Minijets in Deep Inelastic e-p Scattering at HERA.

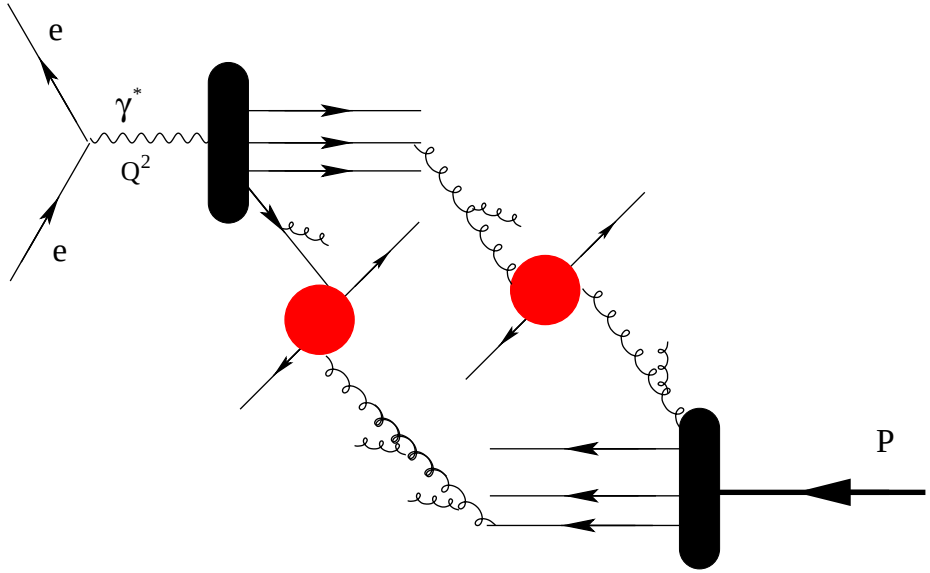
Outline:

* Motivation and Strategy
* Selections
* Data Precision vs. MC
* Summary and Outlook

Motivation 1(2)

* The underlying event: particles produced by the following processes:
  - Beam remnant interactions, usually called Soft Underlying Event (SUE)
  - Multiple Interaction (MI)

* Experimentally it is hard to distinguish between SUE, MI and Initial/Final State Radiation.



Motivation 2(2)

$\longrightarrow$ To measure regions sensitive to underlying event activity in DIS.

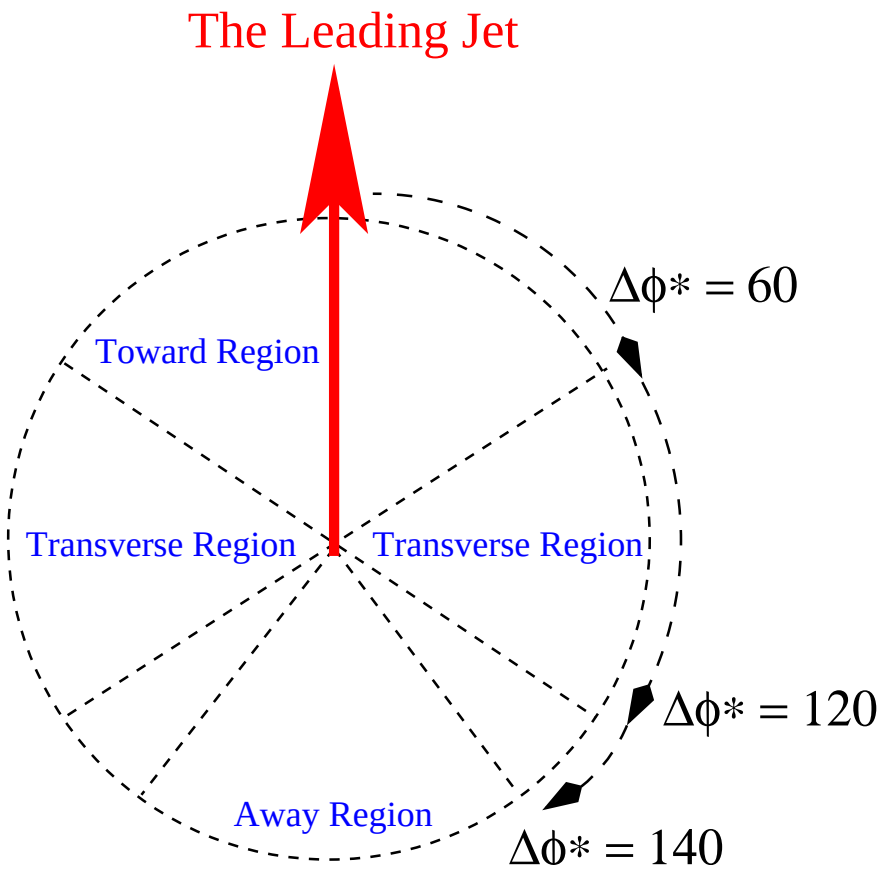
$\longrightarrow$ Models with MI and/or SUE are needed to describe 4-jet kinematic, x_γ distributions and energy flow in photoproduction at HERA. Do these models work at DIS?

$\longrightarrow$ To test different MC tuning with SUE and/or MI.

Strategy 1(4)

* Select the jet with highest P_T^* in $\gamma^* p$ frame, the Leading Jet.

* Define four regions in azimuthal:
  - Two Transverse regions: $60^\circ < |\Delta\phi^*| < 120^\circ$
  - Toward region: $|\Delta\phi^*| < 60^\circ$.
  - Away region: $|\Delta\phi^*| > 140^\circ$

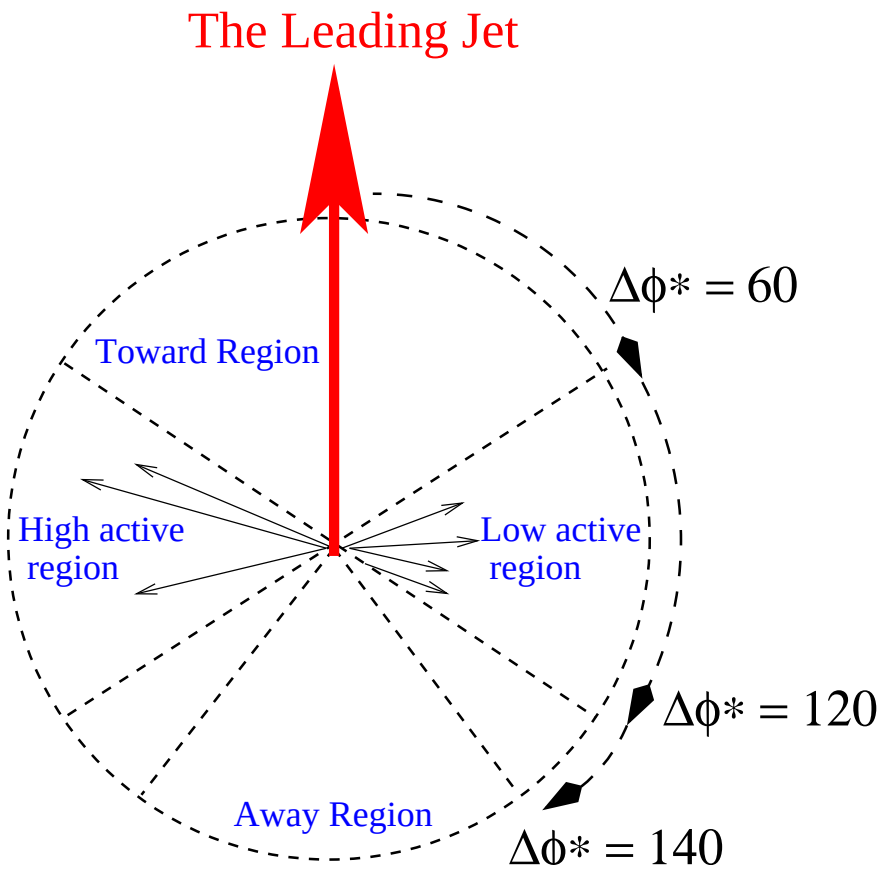


The Toward and Away regions are sensitive to the hard part of the event.

Strategy 2(4)

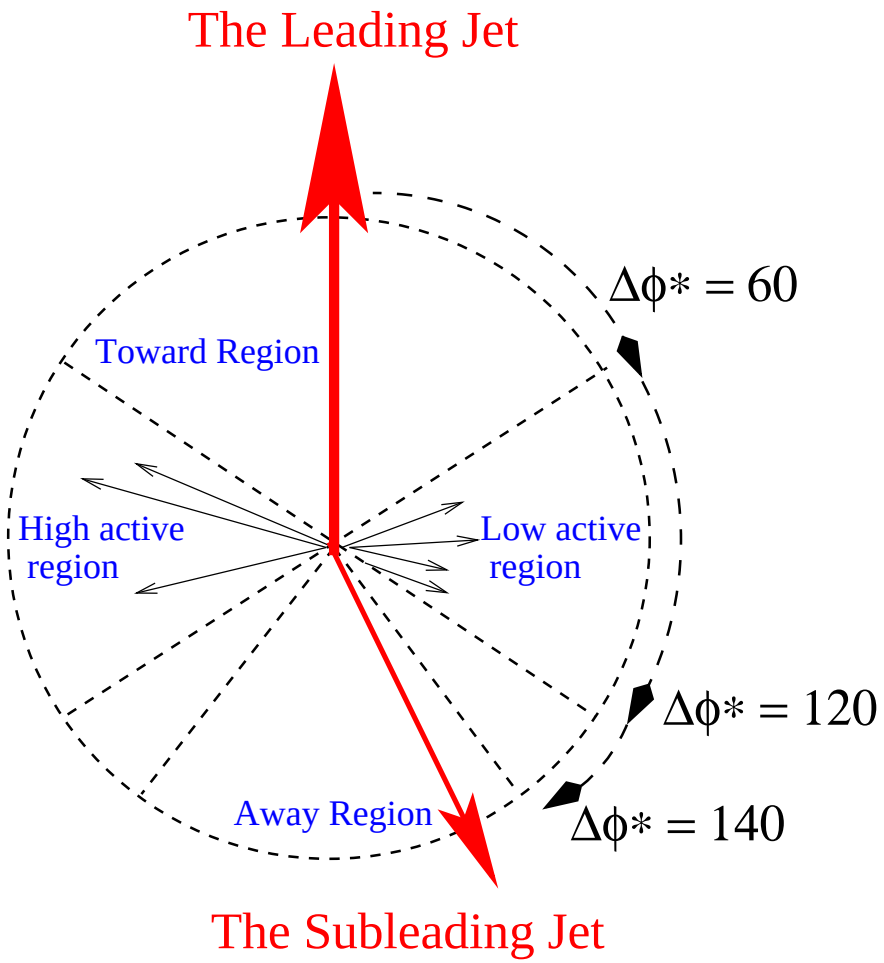
* The scalar E_T^* Sum of the particles, E_{TSum}^*, in the transverse regions is calculated for each event.

* For each event, split the two Transverse regions into a low active region and a high active region acording to E_{TSum}^*.



Strategy 3(4)

* In addition, select a subsample, Dijet sample, where the second hardest jet, Subleading Jet, is restricted to be in the Away region.



Strategy 4(4)

- Measure the jet multiplicity in the different $\Delta\phi^*$ regions as function of P_T^* of the Leading Jet.

$$< N_{MiniJet} > \;\; = \;\; \frac{\sum_{i=1}^{N_{ev}} \;\; N_{MiniJet,i}}{N_{ev}}$$

- Inclusive sample:
  - In bins of Q^2.
  - In bins of η^{lab} of the leading jet
- Dijet sample:
  - In bins of $x_\gamma \;\; = \;\; \frac{\sum_{i=1}^{2} P_{T,i}^* \; exp(\eta_i^*)}{2E_\gamma^*}$

Selection 1(2)

DIS Cuts

$5\ \mathrm{GeV}^2 <$	Q^2	$< 100\ \mathrm{GeV}^2$
$0.1 <$	y	< 0.7
$9\ \mathrm{GeV} <$	E_e	
$200\ \mathrm{GeV} <$	W	

Jets/Minijets are defined as:

Inclusive k_t-algorithm jets (HCM)

Selection 2(2)

Leading Jet sample.

The hardest jet with:

$$-1.7 < \quad \eta^{lab} \quad < 2.79$$

$$5 \text{ GeV} < \quad P_T$$

Dijet sample.

Two hardest jets with:

$$-1.7 < \quad \eta^{lab} \quad < 2.79$$

$$5 \text{ GeV} < \quad P_T$$

and

$$|\phi_1^* - \phi_2^*| \quad > 140^\circ$$

Minijets

$$3 \text{ GeV} < \quad P_T$$

$$-1.7 < \quad \eta^{lab} \quad < 2.79$$

The P_T jet cuts are applied both in HCM and Lab frame

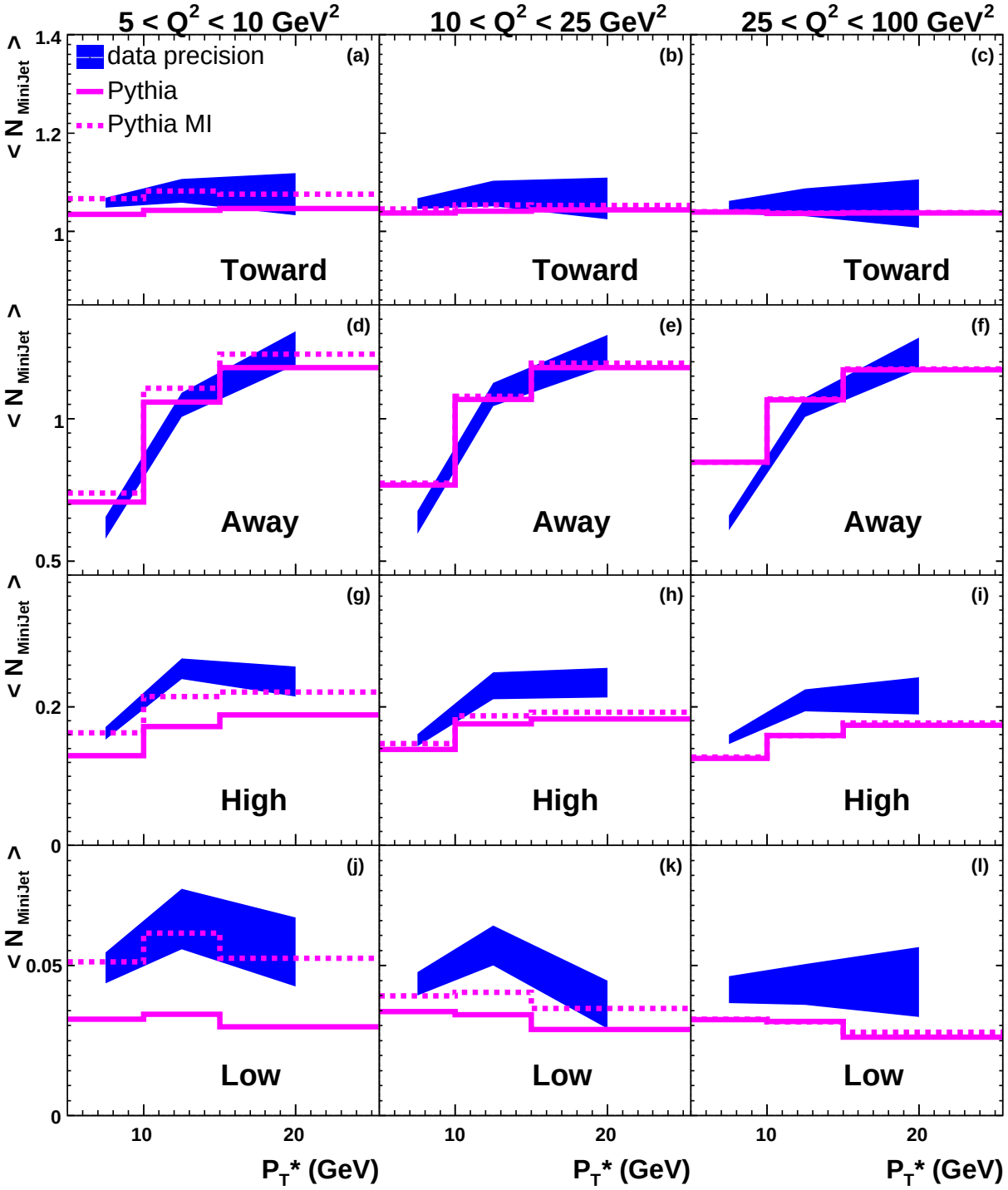
The data point are not official, therefore
only data precision is shown.

Data precision

Inclusive sample

Forward region:

$0.5 < \eta_{lj} < 2.79$

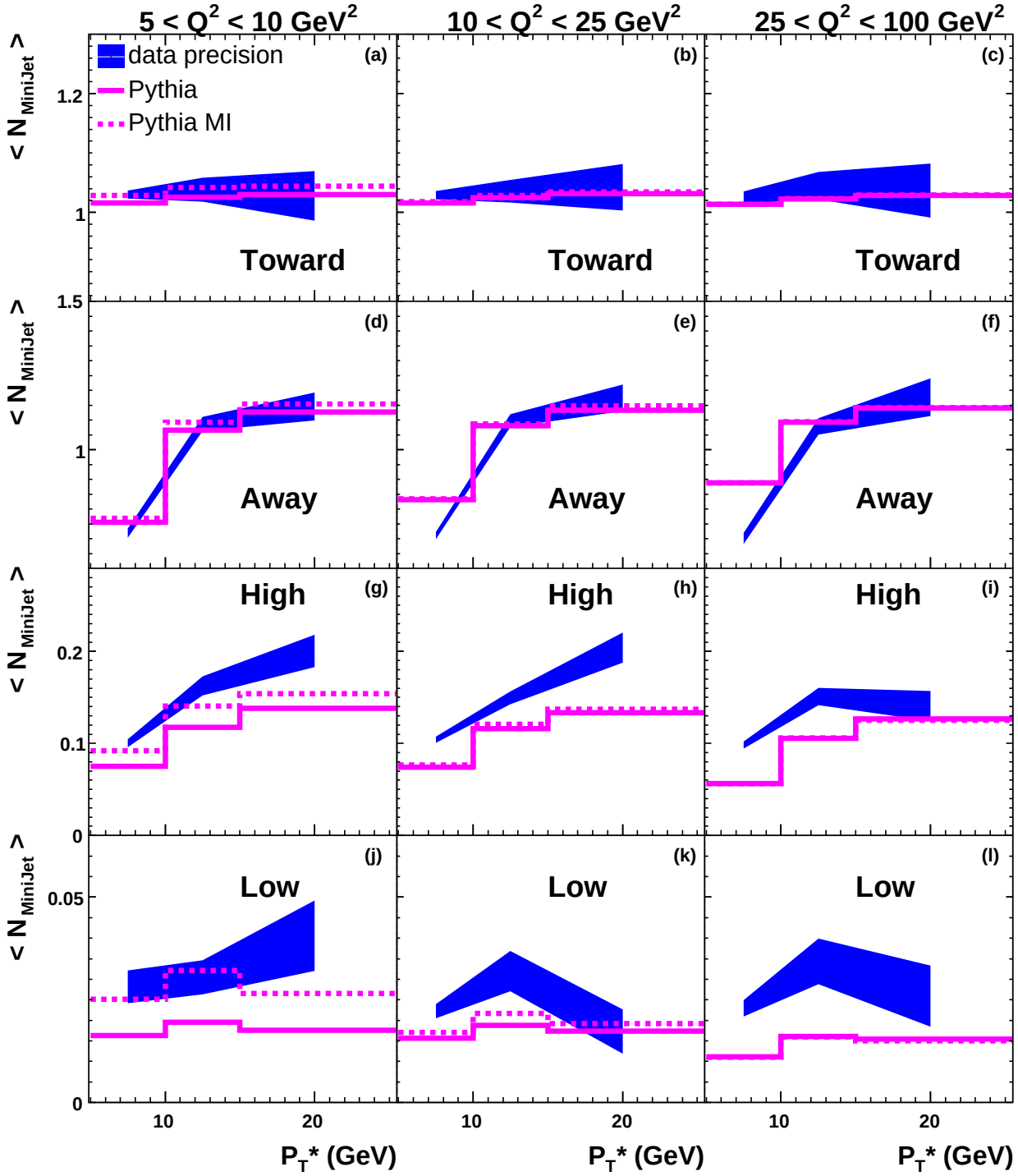


Data precision

Inclusive sample

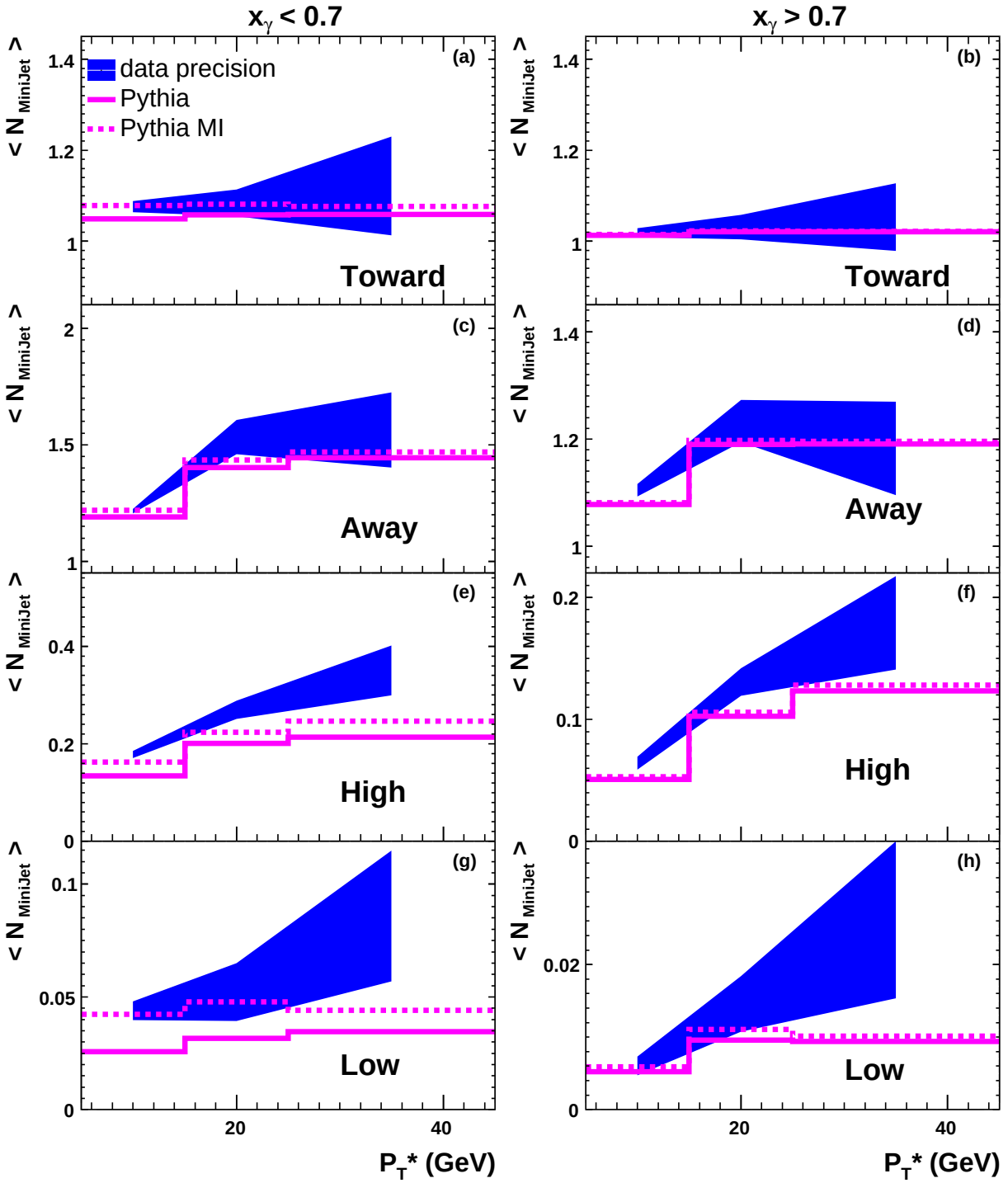
Central region:

$-1.7 < \eta_{lj} < 0.5$



Data precision

Dijet sample



Summary

* Data precision as function P_T of the leading jet was presented.

* MC with additional activities like MI (Pythia) gives additional activity in the transverse regions

Outlook

* Get the data ready for DIS 2007

* Play with the MC

* In bins of W

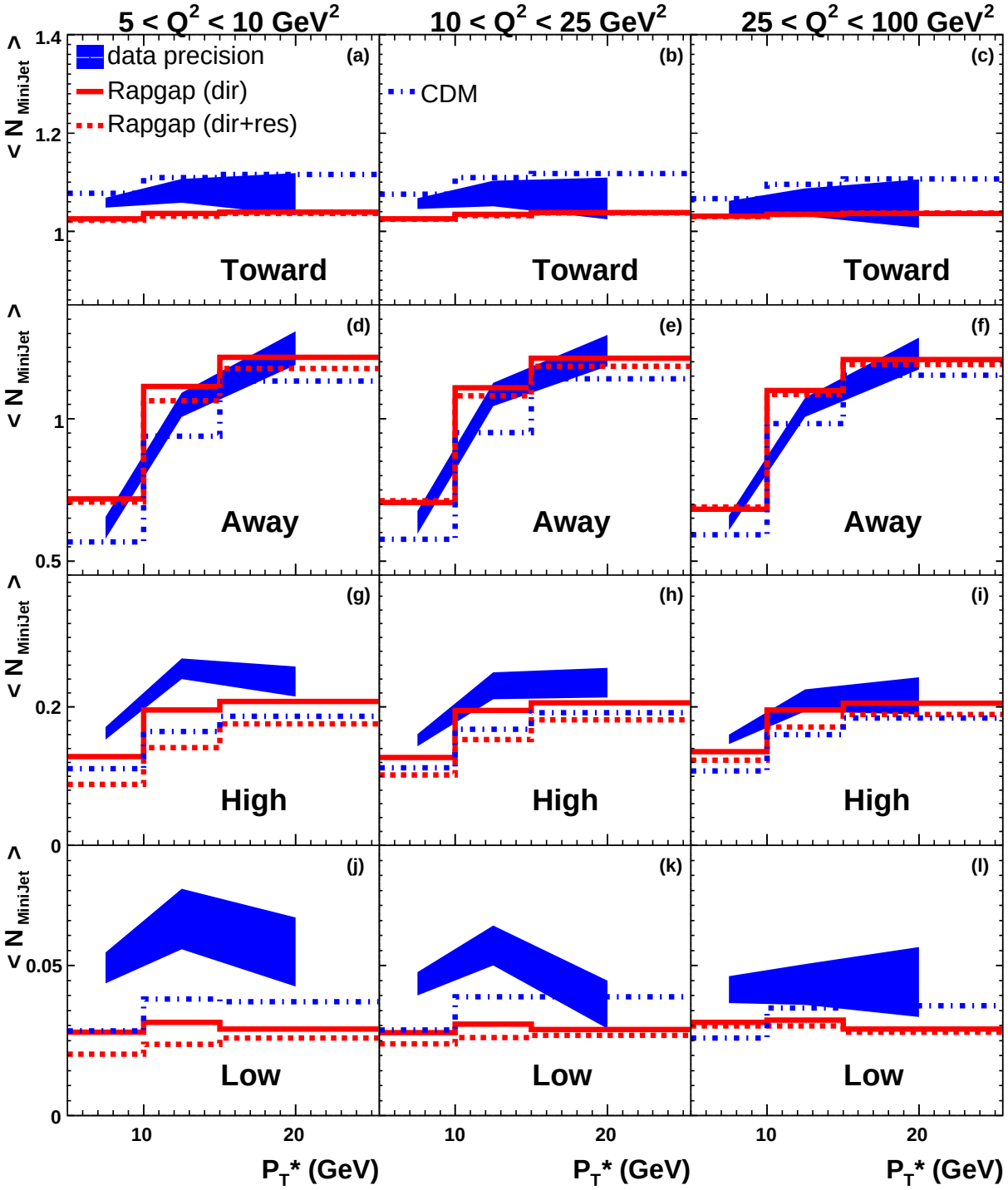
Extra slides

Data precision

Inclusive sample

Forward region:

$0.5 < \eta_{lj} < 2.79$

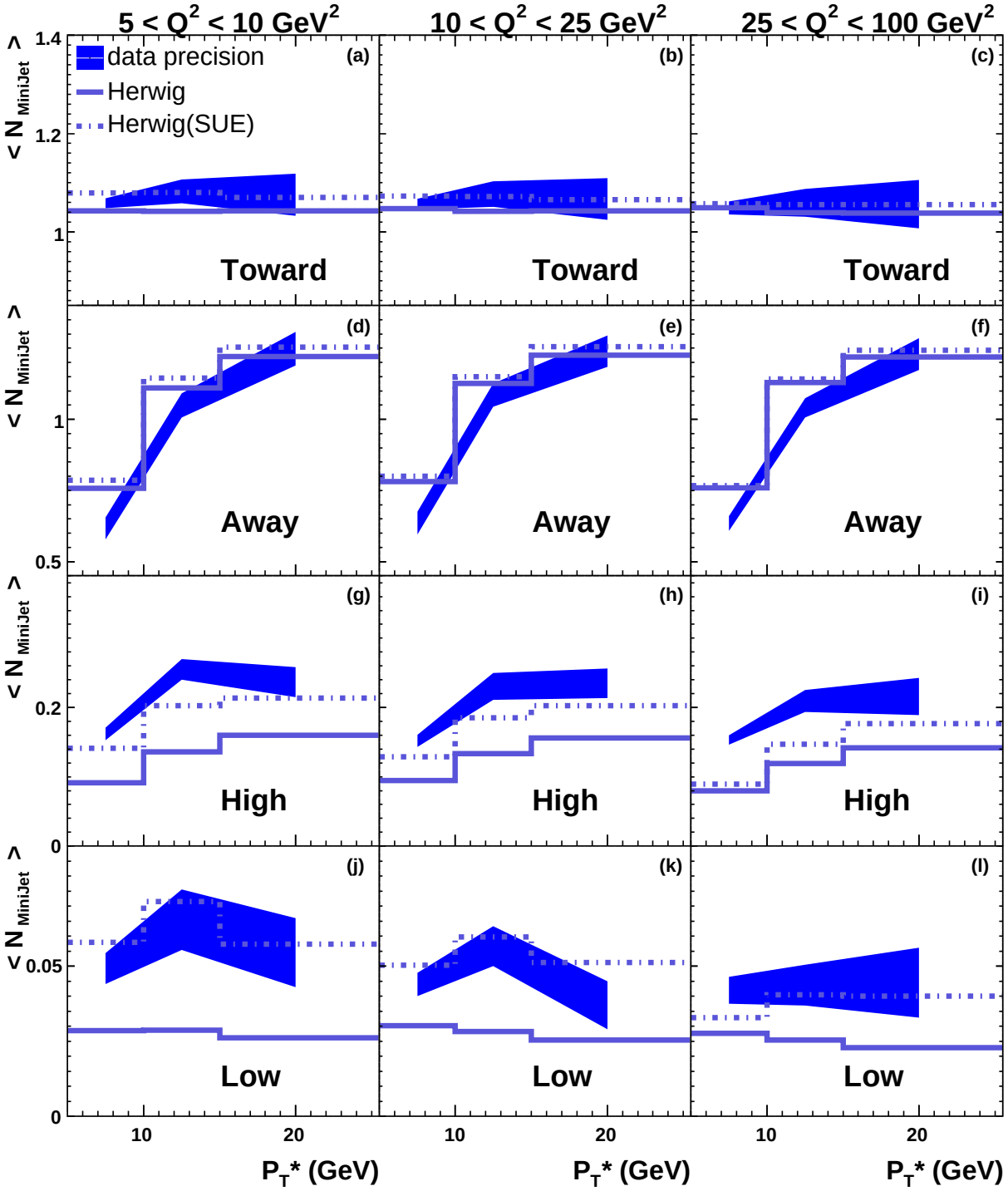


Result

Inclusive sample

Forward region:

$0.5 < \eta_{lj} < 2.79$

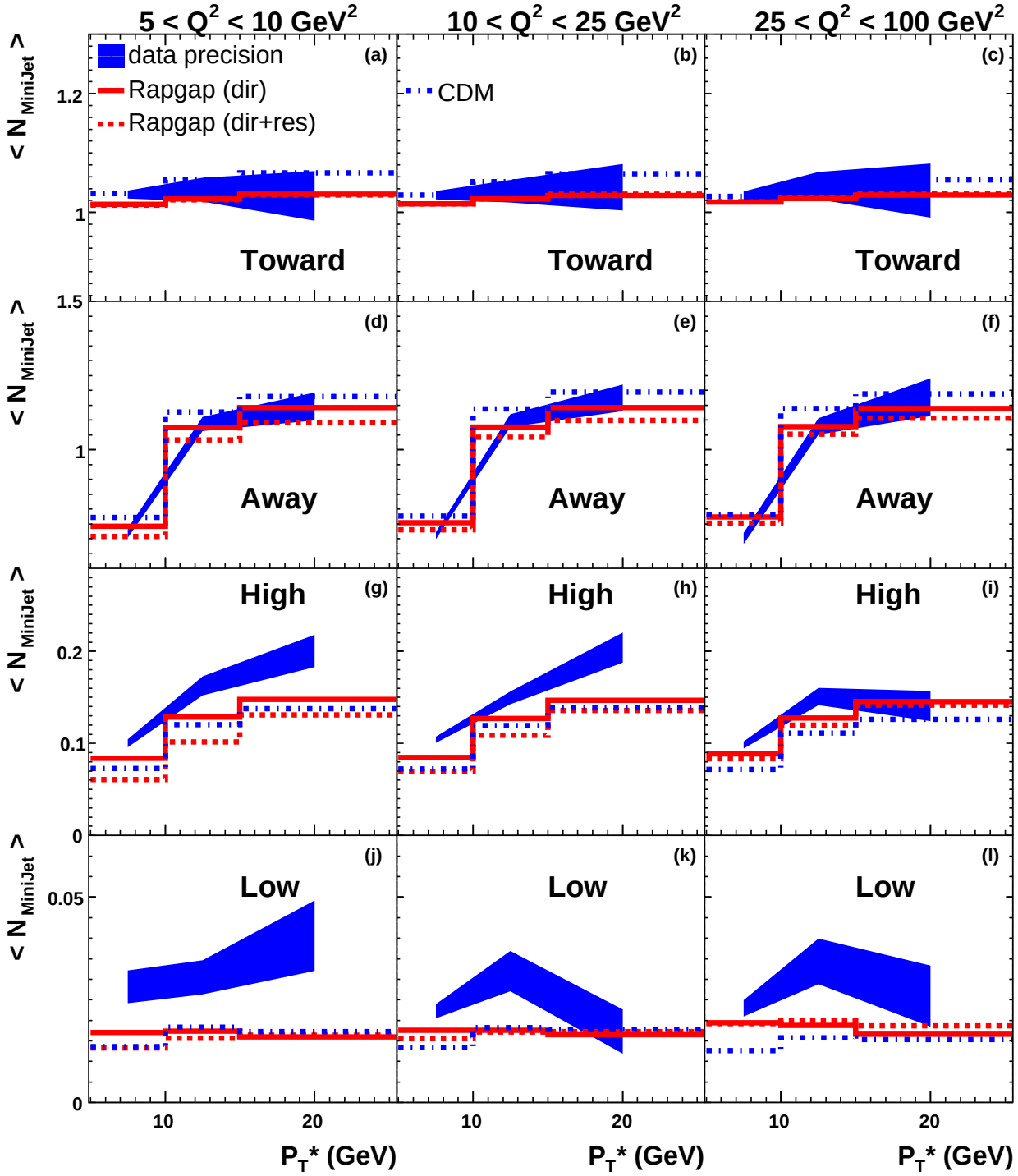


Data precision

Inclusive sample

Central region:

$-1.7 < \eta_{lj} < 0.5$

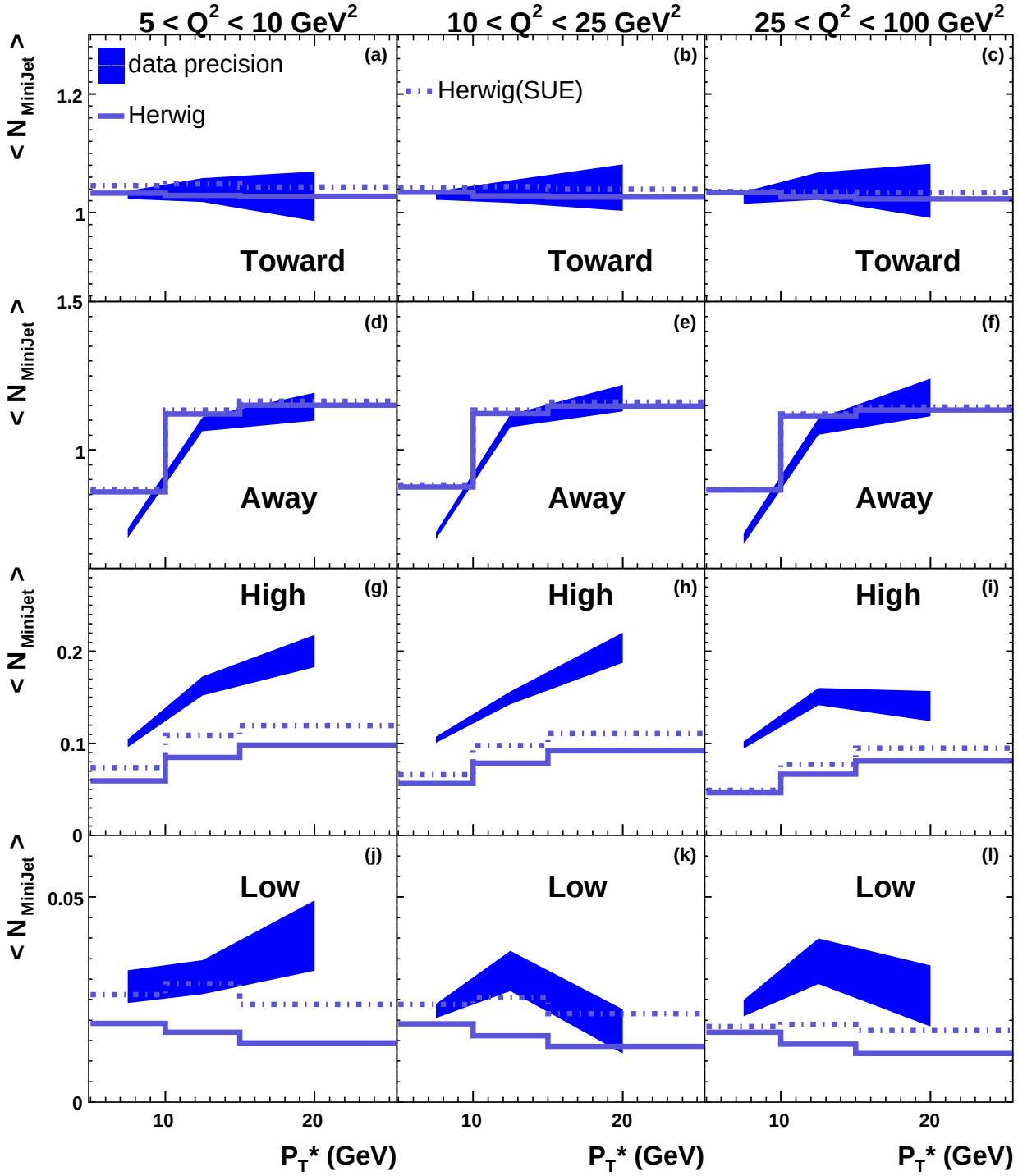


Result

Inclusive sample

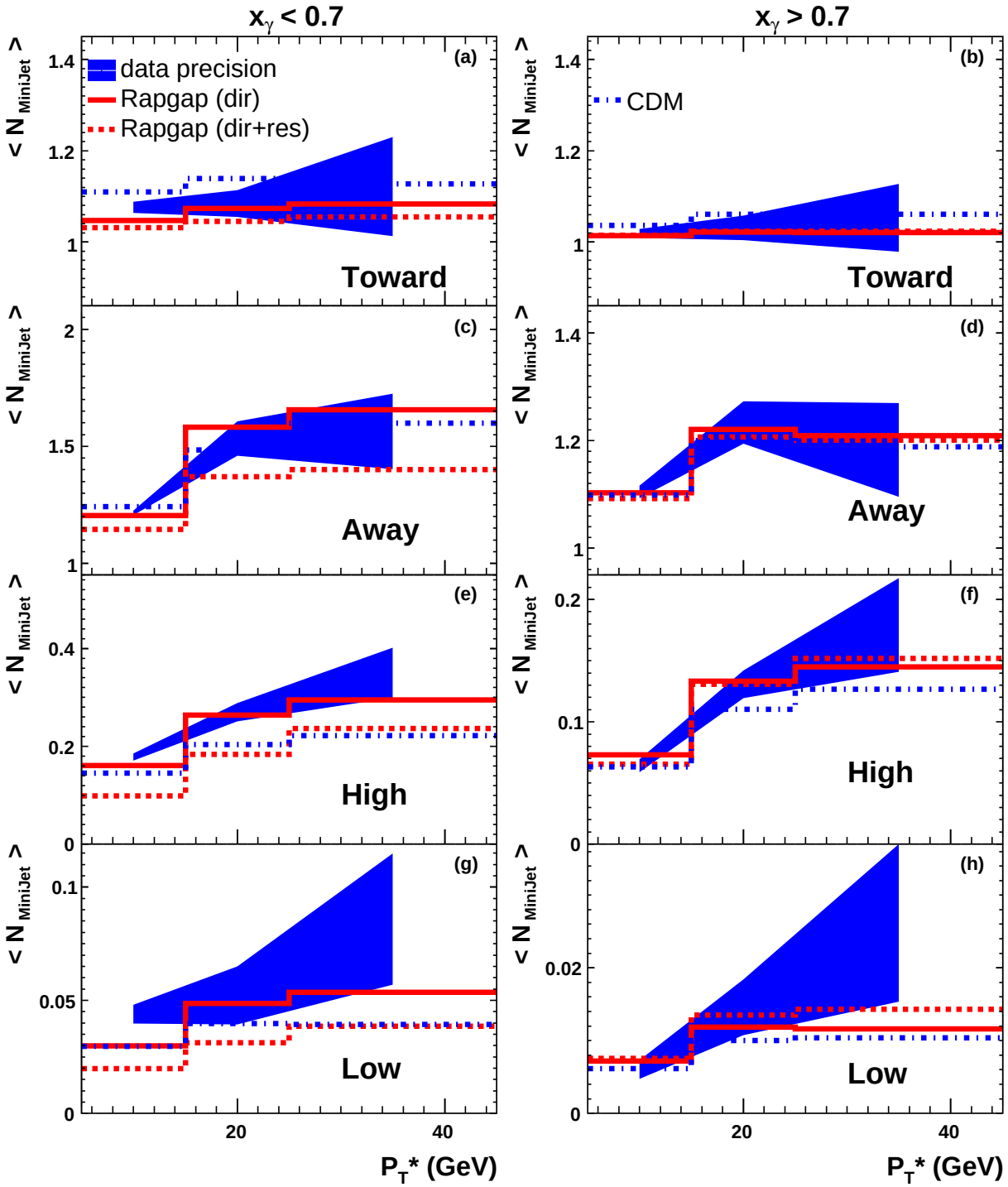
Central region:

$-1.7 < \eta_{lj} < 0.5$



Data precision

Dijet sample



Result

Dijet sample