B/M ratio and multiple parton interactions ?

1. Baryons and mesons: **production at RHIC, HERA and TEVATRON**
2. Underlying event: **definitions and experimental studies**
3. Expectation for the LHC **extrapolations and simulations**
4. Discussion

Boris HIPPOLYTE (IPHC - Université de STRASBOURG)

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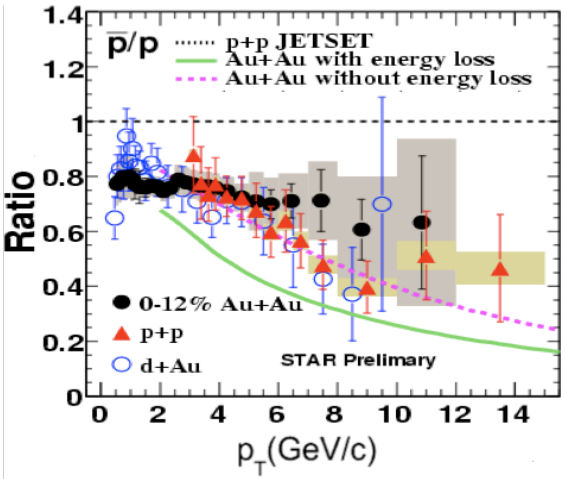
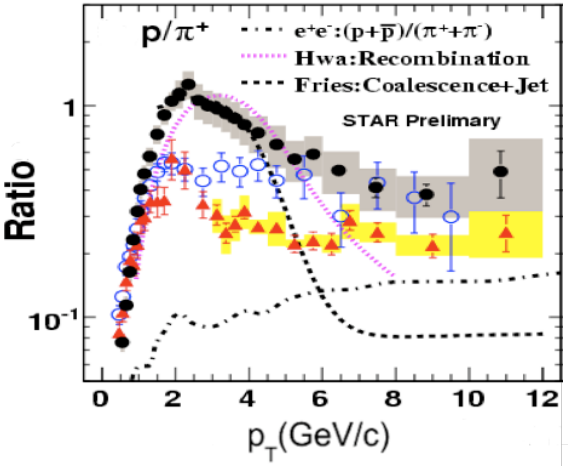
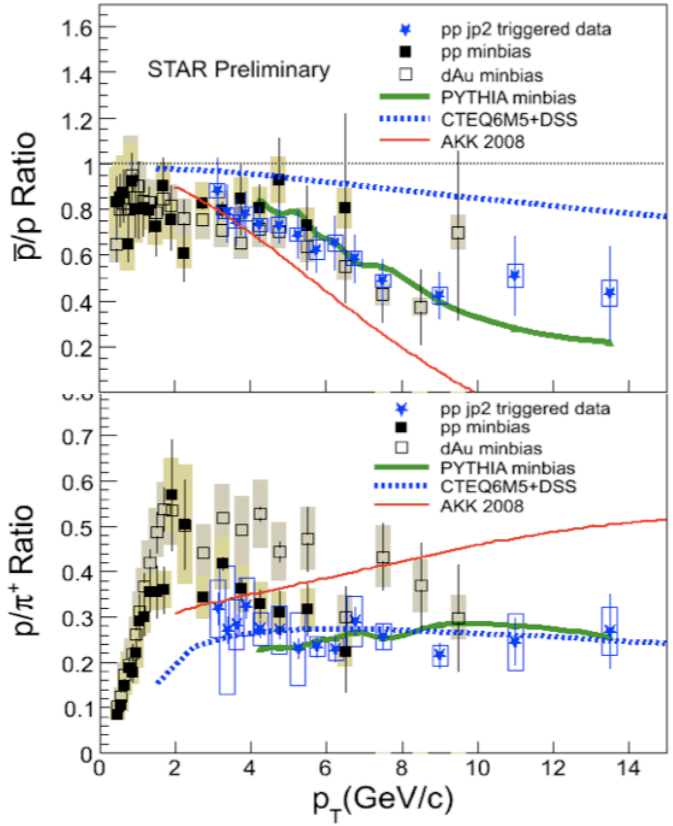
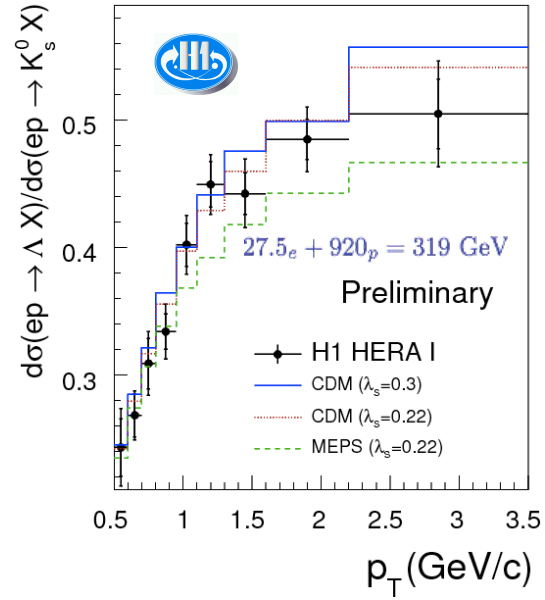
Probing baryon/meson differences at LHC energies implies PID over a large p_T range.





Studying p+p and e+p production for understanding the specificities of A+A





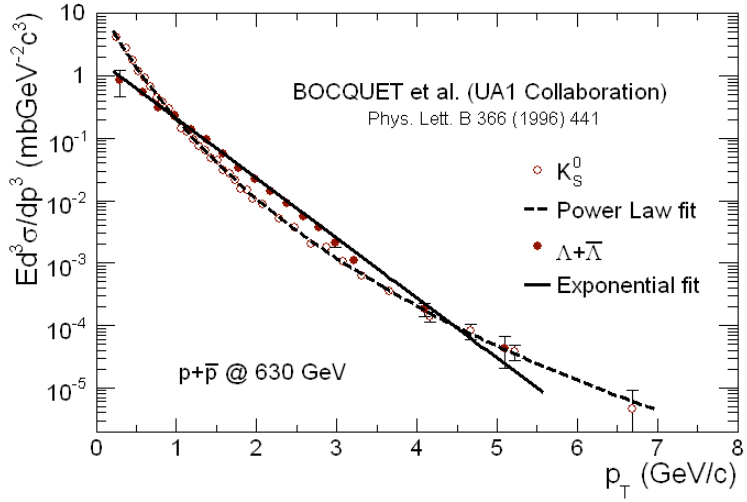
Anna Falkiewicz (H1) DIS08

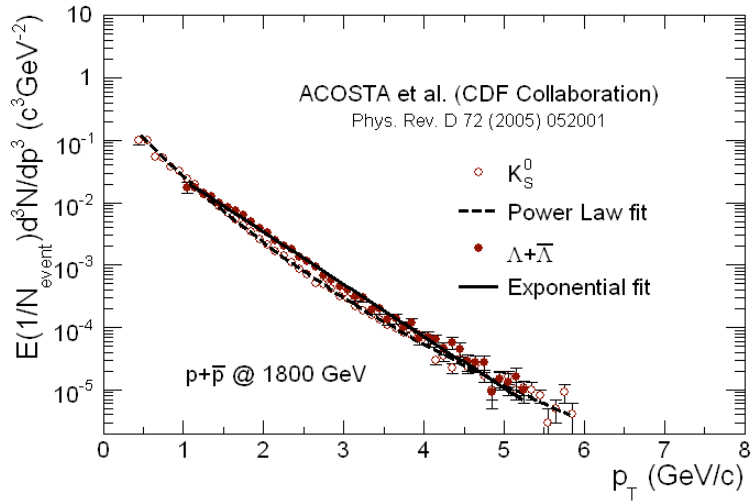
Yichun Xu (STAR) HQ08: nucl-ex arXiv:0901.0692

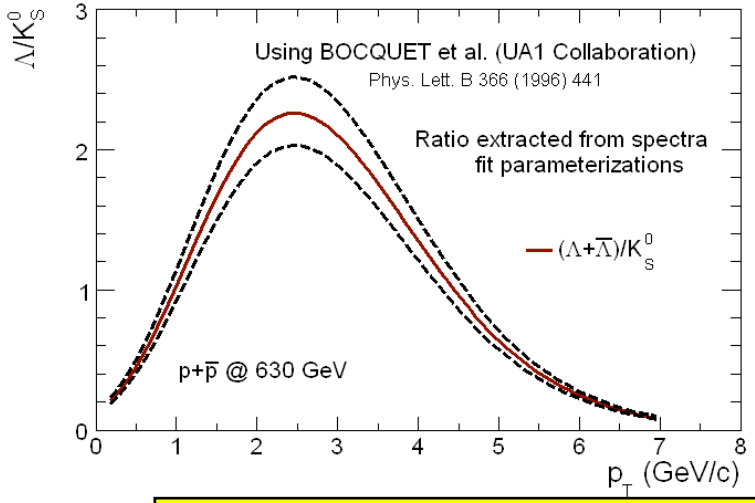
As already studied at RHIC, first step for investigating recombination and coalescence mechanisms

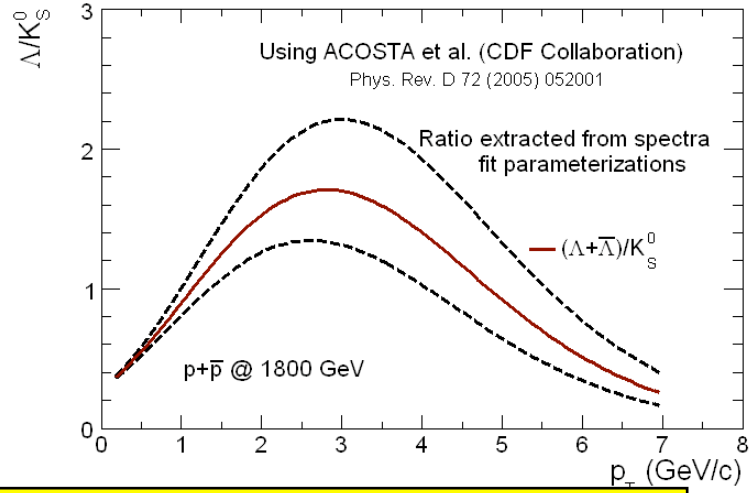
Baryon/Meson p_T ratio in $p+\bar{p}$ @ 630 and 1800 GeV

Extracting mixed ratio from UA1 spectra (1996) and from CDF spectra (2005)







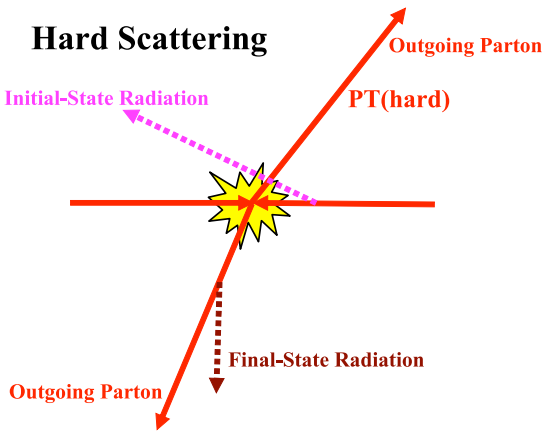


Ratio vs p_T already surprisingly high in p+p data at high energies

Multi-parton dynamics in p+p at LHC energies

Soft component in p+p collision: multiple parton interactions

Hard parton scattering is one part of the story



Significant differences for production rates and ratios between “min. bias” and “u.e.”;
⇨ important for e.g. understanding baryon/meson ratio, deconvoluting R_{AA}...
⇨ angular studies may include leading charged particle and/or full jet reconstruction.

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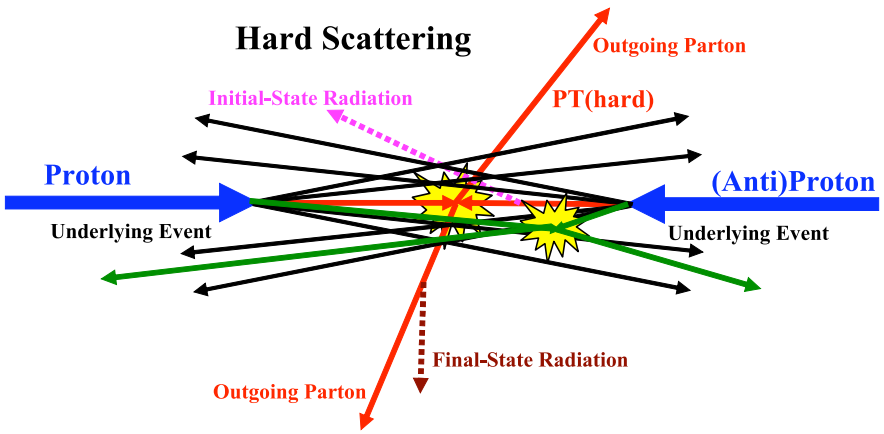

R.Field: «The "underlying event" consists of the "beam-beam remnants" and from particles arising from soft or semi-soft multiple parton interactions (MPI).»

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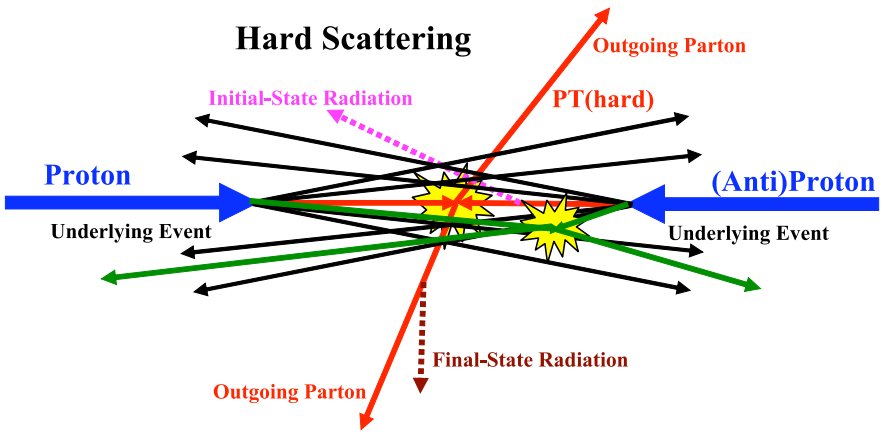

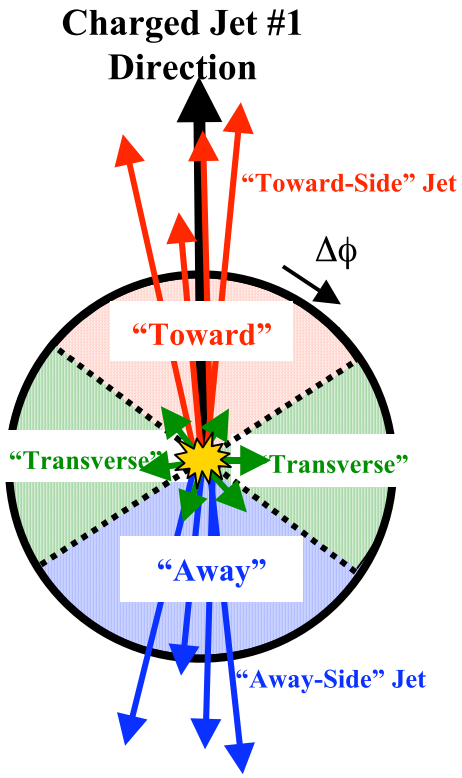

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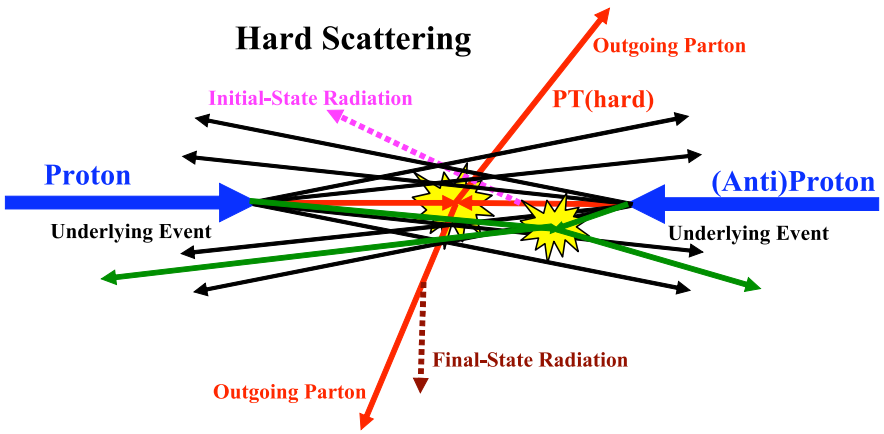

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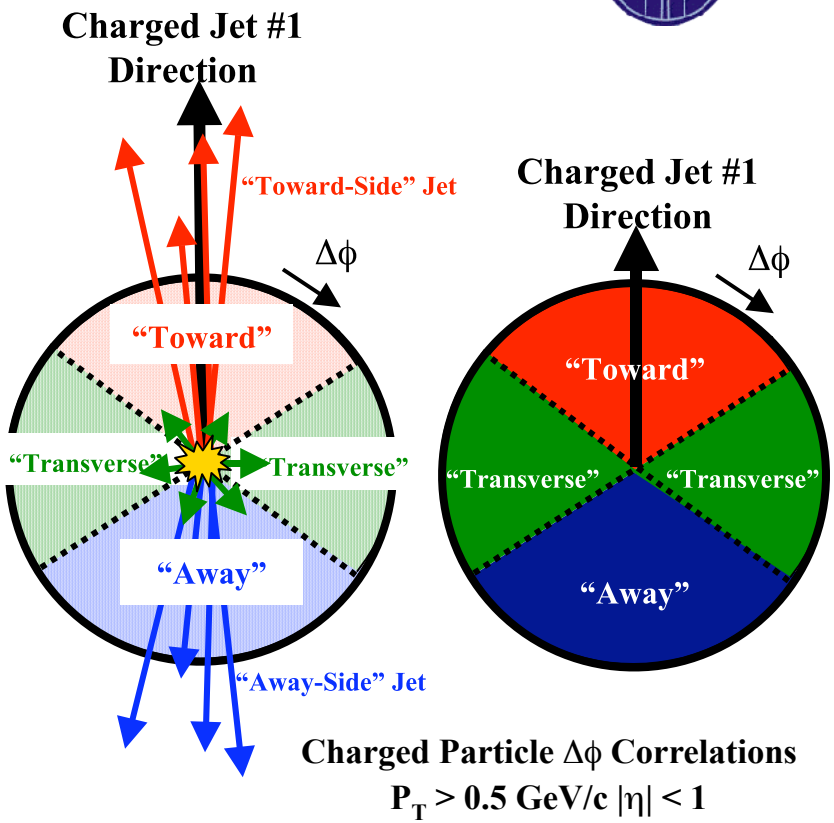

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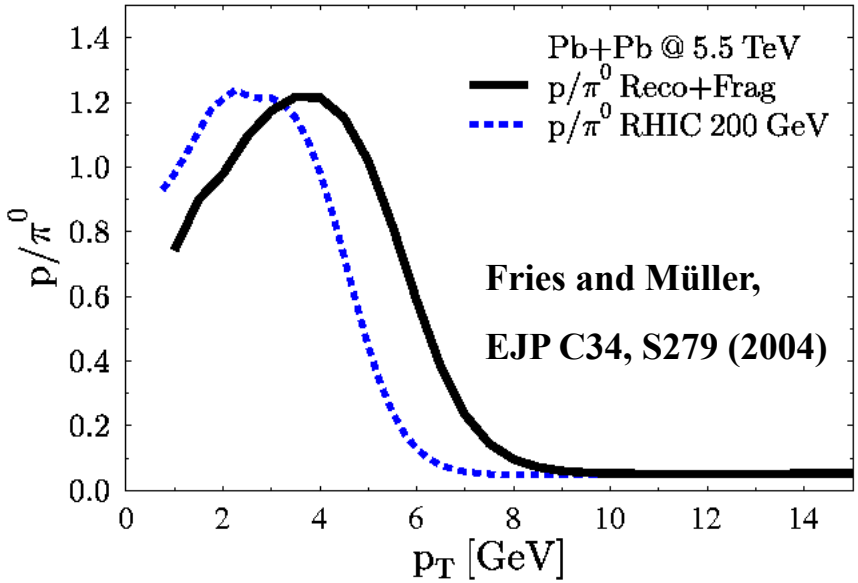
Baryon / Meson ratios at LHC energies

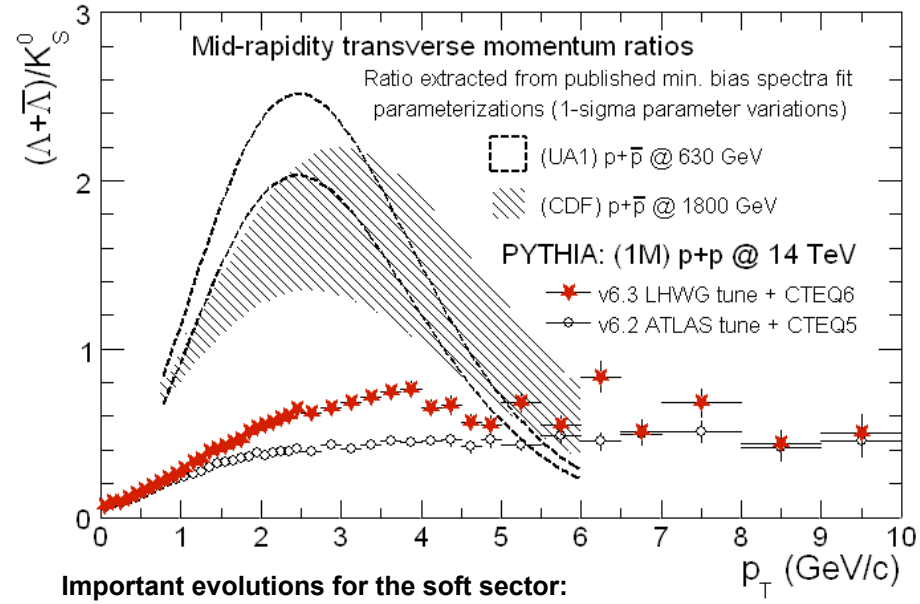
Probing baryon/meson differences at LHC energies implies PID over a large p_T range.

But first LHC data will be <u>elementary collisions</u>
⇨ check magnitude of this behaviour then invoke coalescence mechanisms if needed.

Calculation implies assumption on transverse radial flow extrapolation



PYTHIA Configuration from preprint hep-ph/0604120



Amplitude for mixed ratio predicted to be the same at LHC than for RHIC but the turnover and limit are shifted to higher p_T

Important evolutions for the soft sector:

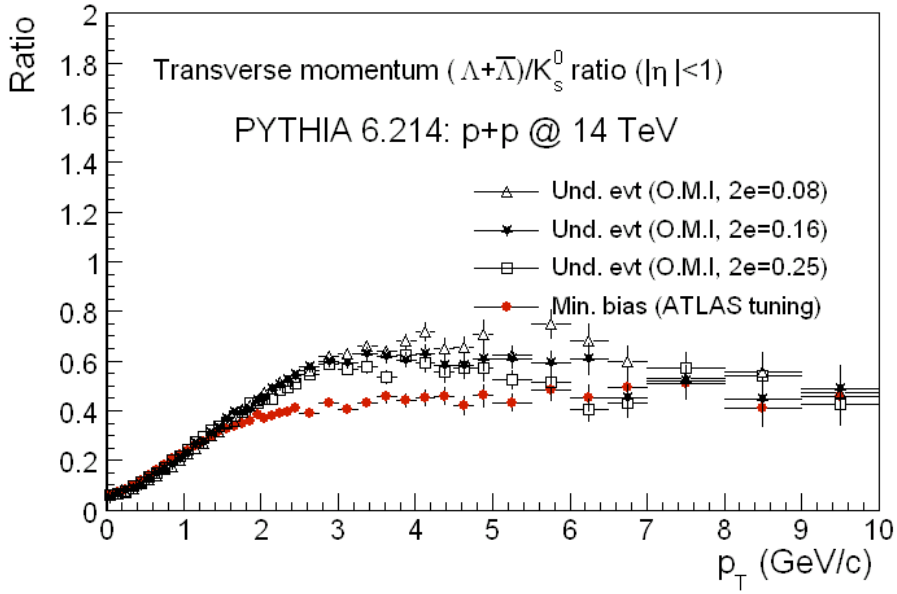
PYTHIA: **v6.2** ⇨ **v6.3** New multiple interaction (N.M.I) treatment (part.-part. interactions and i/fsr)

PDF: **CTEQ5** ⇨ **CTEQ6** Gluon distribution function (visible at low Q^2)

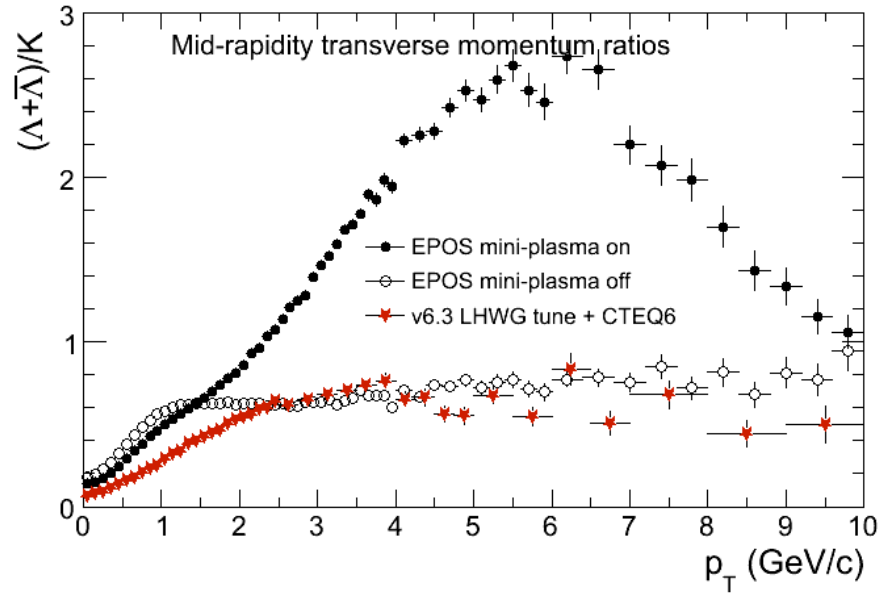
Missing a factor of ~2 wrt RHIC ⇨ UA1 ⇨ CDF extrapolations
⇨ investigation of NLO contribution, baryon creation mechanisms (diquark to popcorn scenario or gluonic baryon junctions).

Predictions for B/M p_T ratio: p+p @ 14 TeV

Ratios and differences between min. bias and underlying event description



Checking uncertainty for parameters energy dependence: PYTHIA authors' suggestions : **2ε~0.08 ⇨ 0.25**



Comparison between standard LHC extrapolation and underlying event description

Little **light/strange** flavor dependence in this region

Underlying event description **needed/enough** for production of hadrons in intermediate p_T region ?

Predictions from EPOS based on pomeron exchanges can lead to much higher ratios

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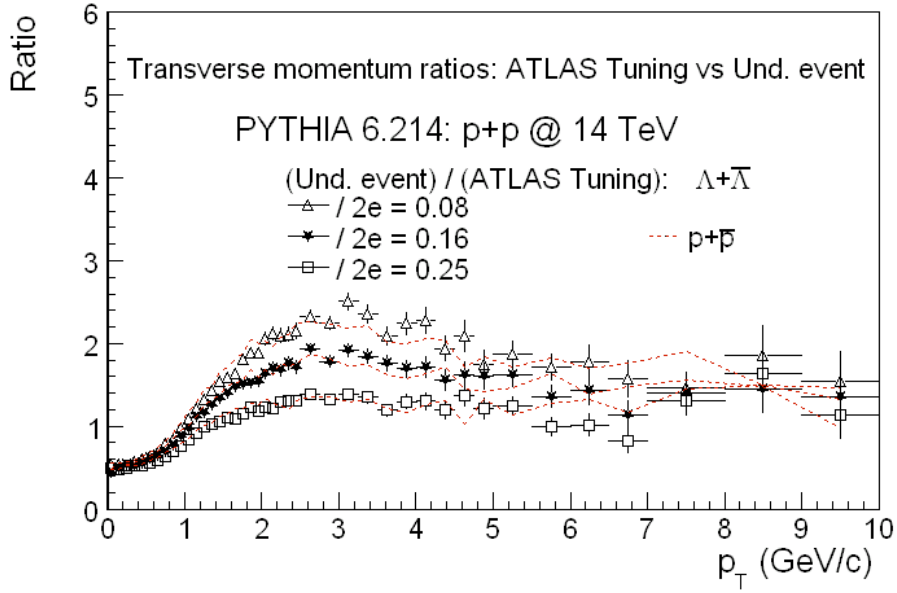

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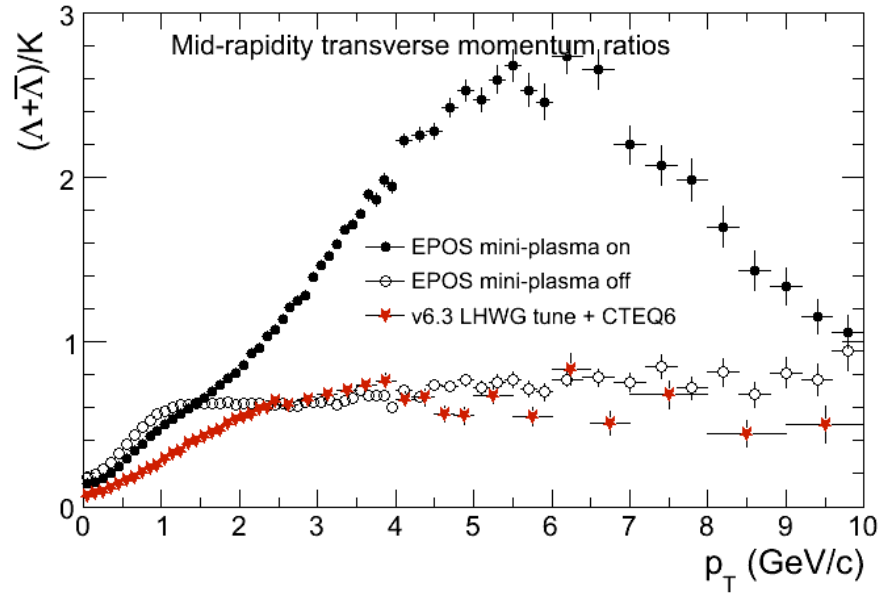

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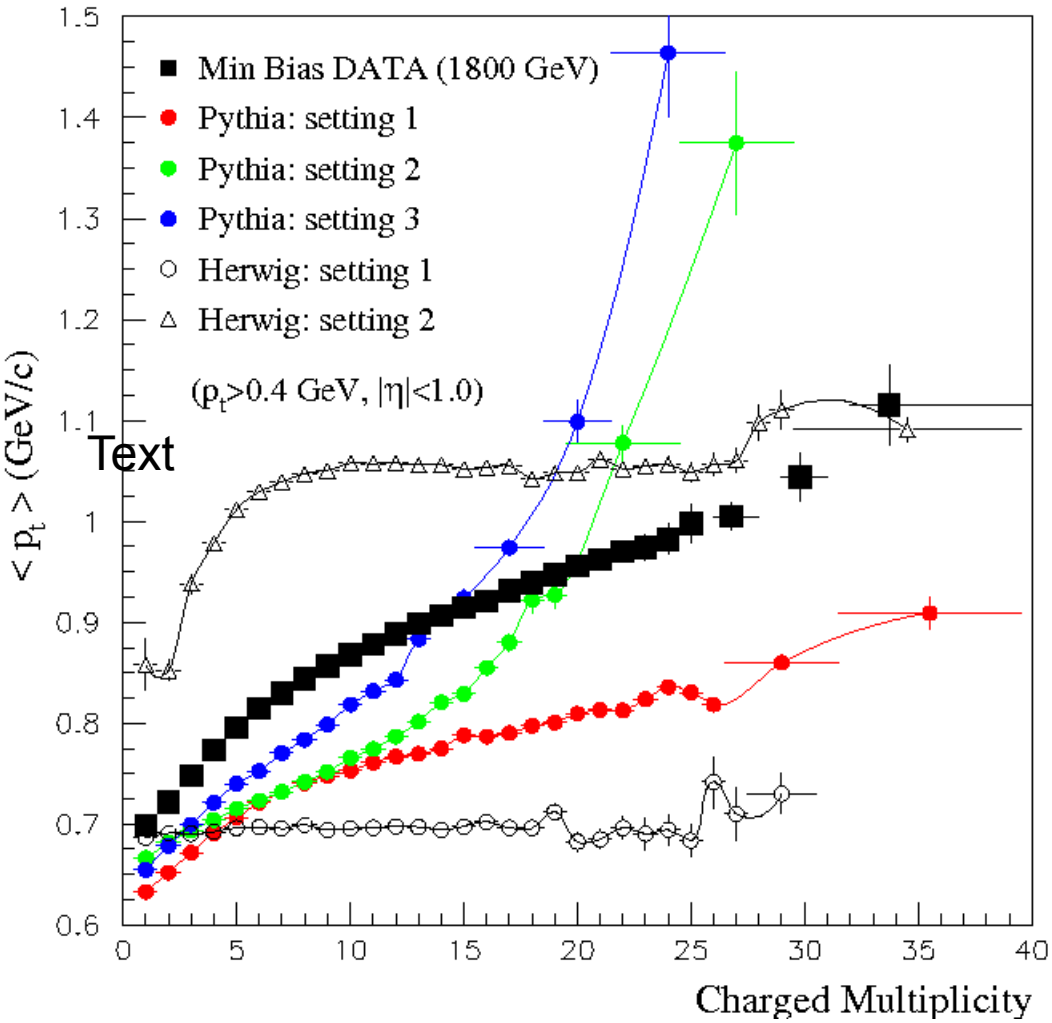
Min. Bias CDF parameter sets for p+$\bar{p}$ @ 1800 GeV