

Standard Handles and Candles:
Comparison and existing tools for SM
Closing Summary and projects

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Jorgen D'Hondt, M.Kraemer

1) how to present LHC cross section results in 2008

can we measure the luminosity precisely

should we quote absolute or relative cross sections

to which process we should normalize our cross sections

2) *Soft physics: min bias and underlying event*

How to estimate trigger bias in minimum bias events

can we improve the tuning or is there a better way to get the diffractive part right?

Benchmark measurements to characterise the underlying event

Underlying event in EW processes

3) *PDFs*

which cross-sections and/or distributions from the LHC will improve our knowledge of PDF's

how to estimate and the handle systematics

4) **real and virtual EW corrections for high Et QCD processes**

implementation in generators, check consistency

effect on distributions (p_t , m_t , $m_{t\bar{t}}$, spin correlations, ...)

estimate the effect on measurements

issue of experimental v. theoretical event selection (whether inclusive or not wrt W/Z emission)

5) **Use of matrix elements and kinematic fitting in data analysis**

implementation of matrix elements techniques (comparison)

implementation of kinematic fit techniques (comparison)

benchmark cases for improvement

comparison between matrix elements and kinematic fit methods

6) **Top**

tt+jets

Spin correlations, colour reconnection

Top mass definitions

Start with brainstorm session this afternoon

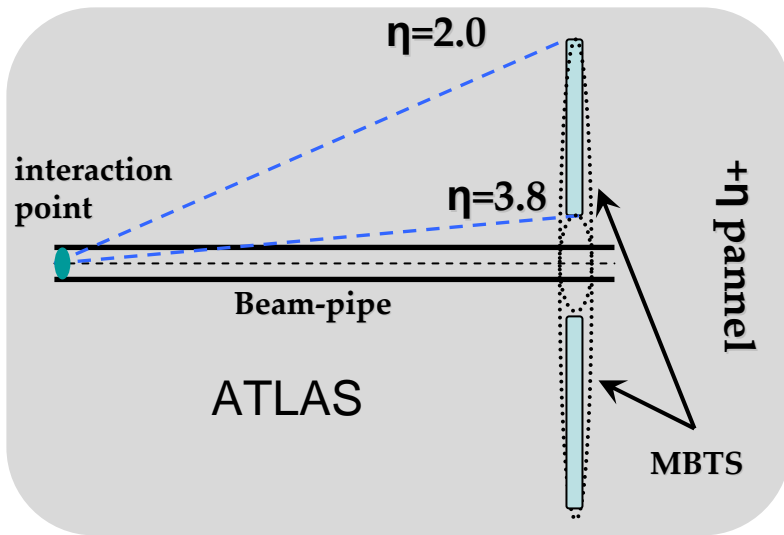
Many overlaps with jets, WG1 and WG3

→ Twiki

Underlying events and minimum bias projects

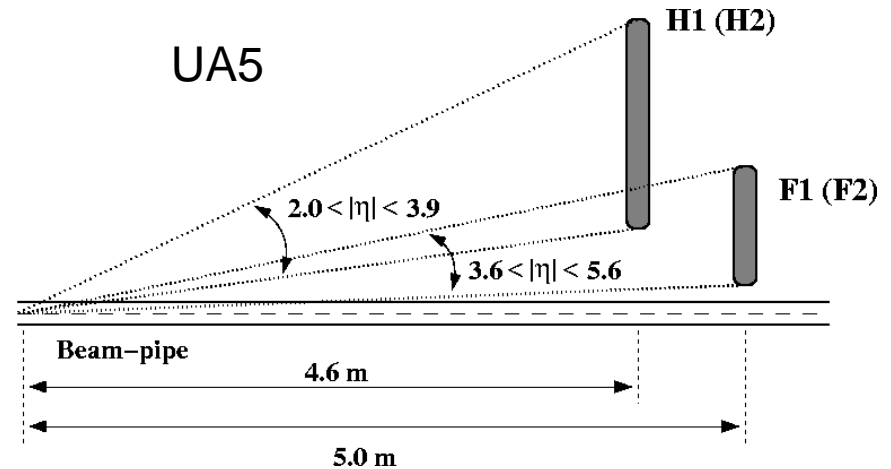
- UE/MB at the LHC and the energy scaling:
A collection of predictions for several experimental cuts
energy scaling
 - Peter S, Arthur, Craig, Jon B, Gavin
- UE subtraction from Jets
Comparison of different techniques (Average*Area vs Average(Nch)*Area vs Energy Flow Subtractions)
From calorimeter showers to particle jets
 - Gavin, Matteo, Peter S, Anwar, Joey, Peter L
- Experimental definition of UE regions
Can this be extended in ATLAS and CMS?
Deadline 1/11
 - Craig, Arthur, Paolo B
- Studies of UE in Drell Yan
 - T Todorov
- Probing multi-parton interactions with Z + 2 jets
 - H Nilsen
- Probing multi-parton interactions in minijets
 - Paolo B
- Energy flow measurements with calorimeter
Charged/neutral problem in UE at CDF
 - Craig, Arthur, Peter L

Min bias triggers



ATLAS MBTS trigger acceptance

	PYTHIA acceptance	PHOJET acceptance
Single diff	7.7	6.4
Double diff	6.1	3.5
Non-diff inelastic	69.9	81.2
Non-single diff	75.5	84.4
NSD/total	90.8	92.8

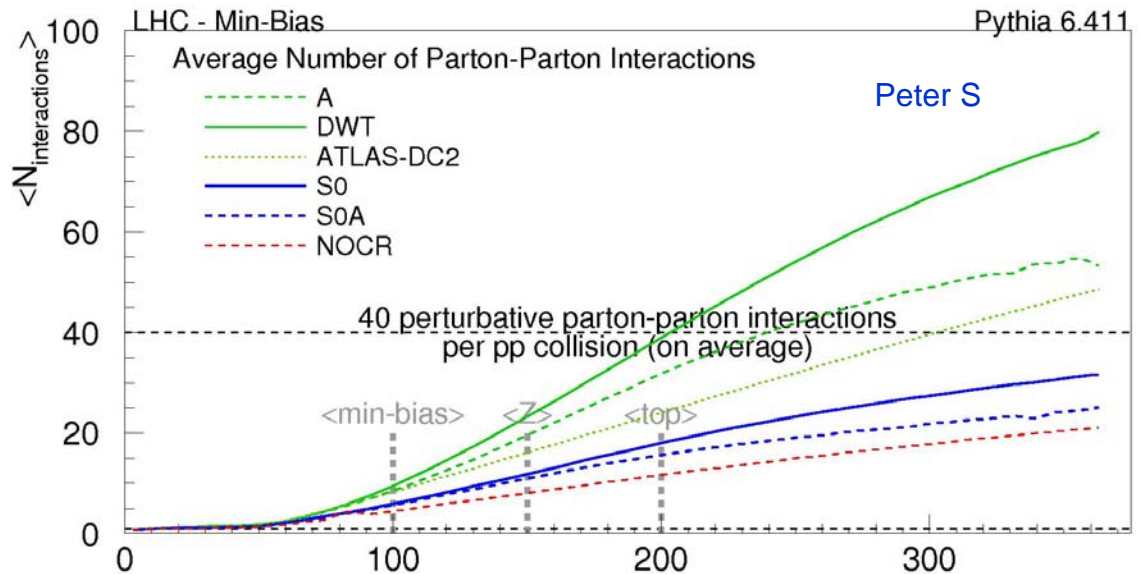
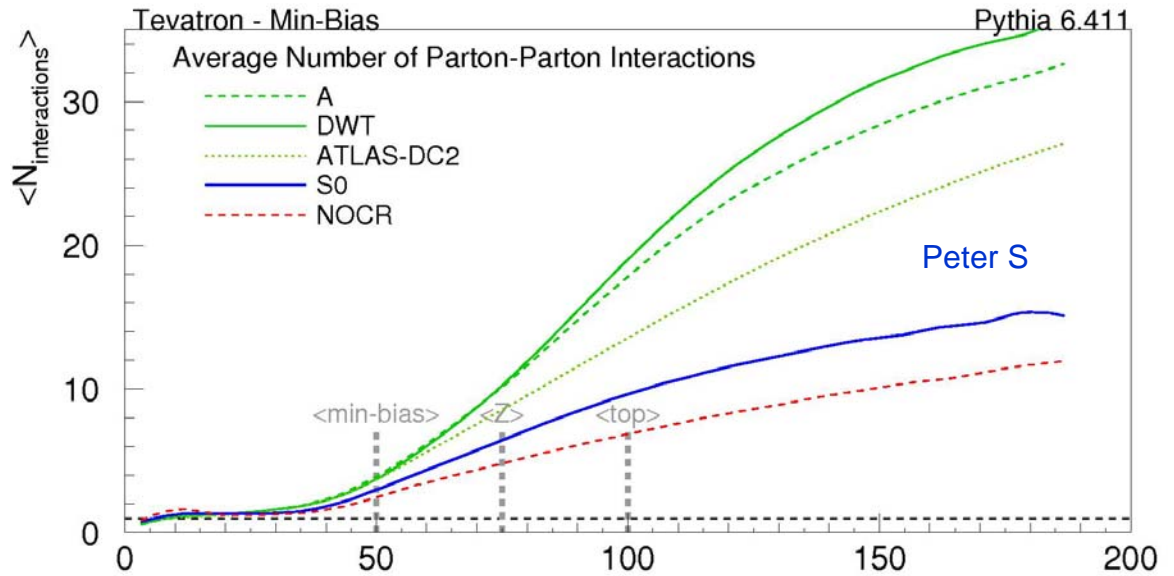


UA5 trigger

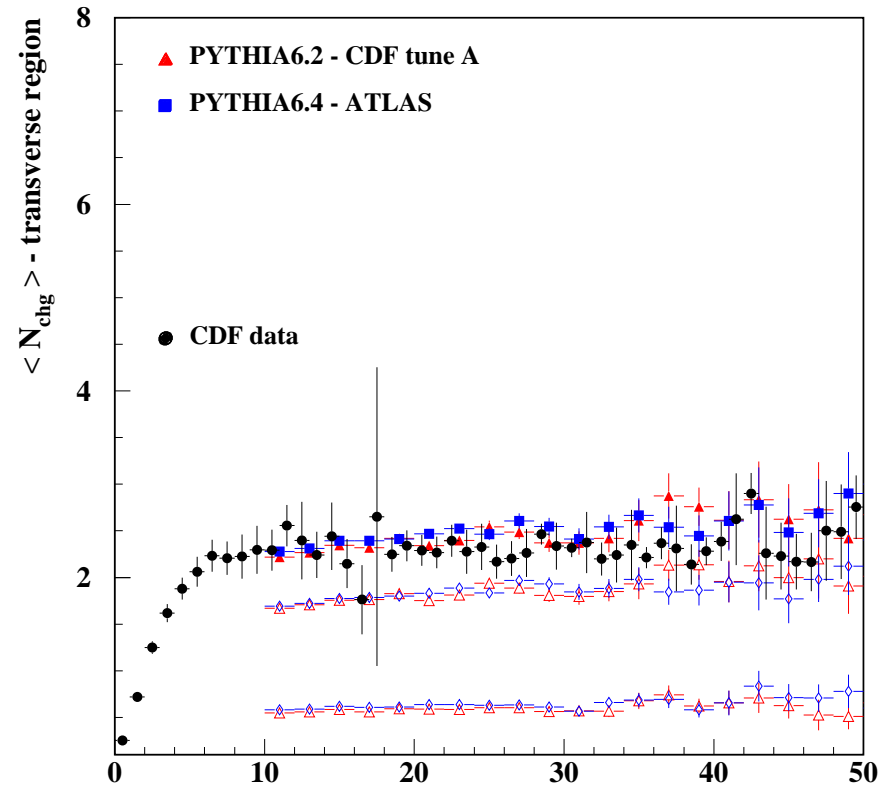
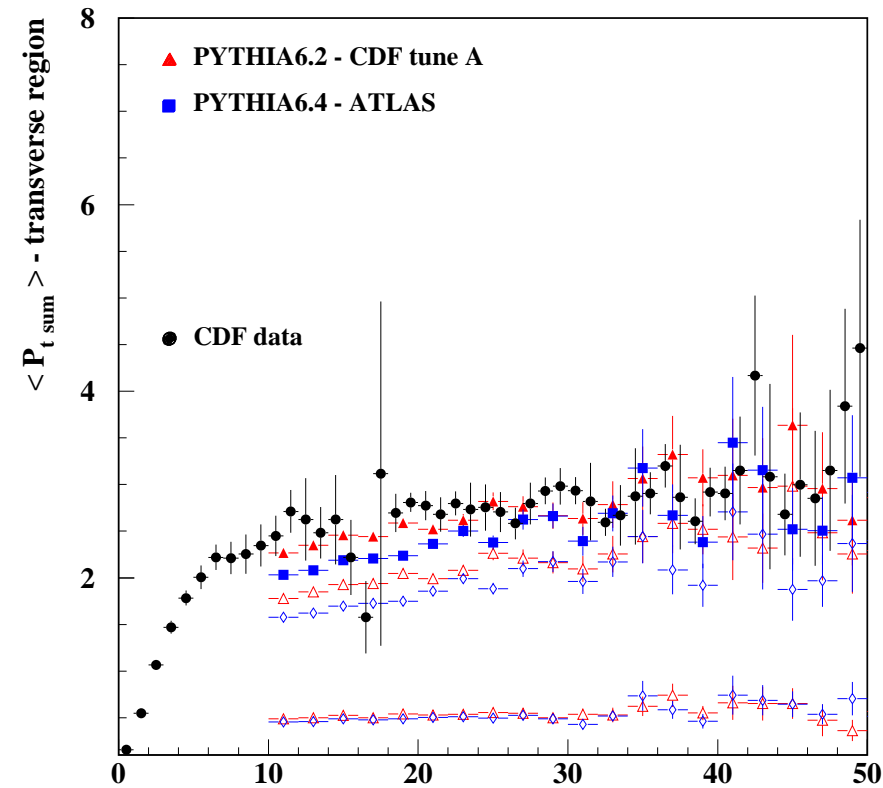
acceptance estimated with UA5 MC (HERWIG SUE)
 Single diffractive 2%
 Non-single diffractive 98%

UE event models

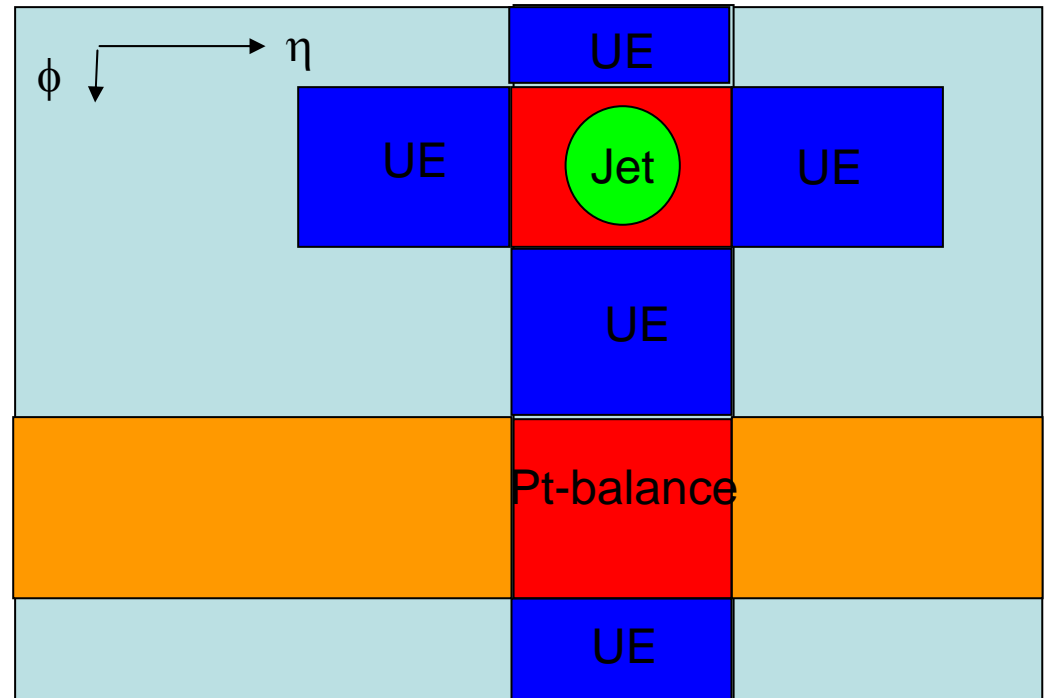
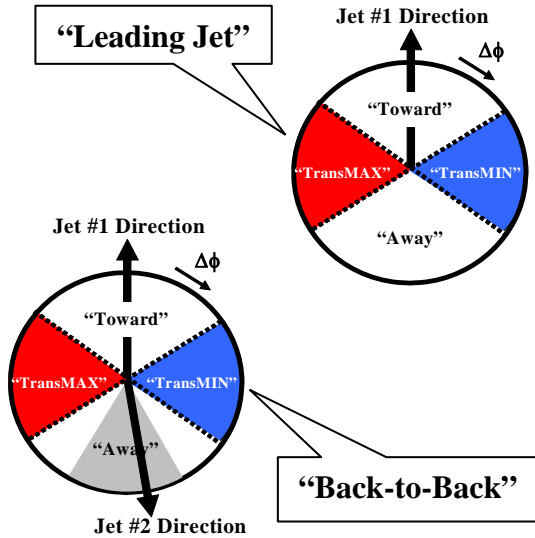
Colour sparks in PYTHIA



Trans-min and max



Defn of underlying event

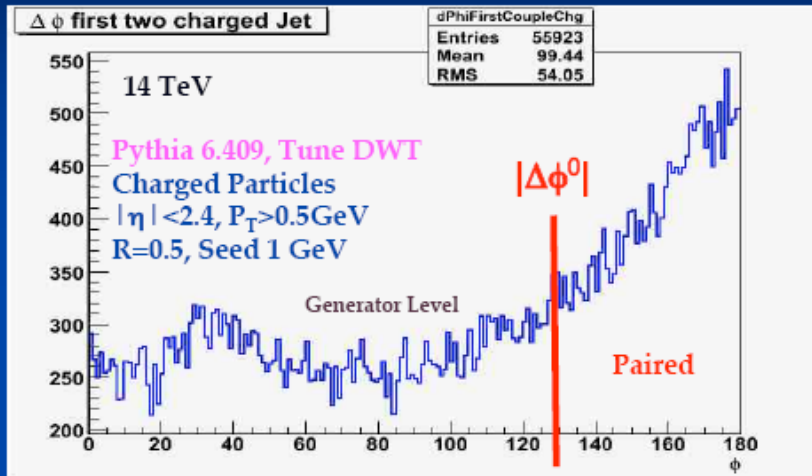


- Traditionally have looked at transverse region
- With extended tracker can also look at longitudinal regions

Shown by courtesy of Tate Gallery, London

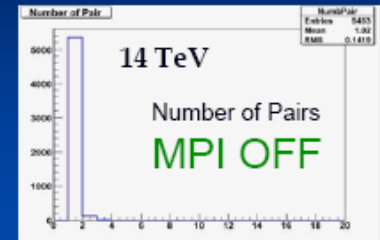
MB: Quoting MPIs through paired MiniJets

$\Delta\phi$ distribution for the two most energetic charged Mini-Jets of the events



Pairing Algorithm:

- MiniJets ordered in decreasing P_T
- Start from the first
- Paired = jet with closest P_T that satisfies the condition $|\Delta\phi^0| < |\Delta\phi|$



The idea of the measurement is to study the Rates for a given number N of Mini-Jet Pairs above a given P_T threshold -> Infrared Safe Quantity

$$\langle N \rangle \sigma_H = \sigma_S \quad \text{and} \quad \frac{1}{2} \langle N(N-1) \rangle \sigma_H = \sigma_D \quad \langle N(N-1) \rangle = \langle N \rangle^2 \frac{\sigma_H}{\sigma_{\text{eff}}}$$

Where $\sigma_{\text{inel}} = \sigma_{\text{soft}} + \sigma_H$

“S” = Single Interactions, “D” = Double Interactions, “H” = Hard [D.Treleani, CMS]
 $\sigma_{\text{eff}}(P_T)$ contains the information on the spatial distribution of partons

PDF projects

- Measurements at LHC that can constrain PDFs
 - Measurements
 - Impact on pdfs
 - Impact on physics measurements: BSM and W/Z cross-section

Juan Rojo-Chacón, Craig, Claire Gwenlan, Joey, Klaus R, Markus
 - How to measure high-x gluon pdf?
 - What to measure?
 - How to minimise sensitivity to jet energy scale

Craig, Claire G, Joey, Peter L, Klaus R, Markus
 - W cross-section
 - Investigate difference between MSTW and CTEQ predictions
 - Understand LHC luminosity measurements

Craig and Joey
 - Document CTEQ relationship between CTEQ eigenvectors and pdfs
- Joey and Jon P

Impact of LHC measurements on PDFs uncertainties

Aims of this study:

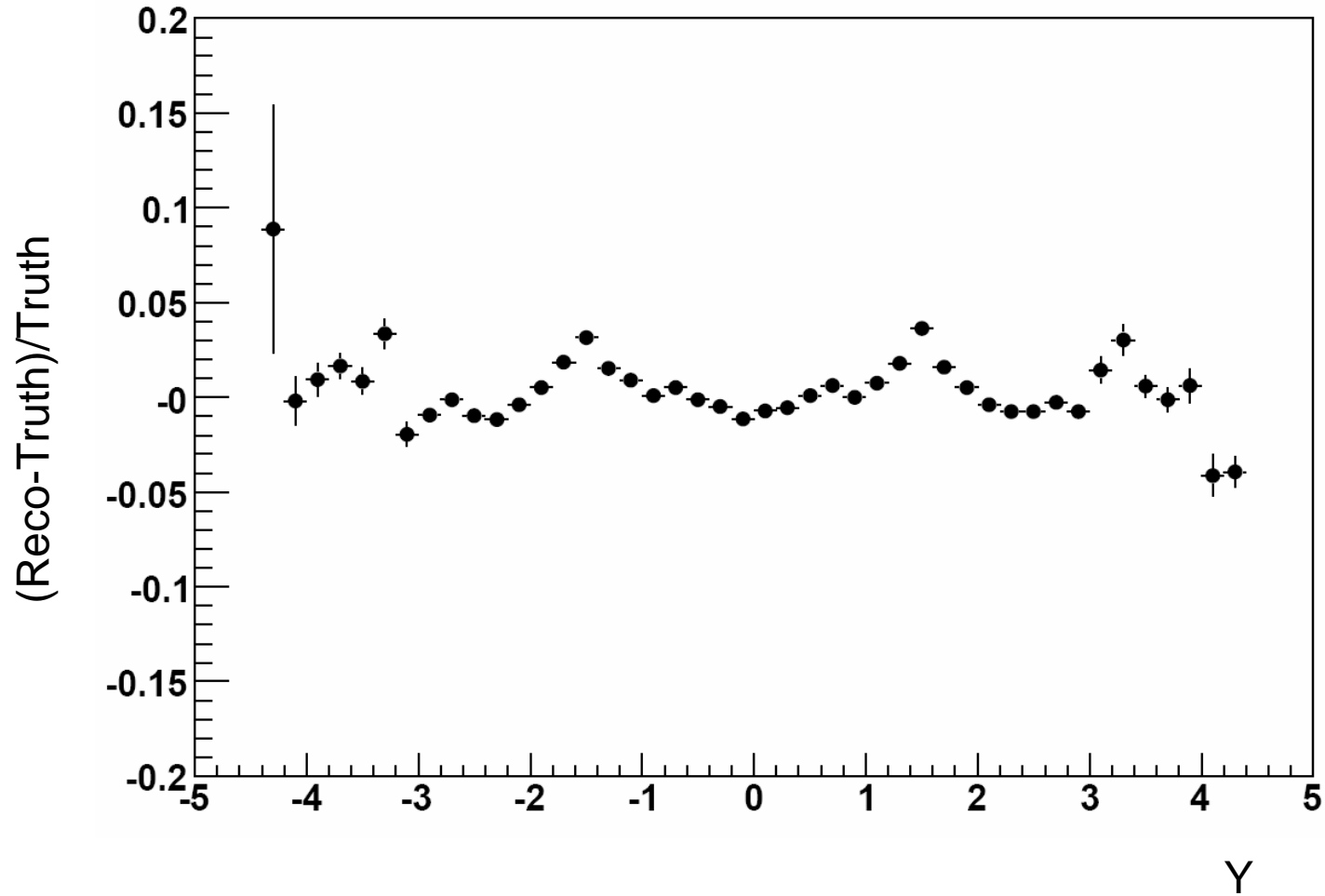
1. Identify those LHC measurements that can constrain PDFs.
2. Assess for which processes improved PDFs would have larger impact.
3. Determine which tools would be needed to incorporate LHC measurements into PDFs fits (like FastNLO or NLOgrid)

(Preliminary) List of processes:

1. Inclusive jet cross section \rightarrow Improve large-x gluon, relevant for BSM searches. Can we overcome the JES uncertainty?
2. Dijet cross sections \rightarrow Need improved NLO grid tools.
3. W/Z rapidity distributions ! Constrain sea quarks (and glue) at small-x.
4. $pp \rightarrow \gamma X$, $pp \rightarrow \gamma\gamma X \rightarrow$ Handle on gluon pdf. Experimental feasibility?
5. $pp \rightarrow Z/W + \text{jets} \dots$
6. Suggestions welcome!

Juan Rojo-Chacón LPTHE - Université Paris VI et Paris

Jet energy scale



P.Loch

Watch the Wiki