MCNET

First comparisons of MC's with CMS data

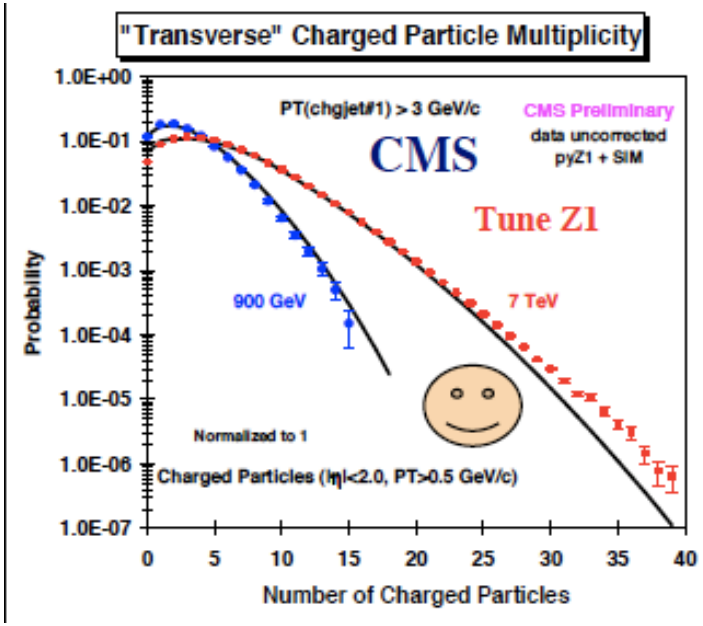
Only some selected topics that you might not yet know about

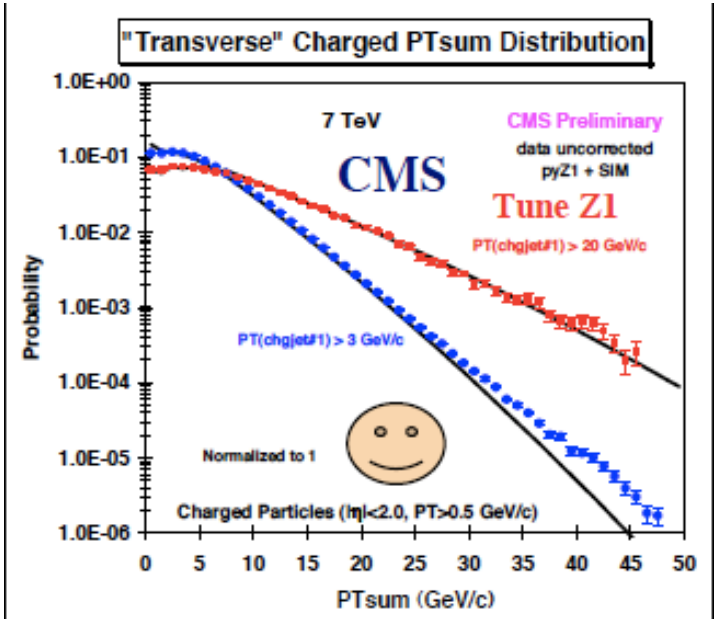
Filip Moortgat (ETH Zurich)

Low-Pt QCD tuning

Tuning

CMS will now use Pythia6 with the Pt-ordered shower, new MPI and Tune Z1 (or Z2) :





R. Field

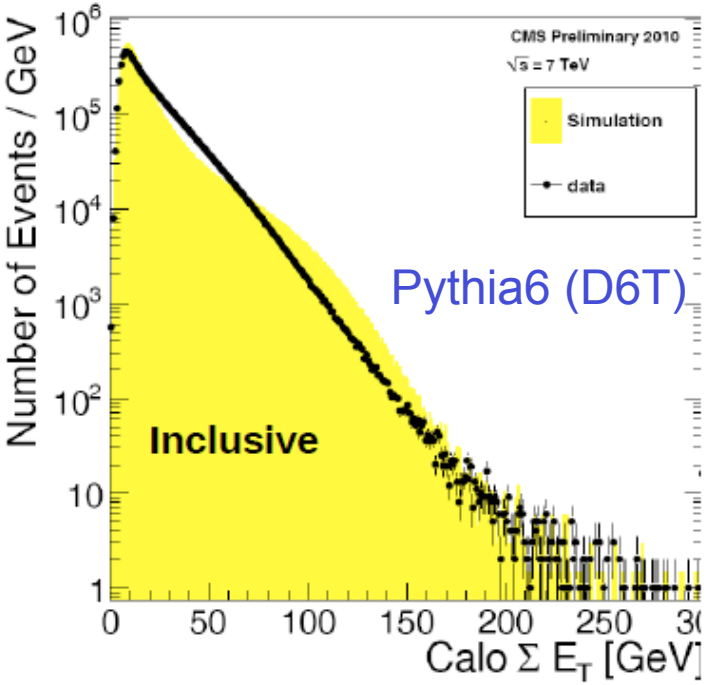
More details: http://indico.cern.ch/getFile.py/access?contribId=164&sessionId=1&resId=0&materialId=slides&confId=68643

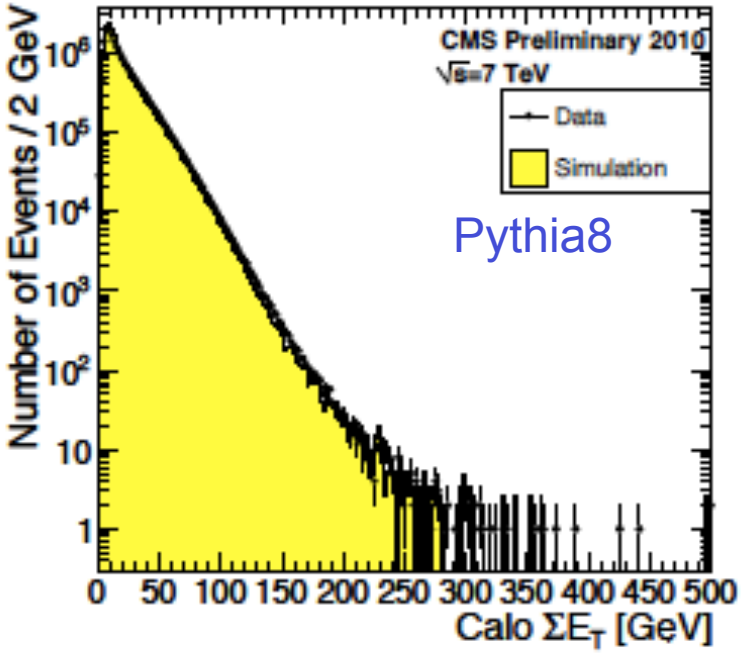
CMS person to work on Rivet/Professor tuning found: Albert Knuttson (DESY)

SumET in MinBias

One of the most difficult quantities to predict: SumET in MinBias events

- Pythia6 (with tune D6T, Perugia, ATLAS CRC) would always get it wrong
- Similar for HERWIG
- Pythia8 gets it right on the spot:





Similar for various charged particle distributions

QCD studies

Hadronic Event Shapes

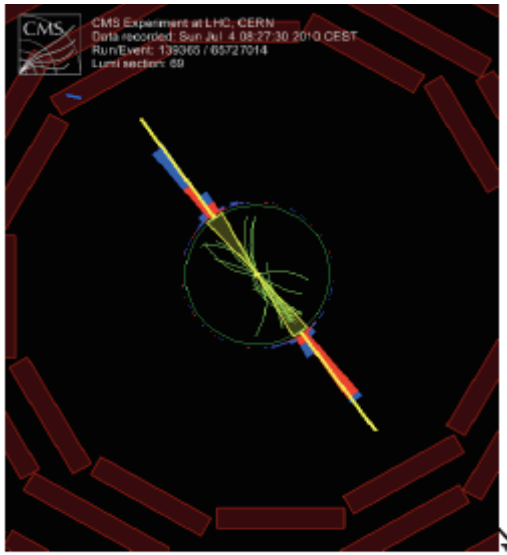
ETH Institute for Particle Physics

- **Central transverse thrust:**

$$T_{\perp,C} \equiv \max_{\vec{n}_T} \frac{\sum_{i \in C} |\vec{p}_{\perp,i} \cdot \vec{n}_T|}{\sum_{i \in C} p_{\perp,i}}$$

$$\log \tau_{\perp,C} = \log(1 - T_{\perp,C})$$

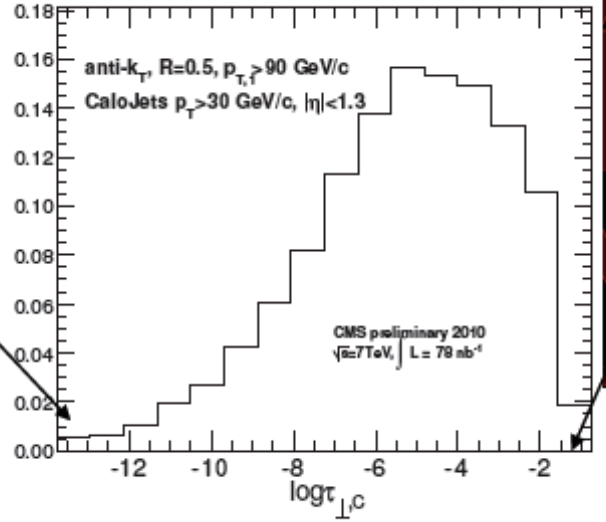
Jet momenta are used as input for the event shape calculation

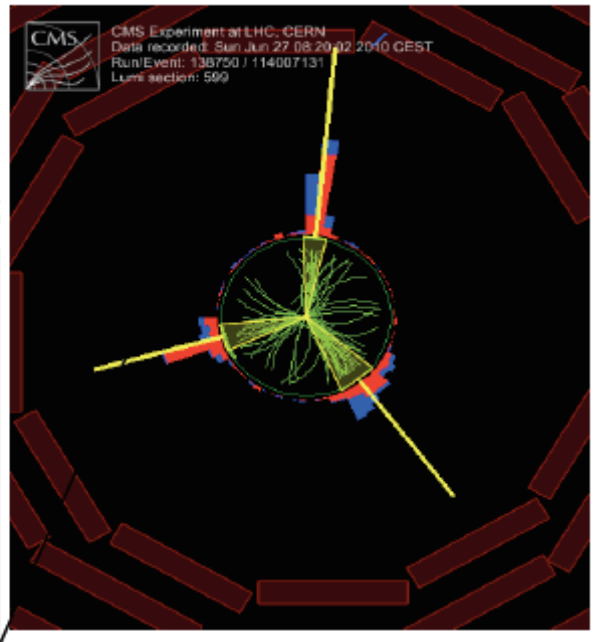


$p_{T,1}$= 359 GeV,
$p_{T,2}$= 337 GeV
MET/SumEt=0.007

$$\tau_{\perp,C} = 0$$

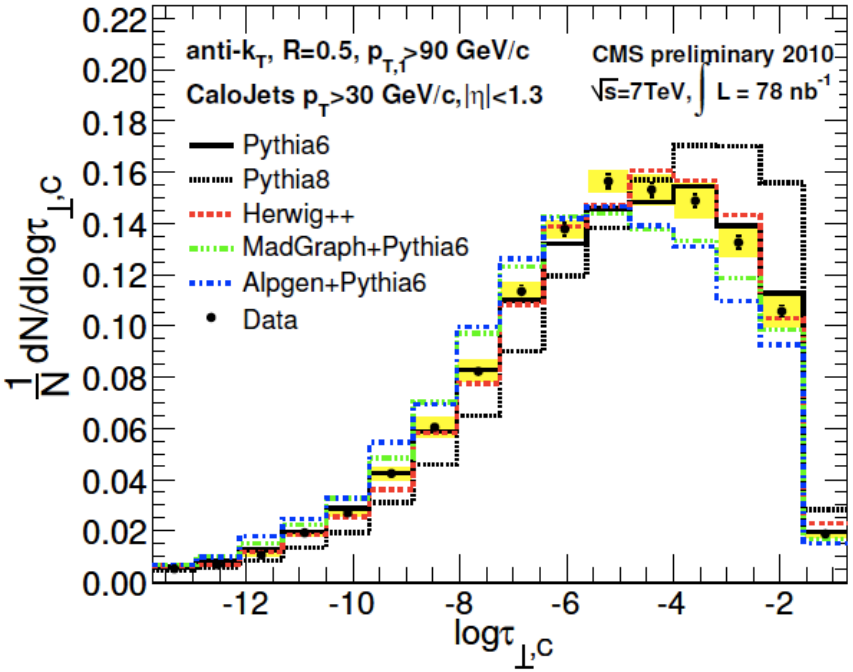
$p_{T,1}$= 262 GeV,
$p_{T,2}$= 189 GeV
$p_{T,3}$= 178 GeV
MET/SumEt=0.05

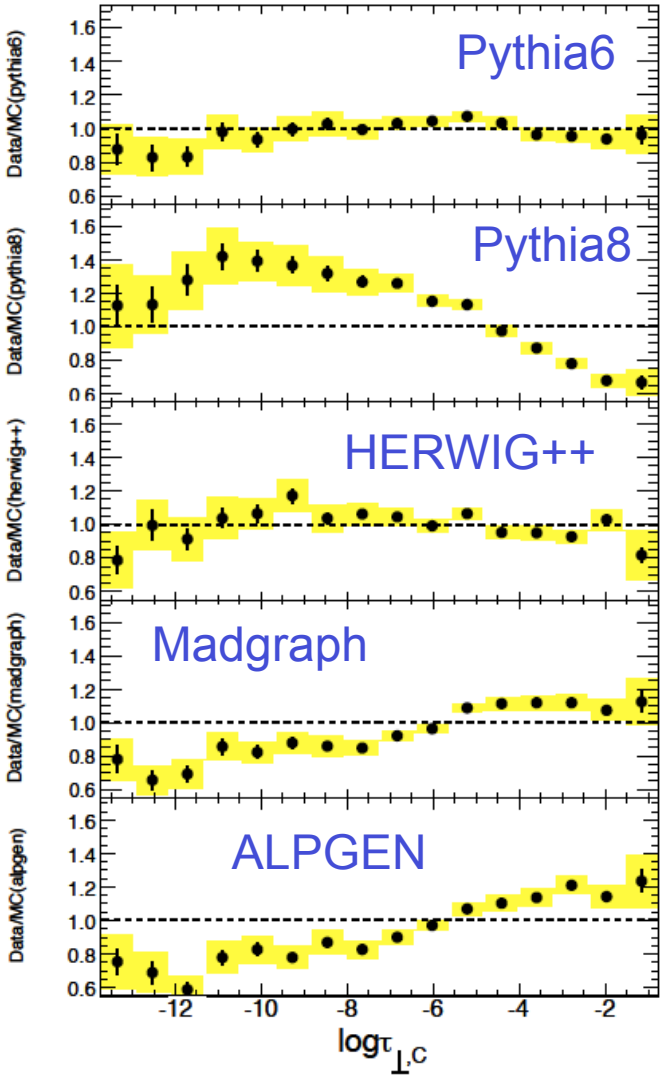




$$\tau_{\perp,C} = 1 - \frac{2}{\pi}$$

Event Shapes (2)

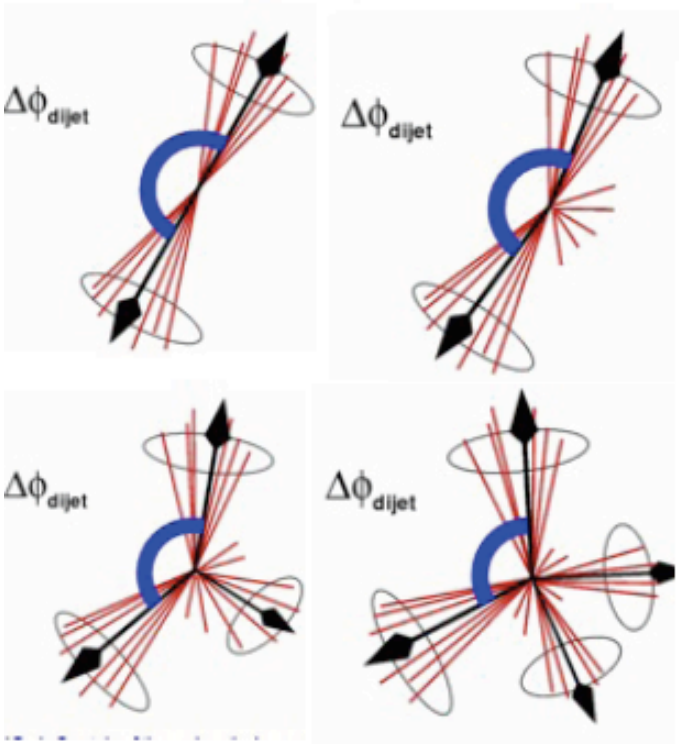




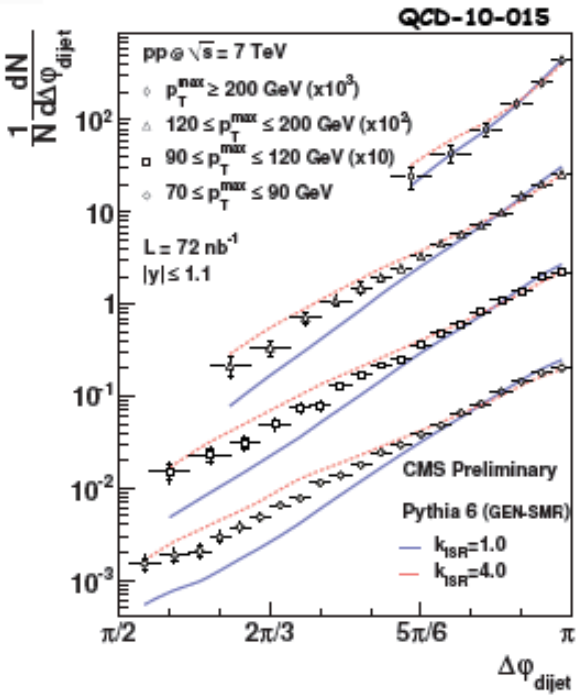
Azimuthal decorrelation

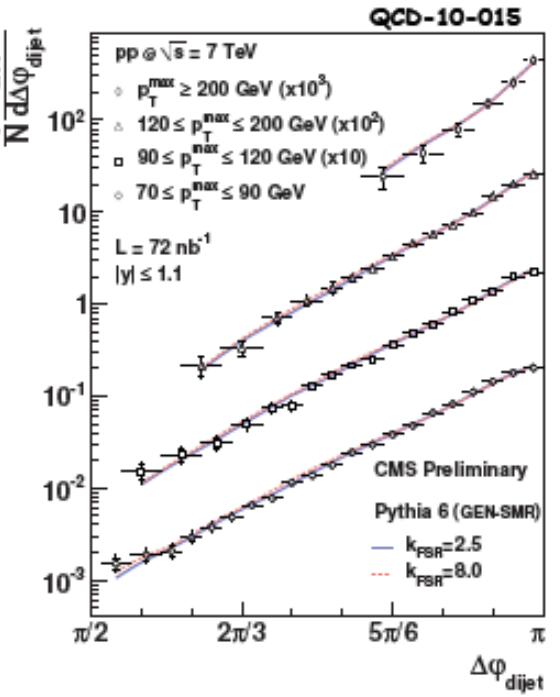
ETH Institute for Particle Physics

- Azimuthal decorrelations was the first QCD measurement from D0 Run II: little sensitivity to JEC and luminosity, but much to perturbative radiation
- Observable is very sensitive to initial state radiation (k_{ISR}=PARP(67)), but shows little sensitivity to final state radiation (k_{FSR}=PARP(71))
- Good agreement between data and Pythia default tune (k_{ISR}=2.5, k_{FSR}=4.0)



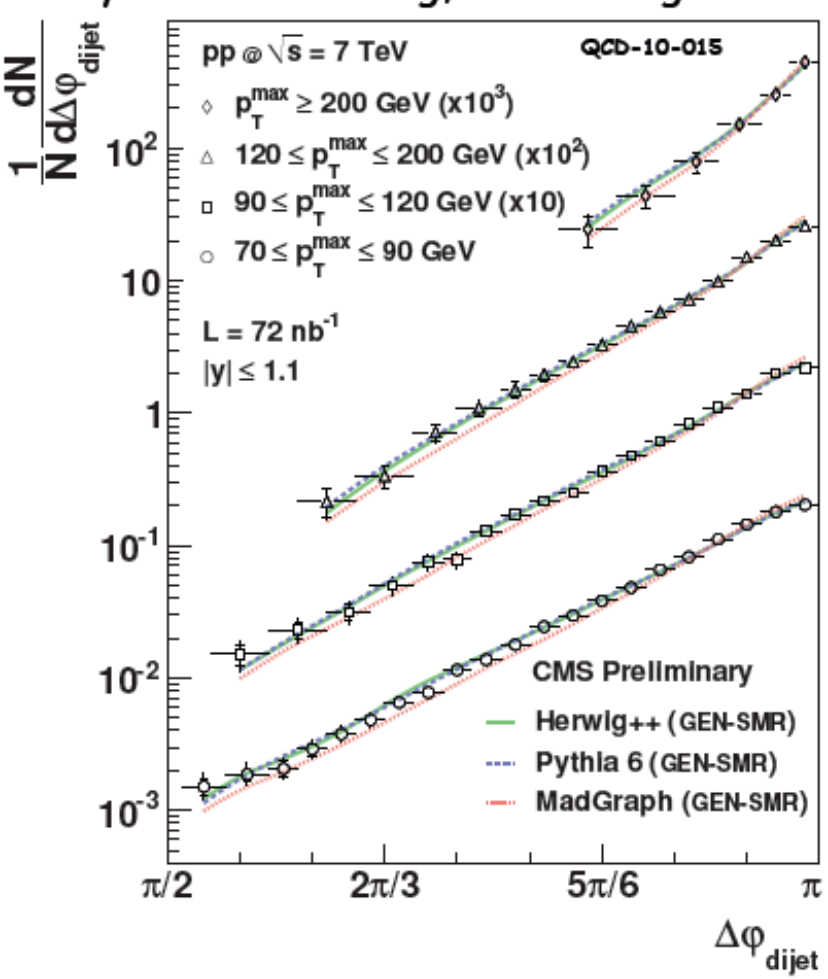
graphics: D0

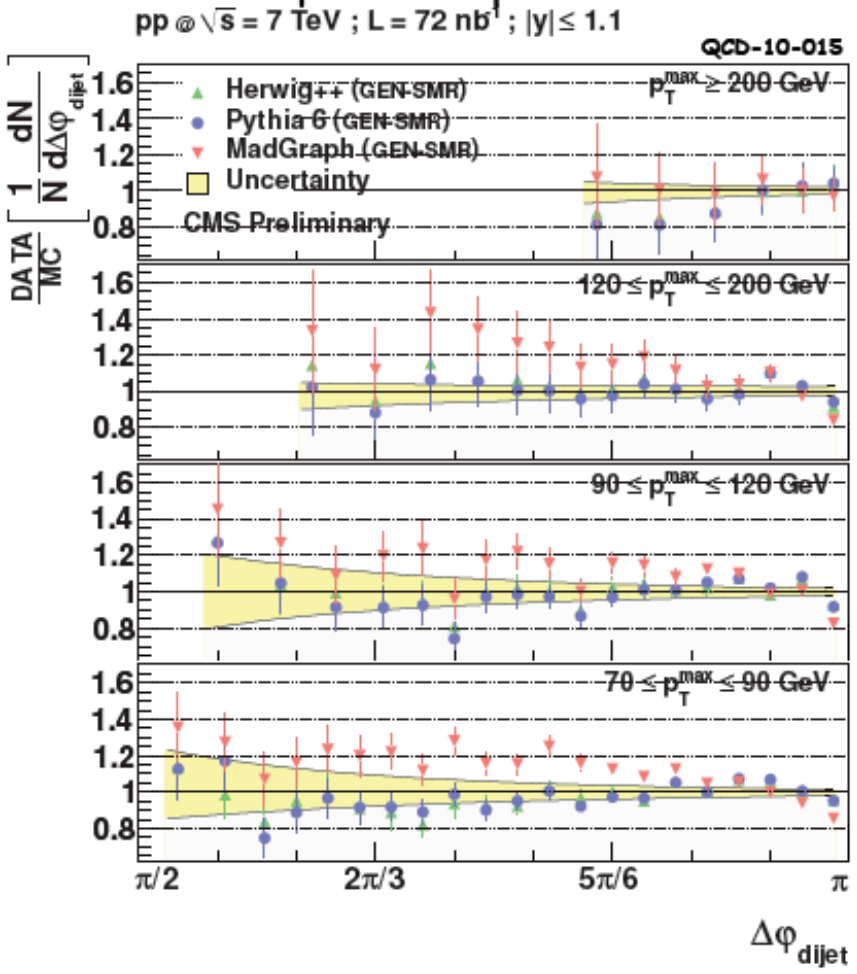




Azimuthal decorrelation (2)

- Comparisons between data and different models show good agreement with Pythia and Herwig, but less agreement with MadGraph at low p_T





QCD comparisons

Very very temporary conclusion on these (and other) high-Pt QCD studies:

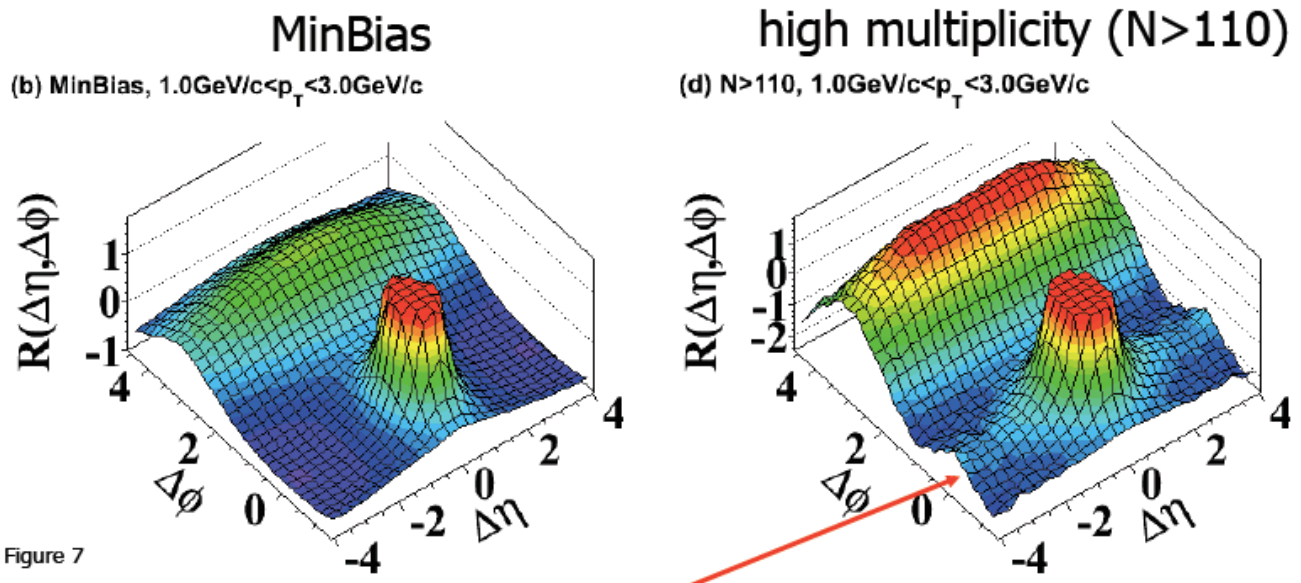
- comparisons with Pythia6, HERWIG6 and HERWIG++ very good
- quite large discrepancies with Pythia8 (standard Tune)
- .slight discrepancies with Madgraph and ALPGEN.
  Due to the MLM matching algorithm?
- comparisons with Sherpa (and CKKW) on the way

News

The ridge

CMS is observing long-range, near-side two-particle correlations in high multiplicity events:

Intermediate p_T: 1-3 GeV/c

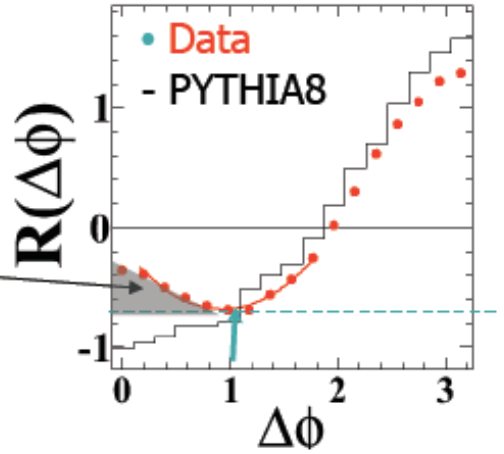


Pronounced structure at large $\delta\eta$ around $\delta\phi \sim 0$!

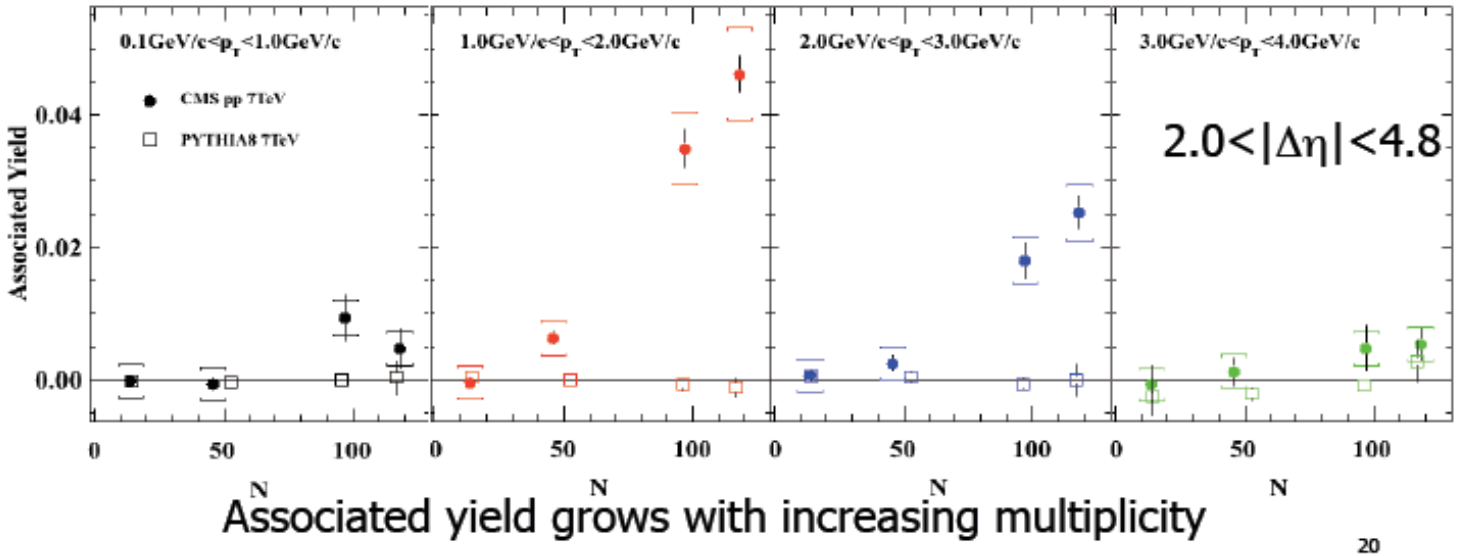
Multiplicity and Pt dependence

Zero Yield At Minimum (ZYAM)

Associated yield:
correlated multiplicity per particle



N>110
2.0<|Δη|<4.8
1GeV/c<p_T<2GeV/c



Associated yield grows with increasing multiplicity

20

The ridge (2)

See presentation at

http://indico.cern.ch/conferenceDisplay.py?confId=107440

or writeup at http://arxiv.org/pdf/1009.4122v1

The CMS Collaboration has made many cross-checks and is convinced the effect is real.

Next question: how to *interpret* it?

- due to colour string connections that are not in Pythia/HERWIG?
- plasma behaviour?
- other?

Suggestions for comparisons & additional checks are welcome.