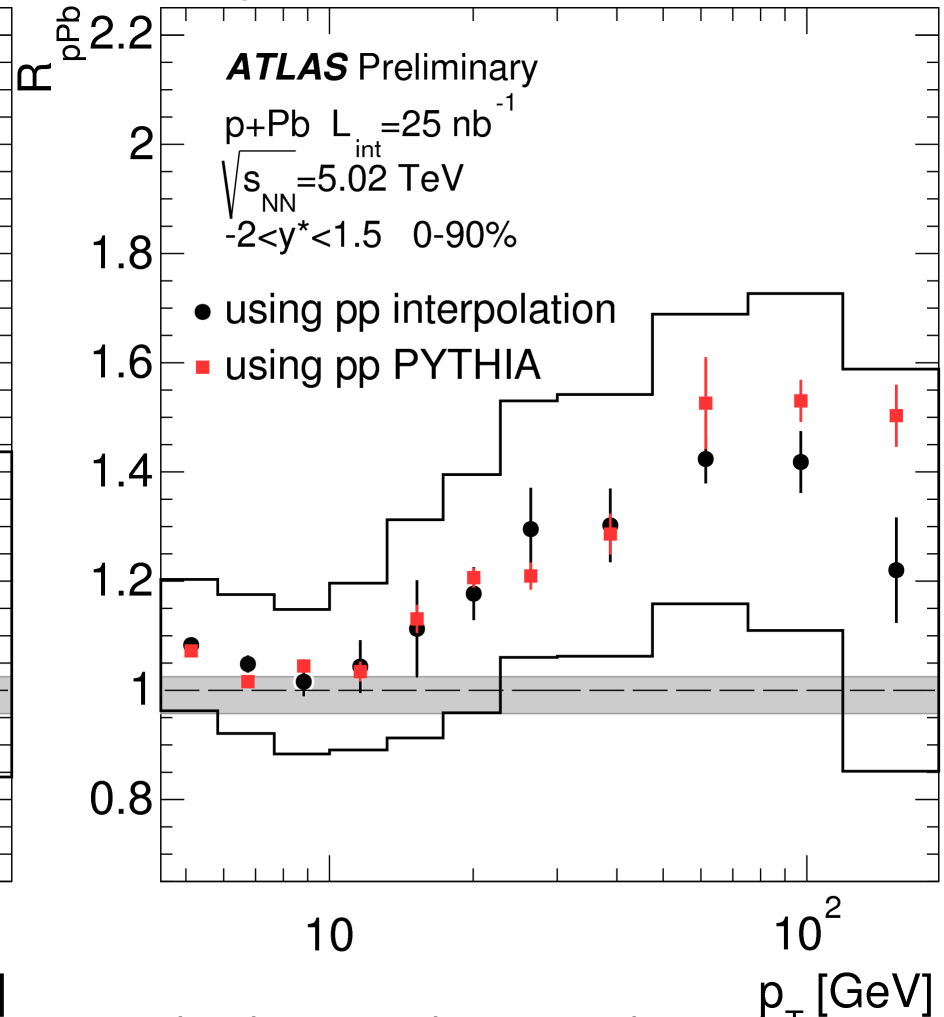
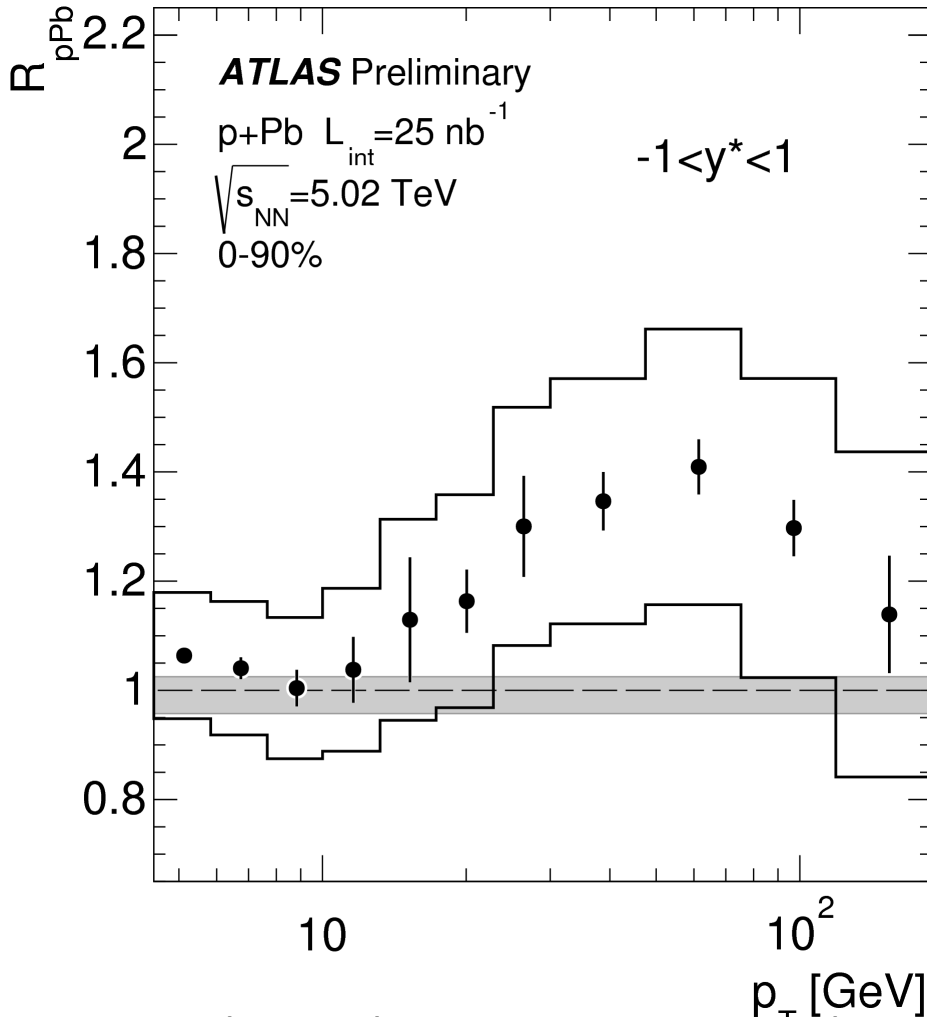
- Results have been shown at Hard Probes 2013 conference (November 2013)
- CMS result is larger than it is expected from the parton anti-shadowing predictions

ATLAS pPb spectra



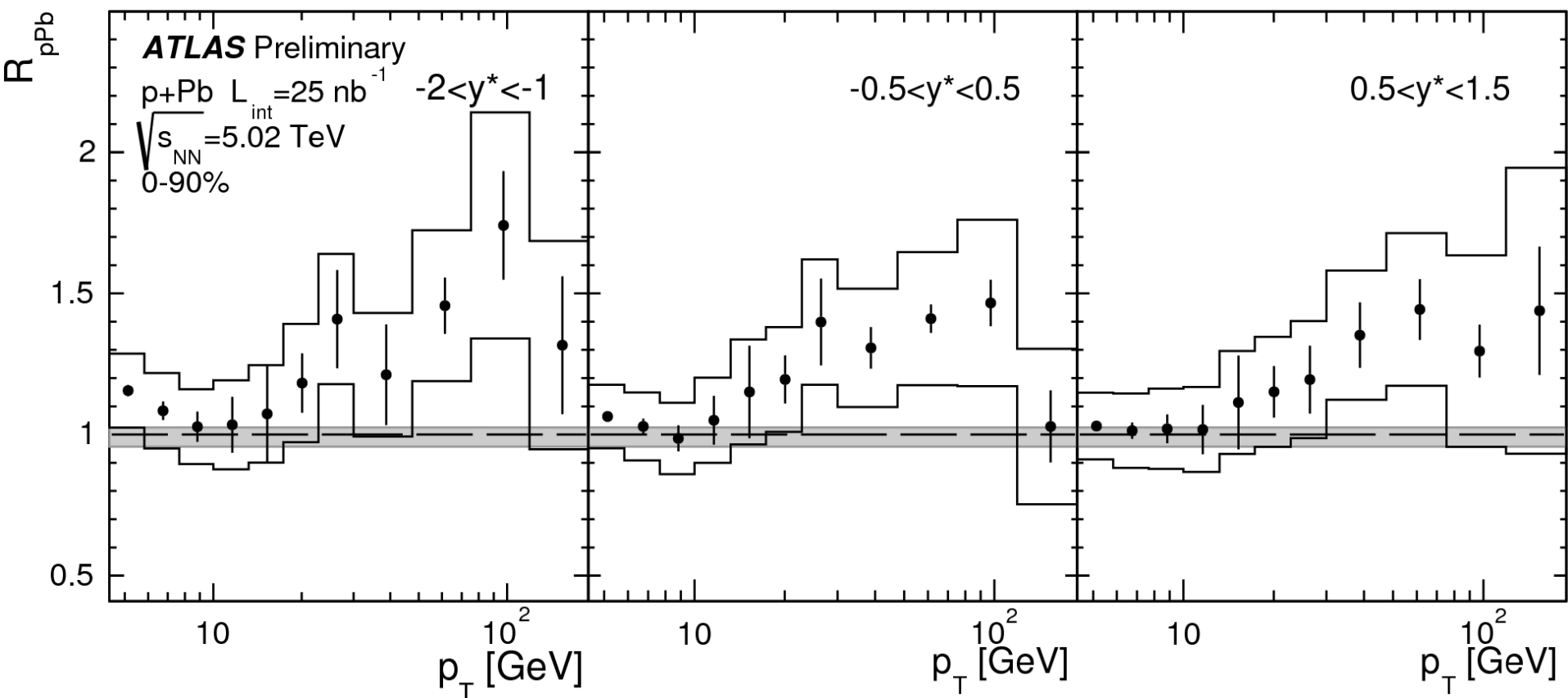
- Results have been shown at Quark Matter 2014 conference (May 2014)
- The spectra are used to produce resulting R_{pPb}

ATLAS pPb R_{pPb}



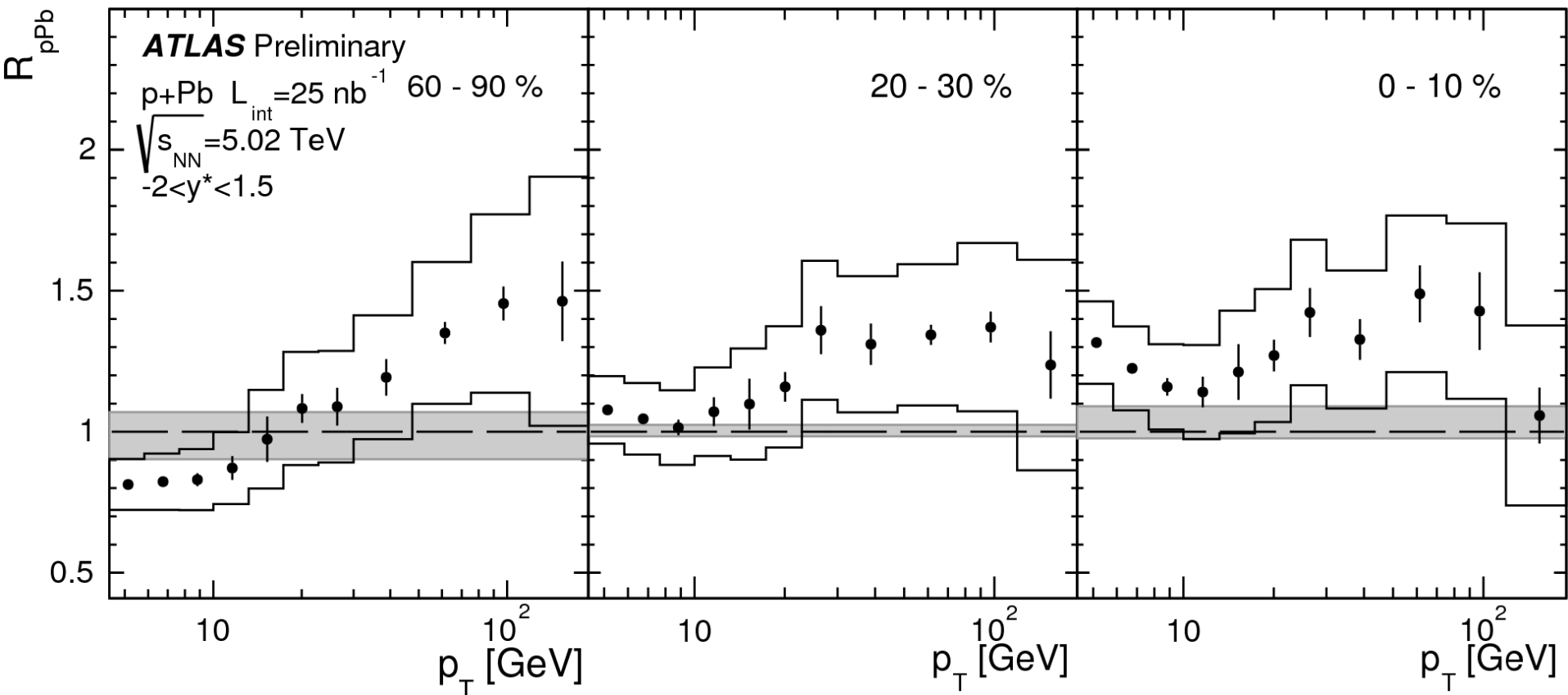
- ATLAS have shown consistent with CMS result showing larger values than it is expected from the parton anti-shadowing predictions

ATLAS pPb R_{pPb}



- At lower p_T values R_{pPb} is y^* dependent
- At higher p_T – it is enhanced

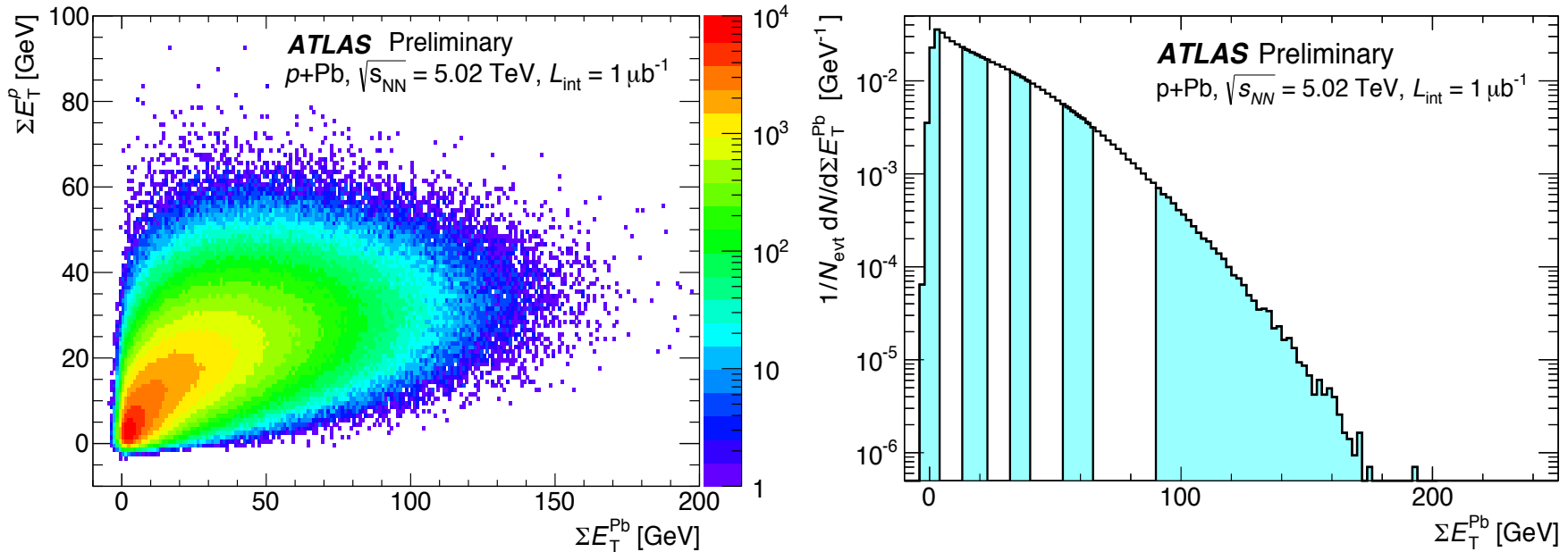
ATLAS pPb R_{pPb}



- At lower p_T values R_{pPb} is highly centrality dependent
- At higher p_T – it is enhanced

Back Up

Centrality definition



- Pb-going FCal (side “A”) is used to characterize event centrality, it is more sensitive to nuclear geometry
- FCal ΣE_T^{Pb} is divided into centrality intervals: 0-1%, 1-5%, 5-10%, 10-20%, 20-30%, 30-40%, 40-60%, 60-90%
- 90-100% is excluded due to larger systematic uncertainties on event composition and reconstruction efficiency

Glauber and Glauber-Gribov models

To model N_{part} distribution we used:

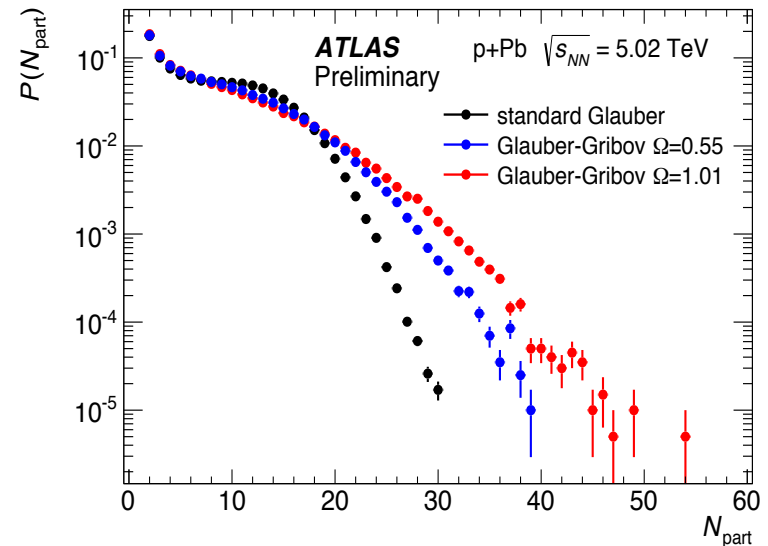
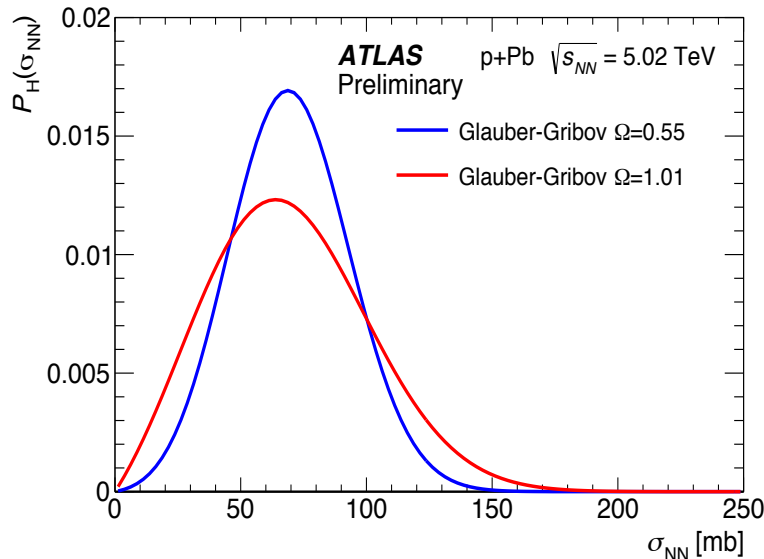
- standard Glauber with σ_{NN} cross section = $70 \pm 5 \text{ mb}$
- Glauber-Gribov color fluctuation models, with $\langle \sigma_{\text{NN}} \rangle$ cross section = $70 \pm 5 \text{ mb}$

In Glauber-Gribov model:

- σ_{tot} is considered frozen for each event
- parameter Ω controls the amount of fluctuations
- Ω is extracted from experimental data: 0.55 [PLB633 (2006) 245–252] and 1.01 [PLB 722 (2013) 347–354]

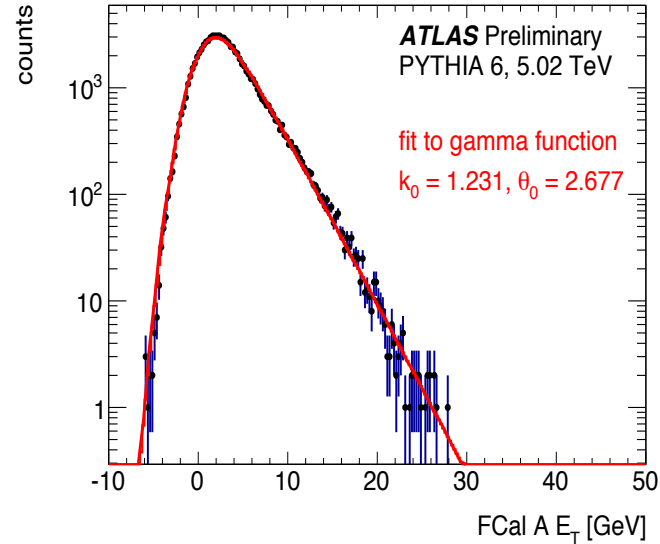
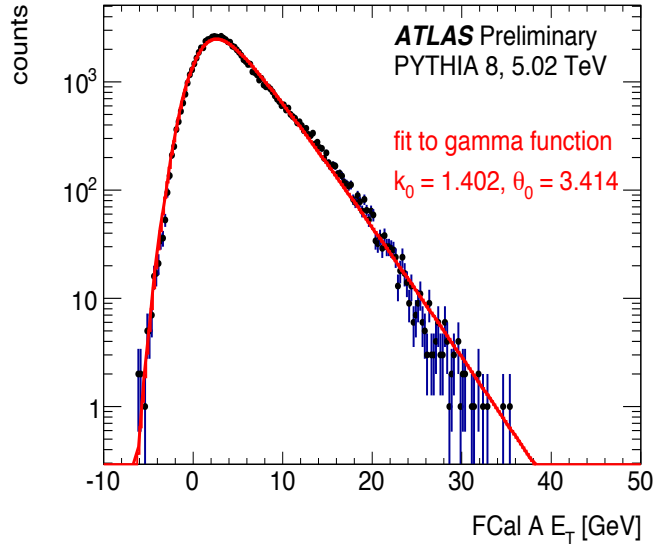
$$P_h(\sigma_{\text{tot}}) = \rho \frac{\sigma_{\text{tot}}}{\sigma_{\text{tot}} + \sigma_0} \exp \left\{ -\frac{(\sigma_{\text{tot}}/\sigma_0 - 1)^2}{\Omega^2} \right\}.$$

$$P_H(\sigma_{\text{NN}}) = \frac{1}{\lambda} P(\sigma_{\text{NN}}/\lambda)$$



Constructing FCal ΣE_T^{Pb} response

E_T distribution modeled by PYTHIA simulated taking into account FCal response in p +Pb configuration and were approximated by Gamma(k, θ) distributions

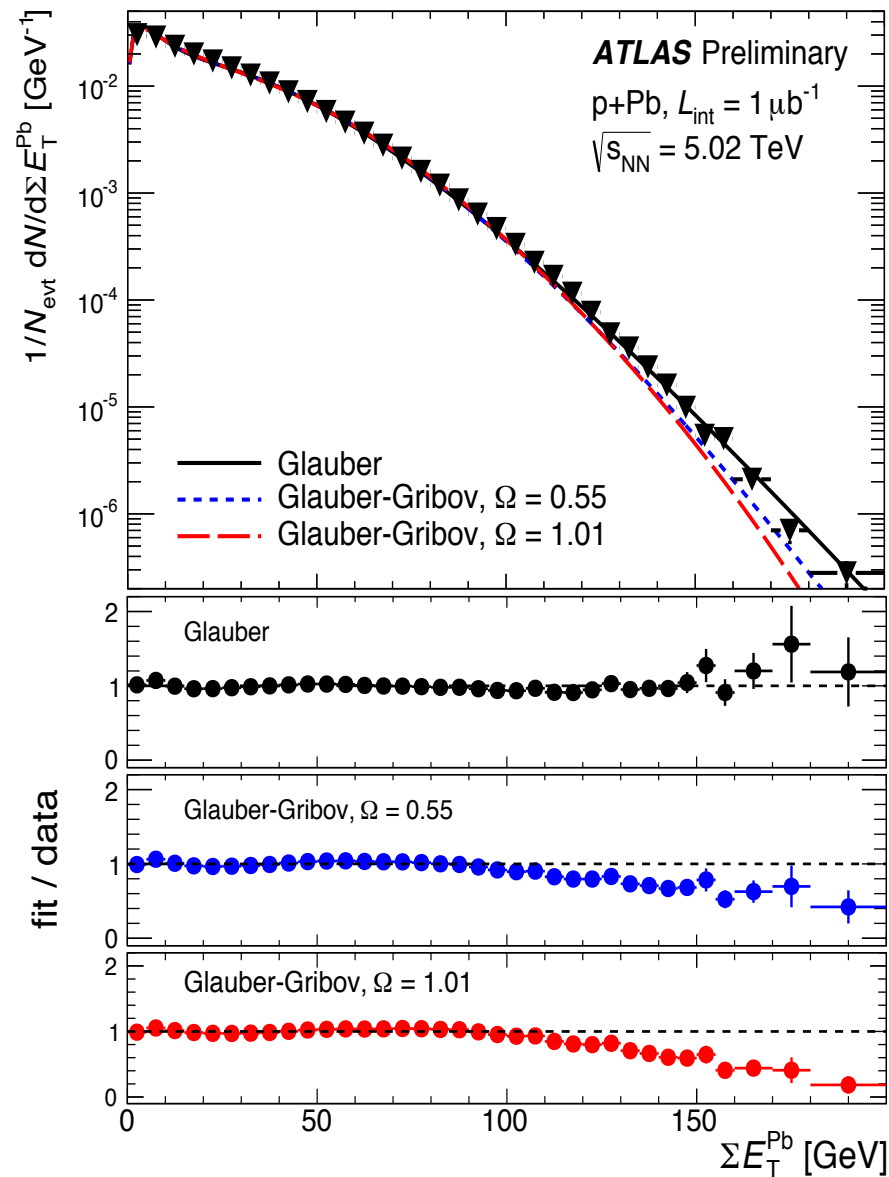


Convolution of N_{part} Gamma(k, θ) was taken as Gamma($k(N_{part}), \theta(N_{part})$)

We allowed: $k(N_{part}) = k_0 + k_1 * (N_{part} - 2); \quad \theta(N_{part}) = \theta_0 + \theta_1 * (\log(N_{part} - 1));$
 In WN : $k(N_{part}) = k * N_{part}; \quad \theta(N_{part}) = \theta;$

E_T response for N_{part} was weighted according to Glauber or Glauber-Gribov model and fitted to the data

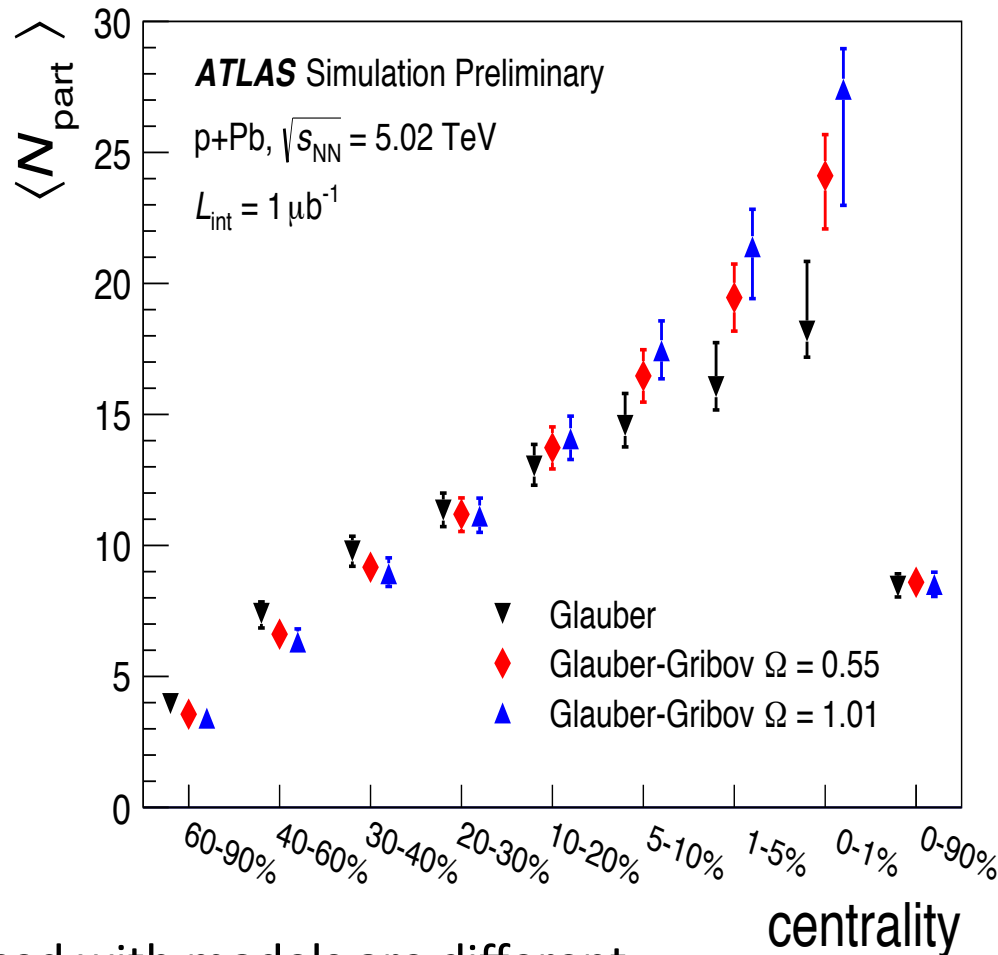
FCal E_T distribution fits



- dN_{evt}/dE_T obtained by summing the gamma distributions over different N_{part} values weighted by $P(N_{part})$

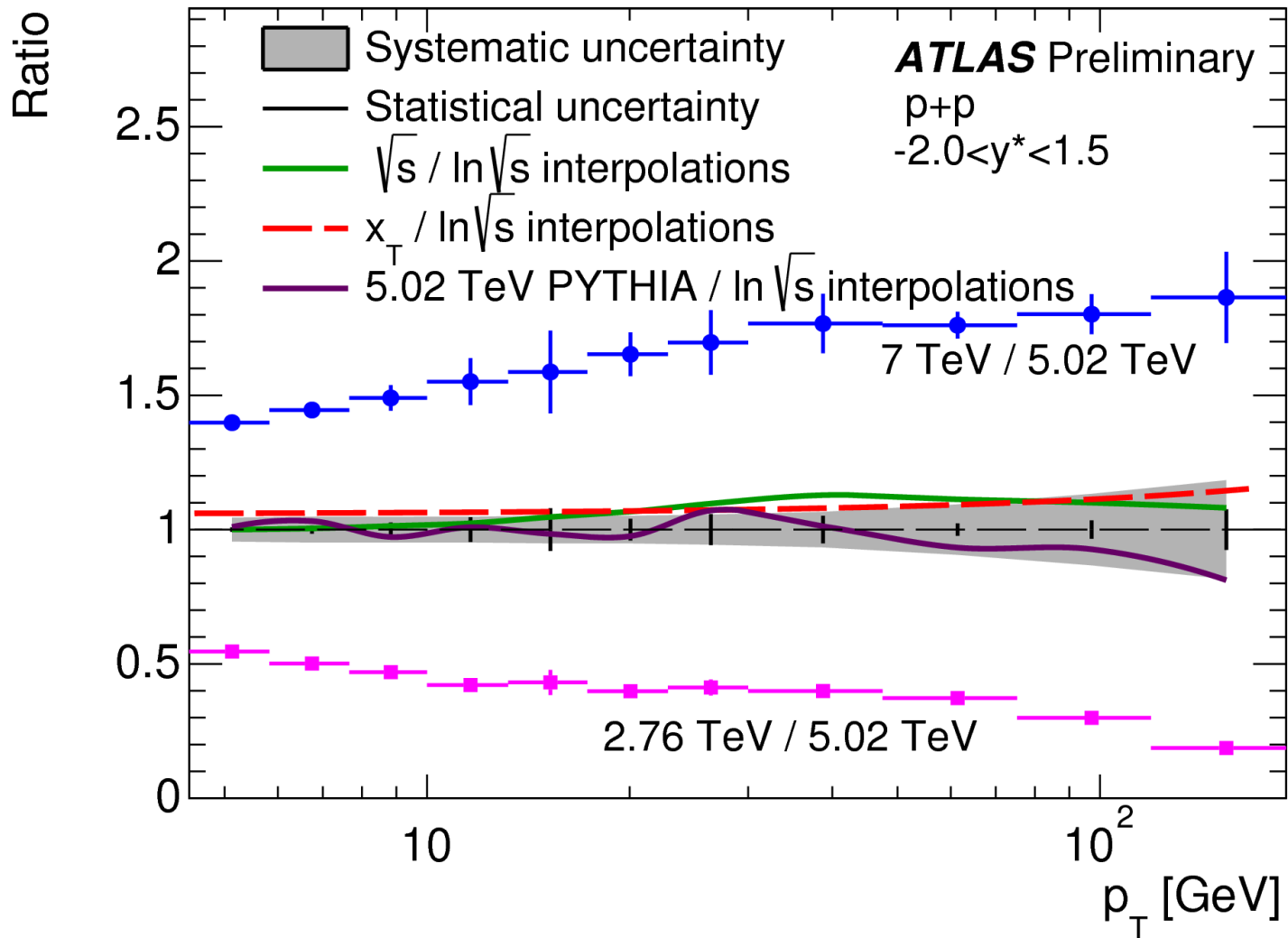
Fits to the measured E_T^{Pb} distributions show reasonable agreement over 3 orders of magnitude in E_T distribution.

N_{part} for different Glauber models

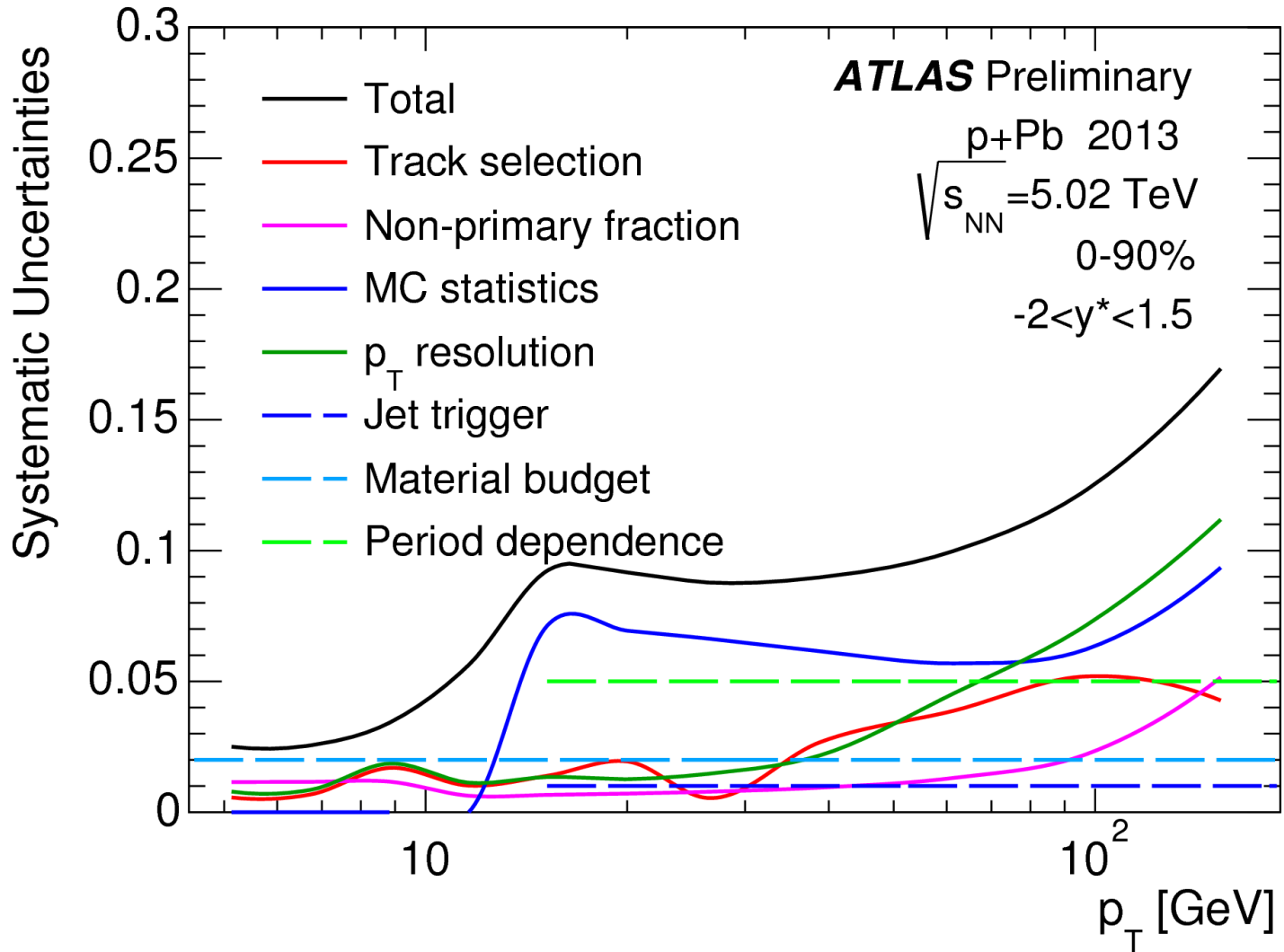


- Results produced with models are different
- Standard Glauber has highest fluctuations of produced E_T per participant
- Glauber-Gribov $\Omega=1.01$ has less E_T fluctuation and therefore gives highest N_{part}

Systematics and comparisons



Systematics and comparisons



ATLAS R_{pPb} and R_{CP} for the low p_T

