

# Comparison of tunings to (UE) data

**Hendrik Hoeth**  
(Durham University)



# Overview

Status – where we are today

Plots – a broad view on data

Summary – says it all, doesn't it?

## Today's situation

We are slowly starting to see corrected MB/UE data from LHC.  
This is great!

Unfortunately it still needs to be read off the plots, since ATLAS “discourages the use of preliminary data for tuning”, CMS didn't show anything yet, ALICE showed first plots yesterday.

All three major MC generators are ready for production, but we keep seeing Pythia 6 tunes over and over again. Why?!?

# Generators

Major improvements in **Herwig++ 2.5** (see Andrej's talk). Unfortunately I have almost no Herwig plots for you today – the computer with the files literally blew up two days ago.

UE issues in **Pythia 8** have been fixed in summer (see Richard's talk). Tunings are available – I will show a preliminary Professor tune today.

**Sherpa 1.2.3** will be released in the next few days, including tunings to LHC data with CTEQ66 and CTEQ6L1.

## Issues. Issues?

We've heard a couple of strong statements this week:

- Strange data is soooooo far off, we need something like statistical hadronisation!
- There is a strong tension between Tevatron and LHC, we can't get both to fit simultaneously!

But the truth isn't always that simple.

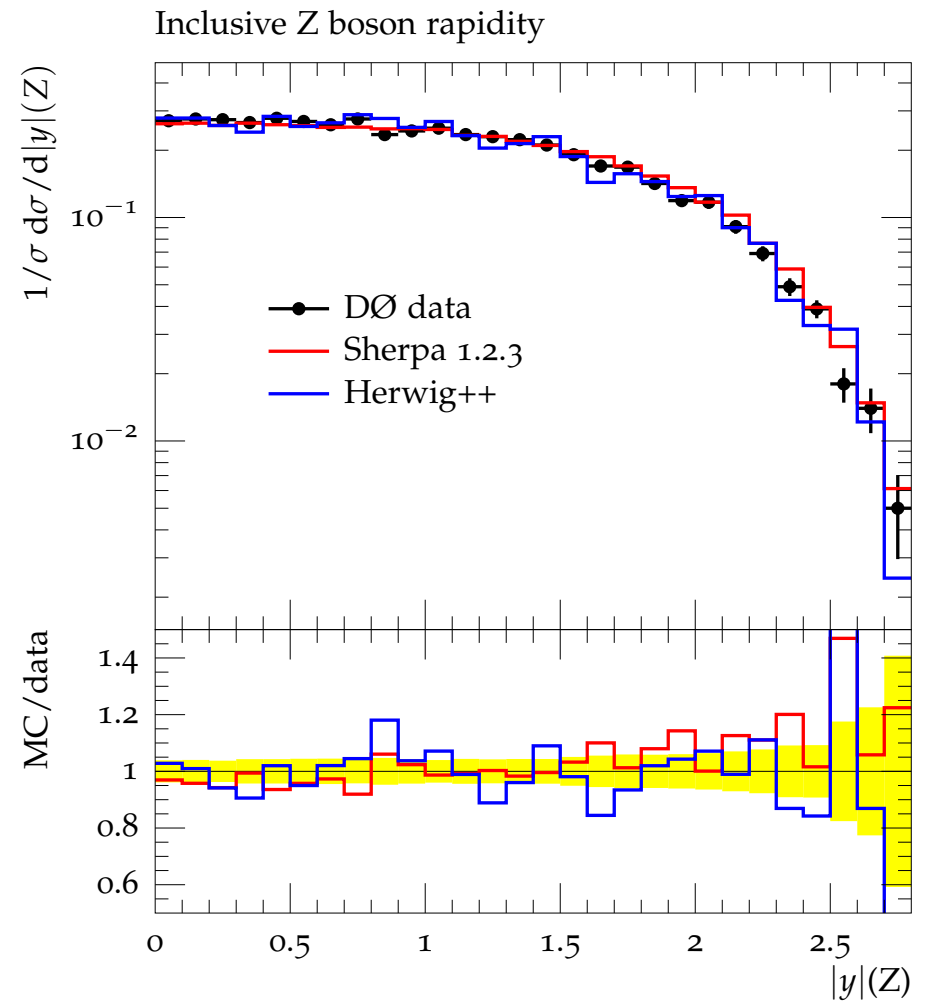
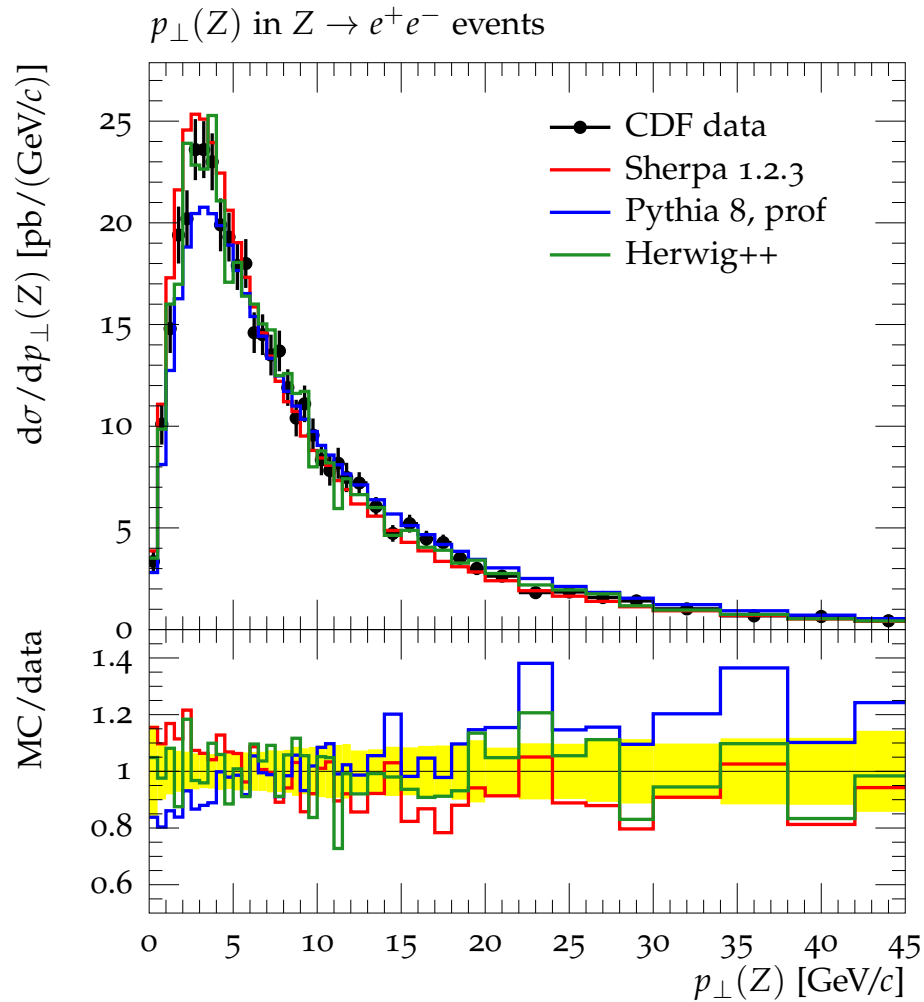
# We want pictures!

On following slides I compare

- Herwig++ 2.5 pre-release, Professor tune
- Sherpa 1.2.3 pre-release with CTEQ6L1, Professor tune
- Pythia 8.145, tune 4C and/or Professor tune

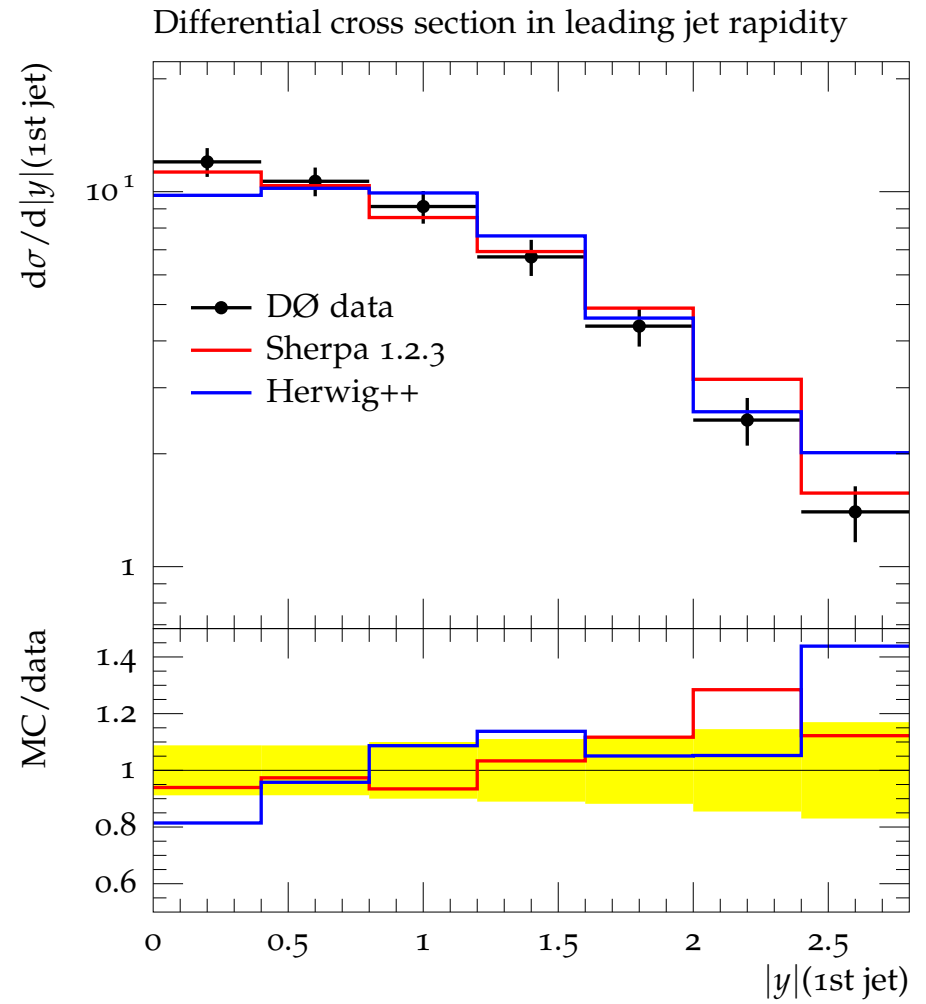
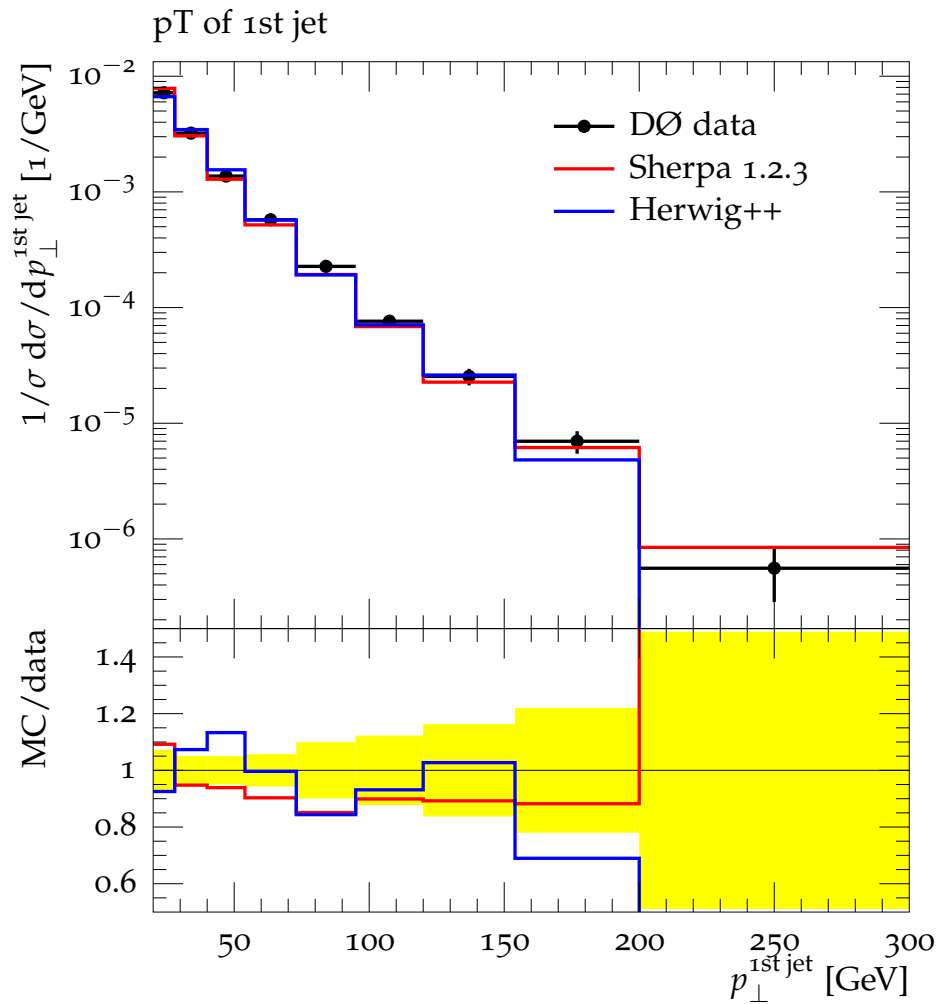
# Z production at Tevatron

hep-ex/0001021, hep-ex/0702025



# Z + jets at Tevatron

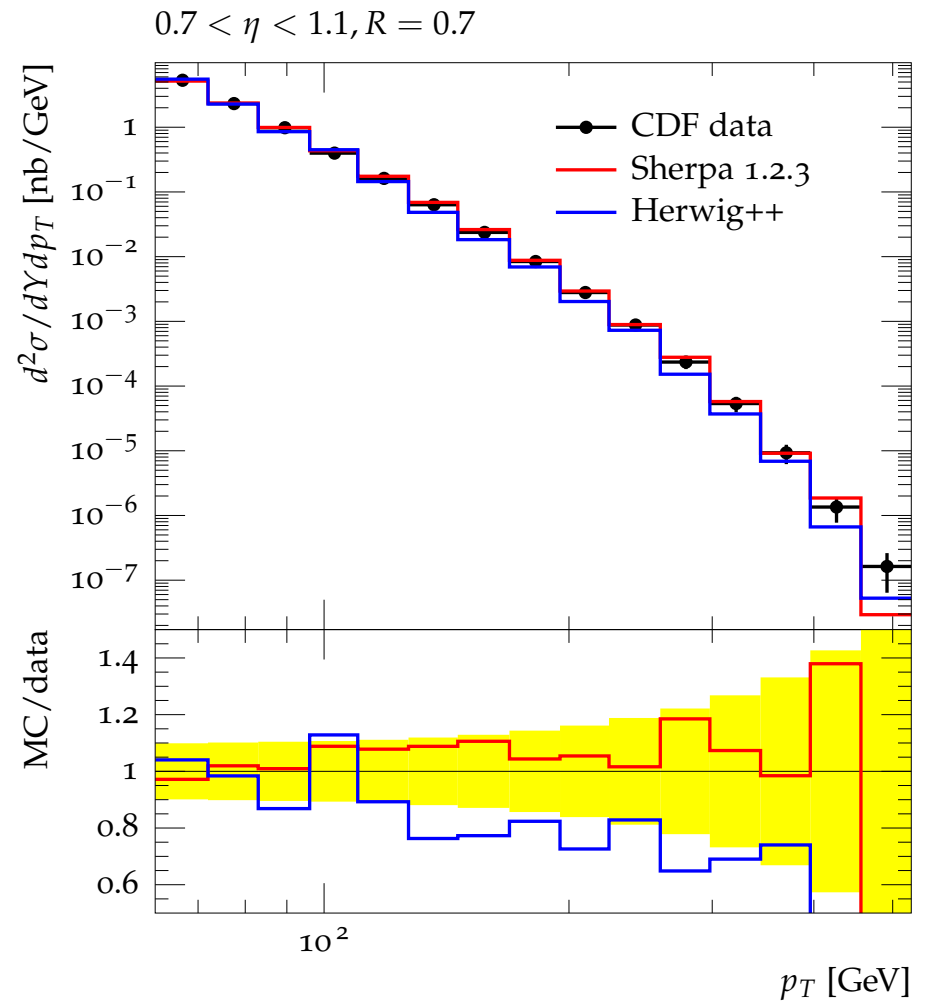
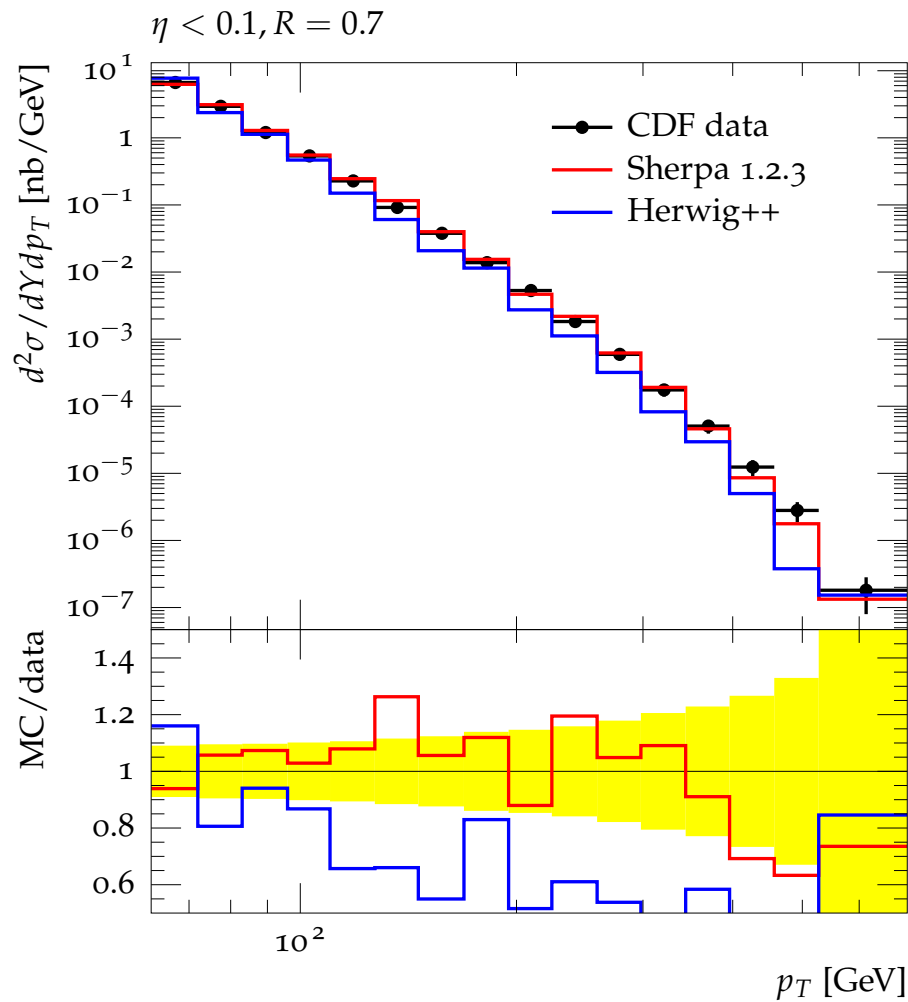
arXiv:0903.1748, arXiv:0808.1296





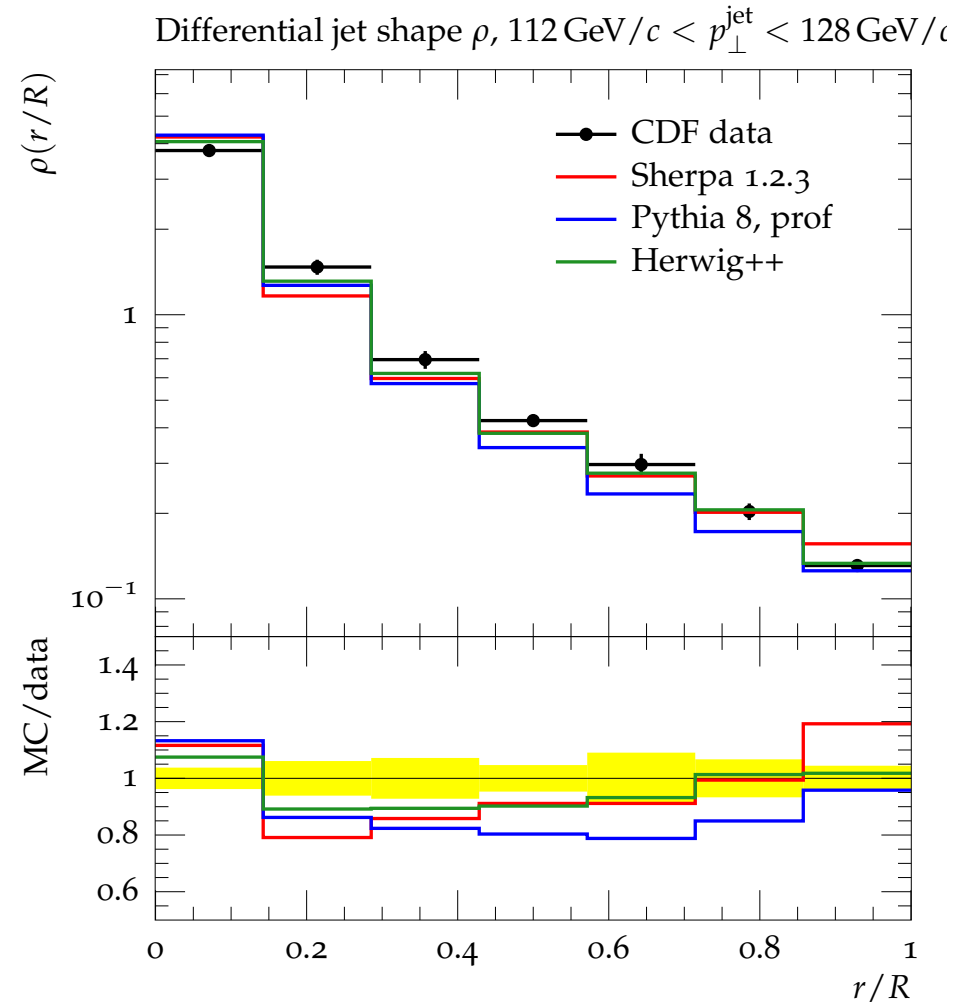
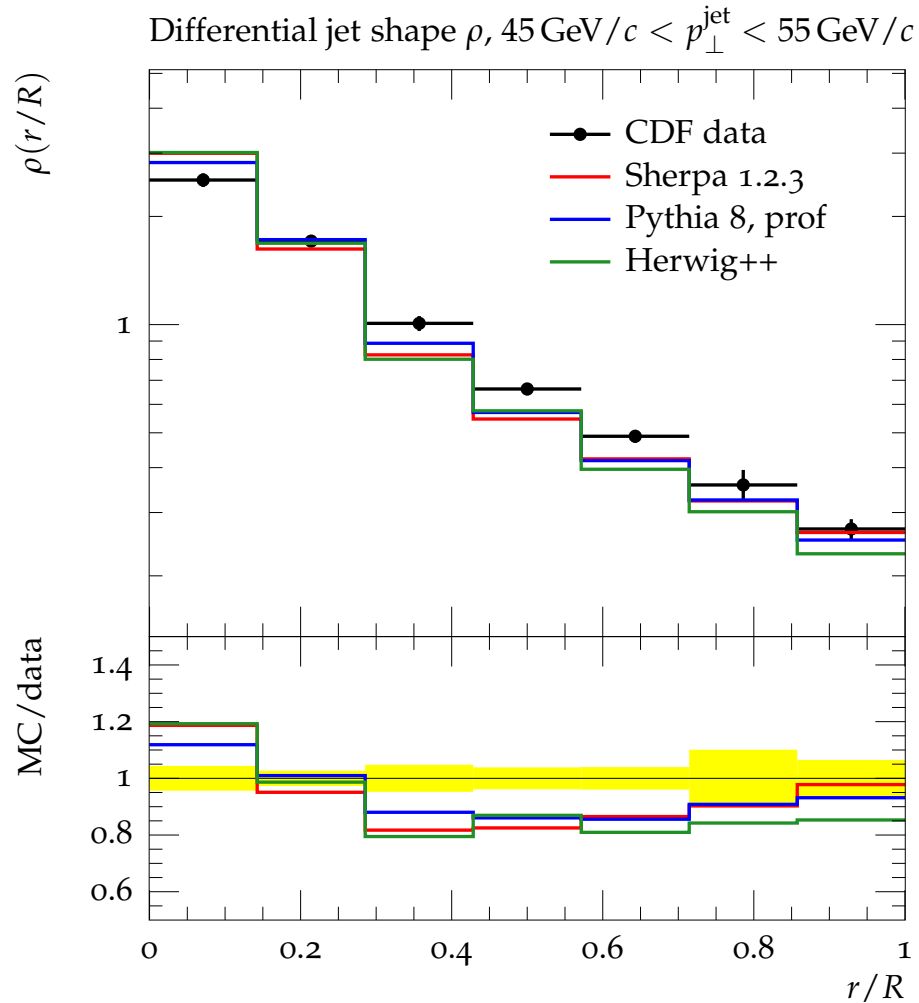
# Inclusive jets at Tevatron

arXiv:0807.2204



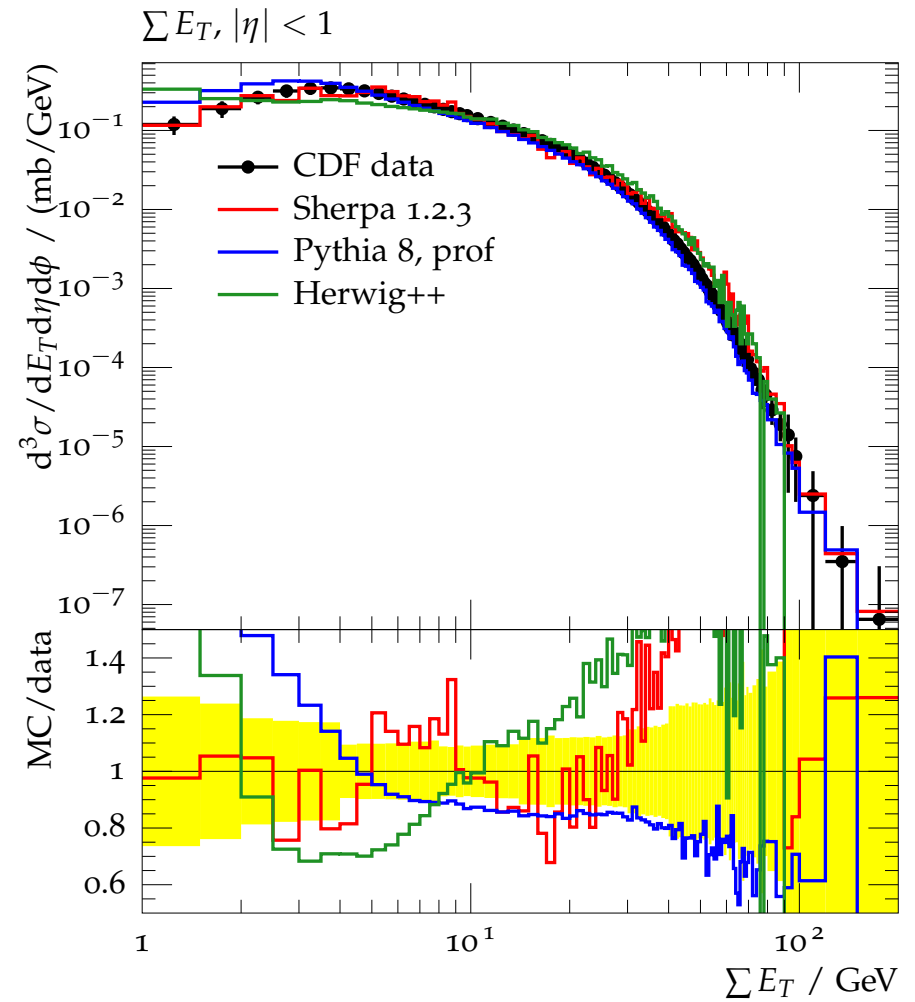
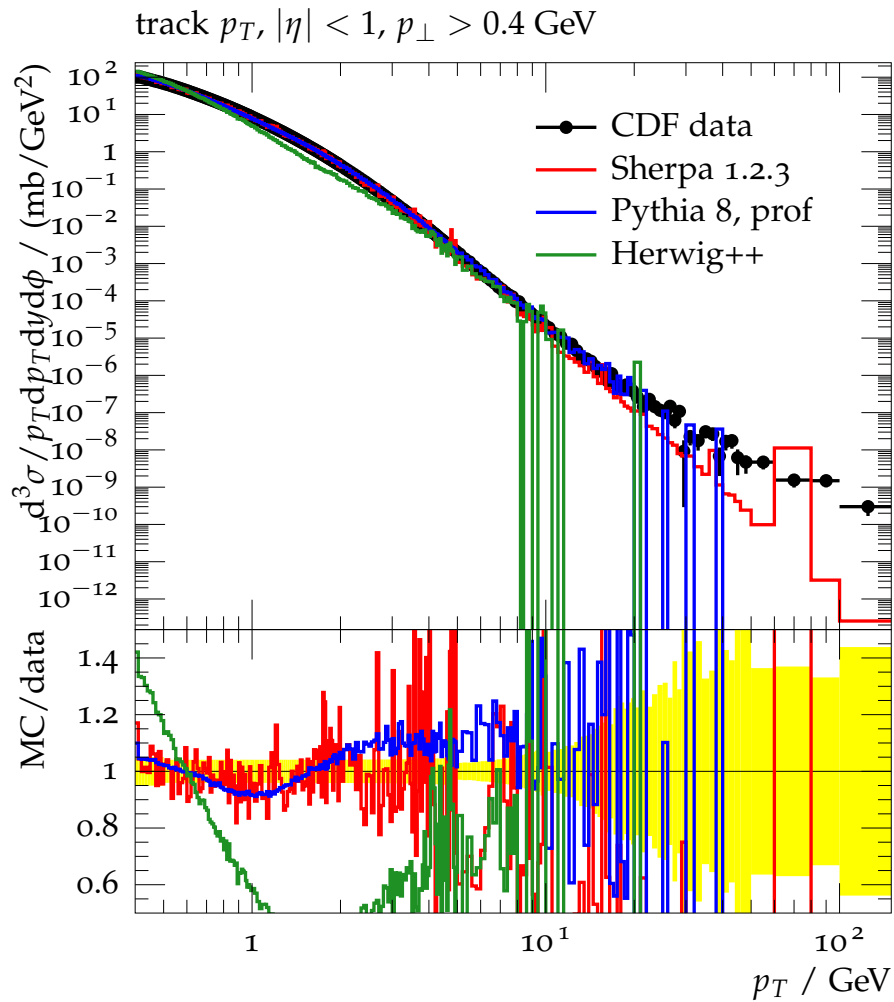
# Jet shapes at Tevatron

hep-ex/0505013



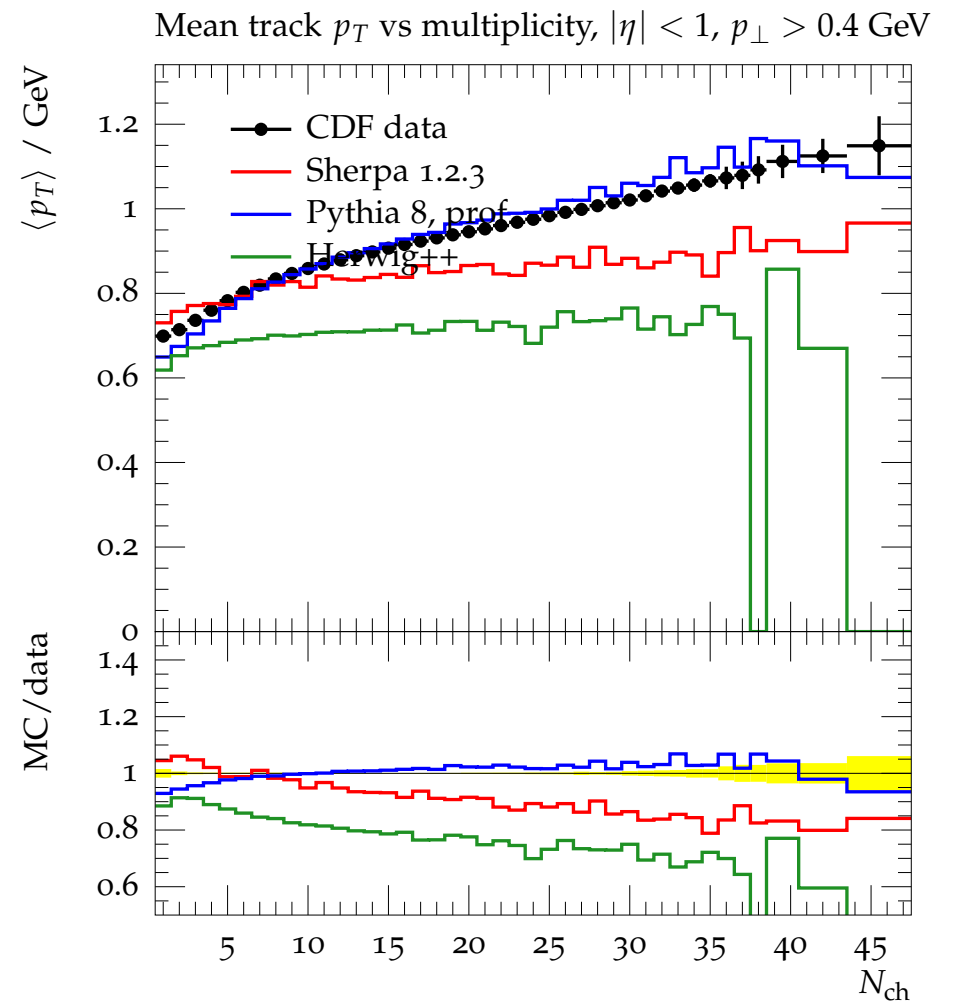
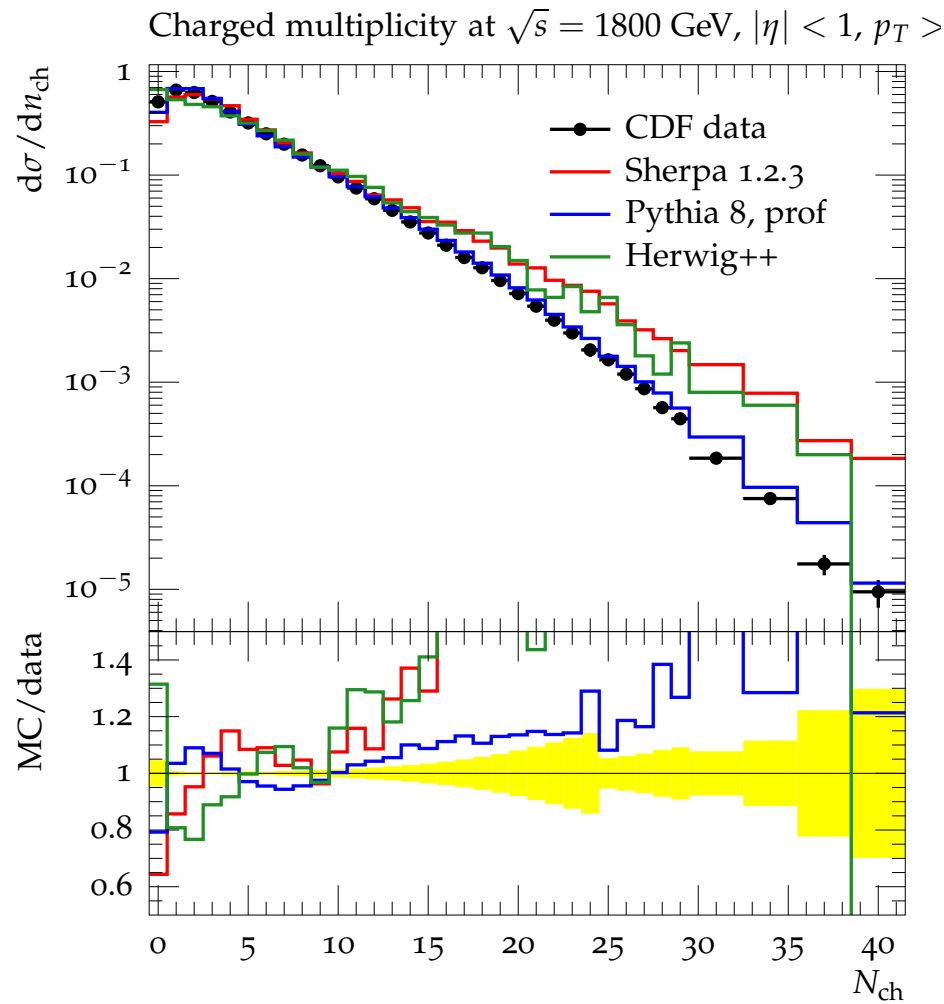
# Minbias at Tevatron

arXiv:0904.1098



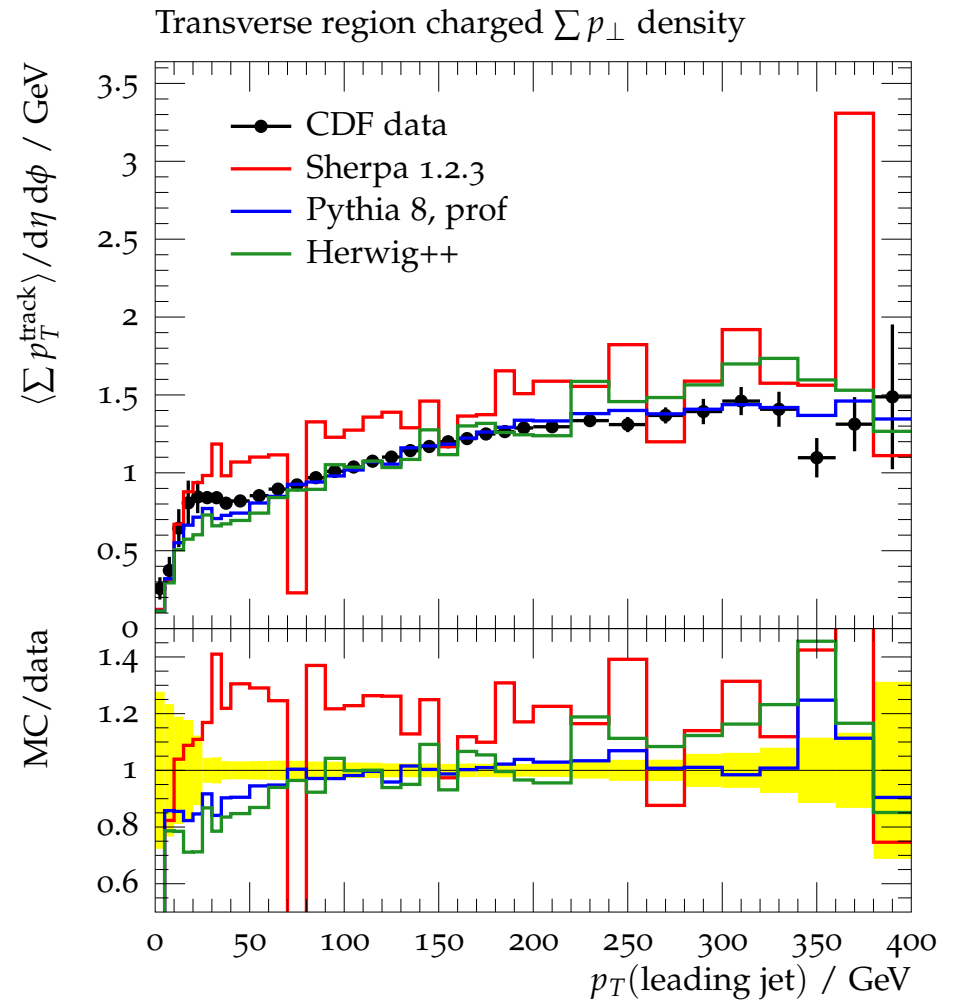
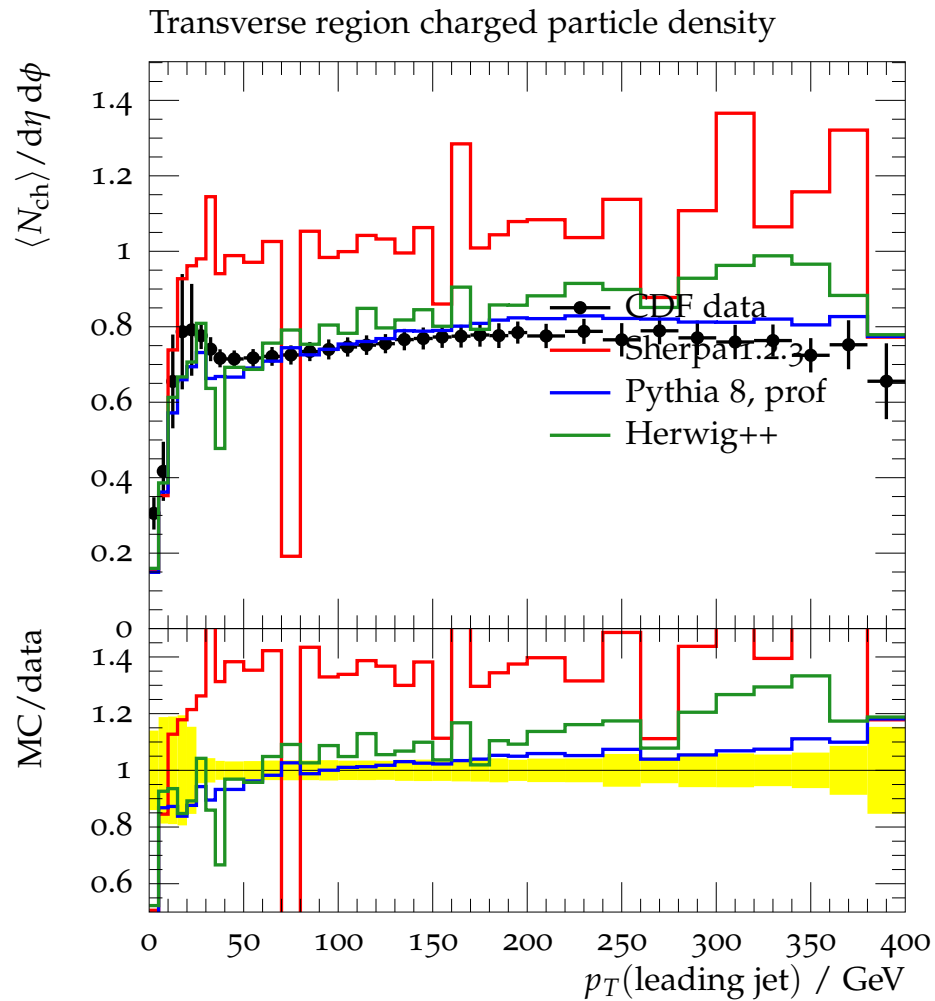
# Minbias at Tevatron

Phys.Rev.D65:072005,2002, arXiv:0904.1098



# UE at Tevatron (jets)

Rick's leading jet UE analysis

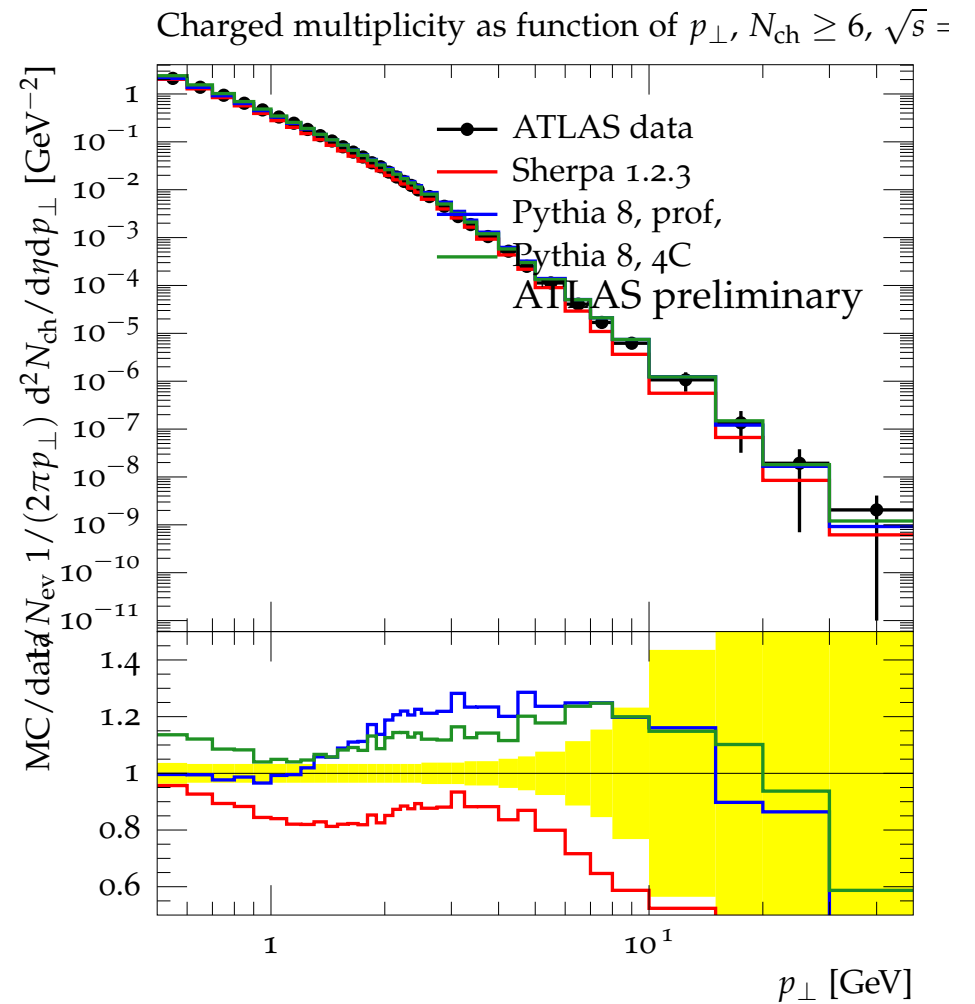
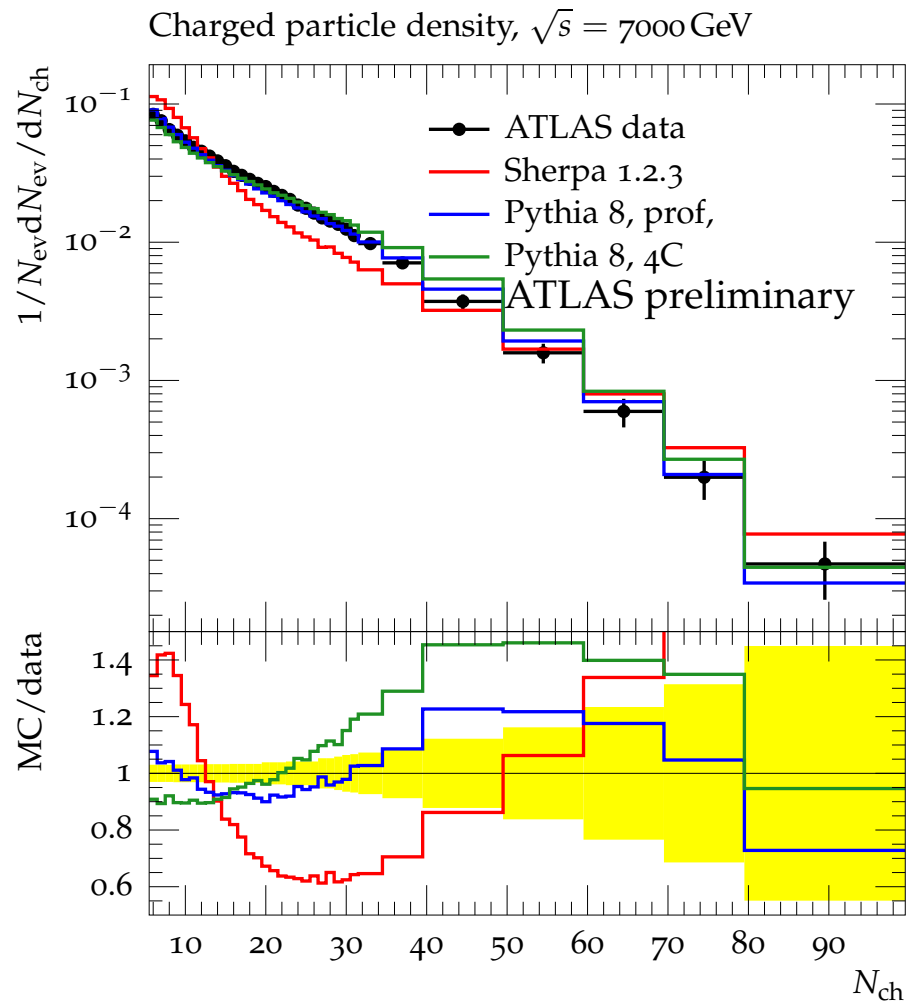


Now let's come to LHC.

Note: All ATLAS data has been read off the plots  
on the ATLAS web page.

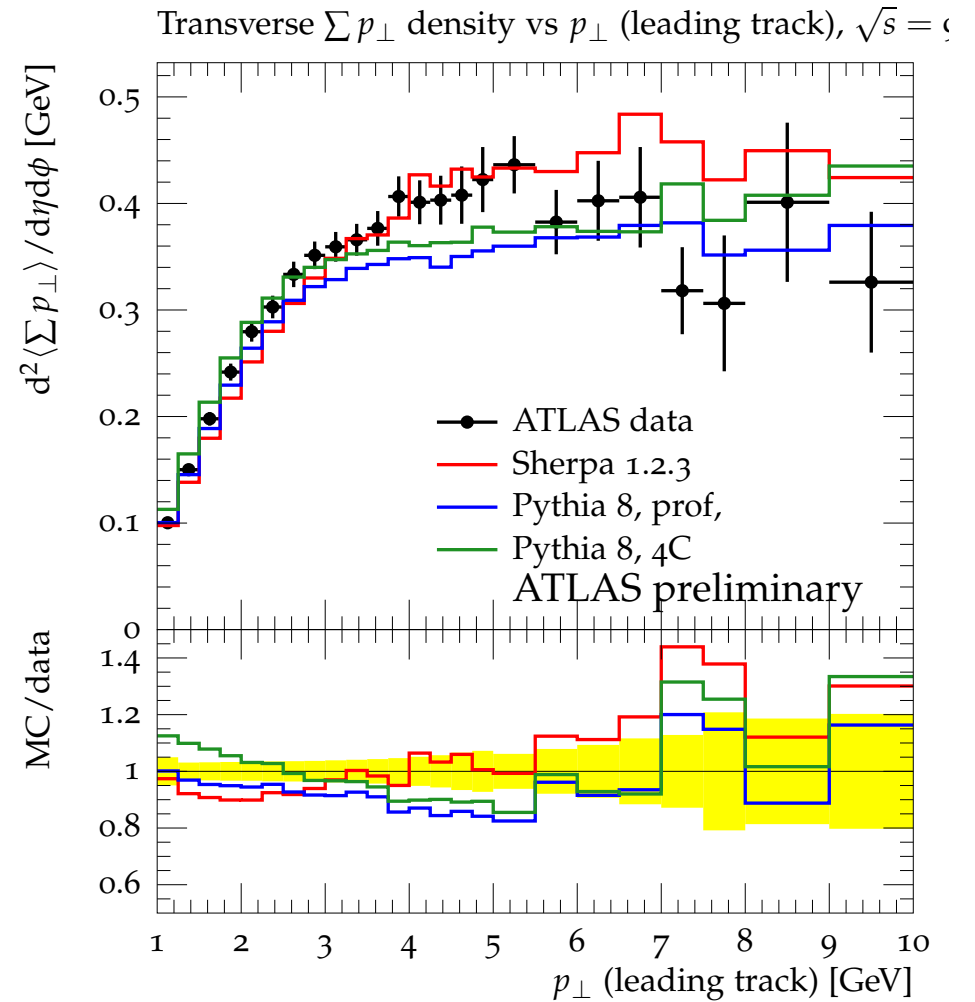
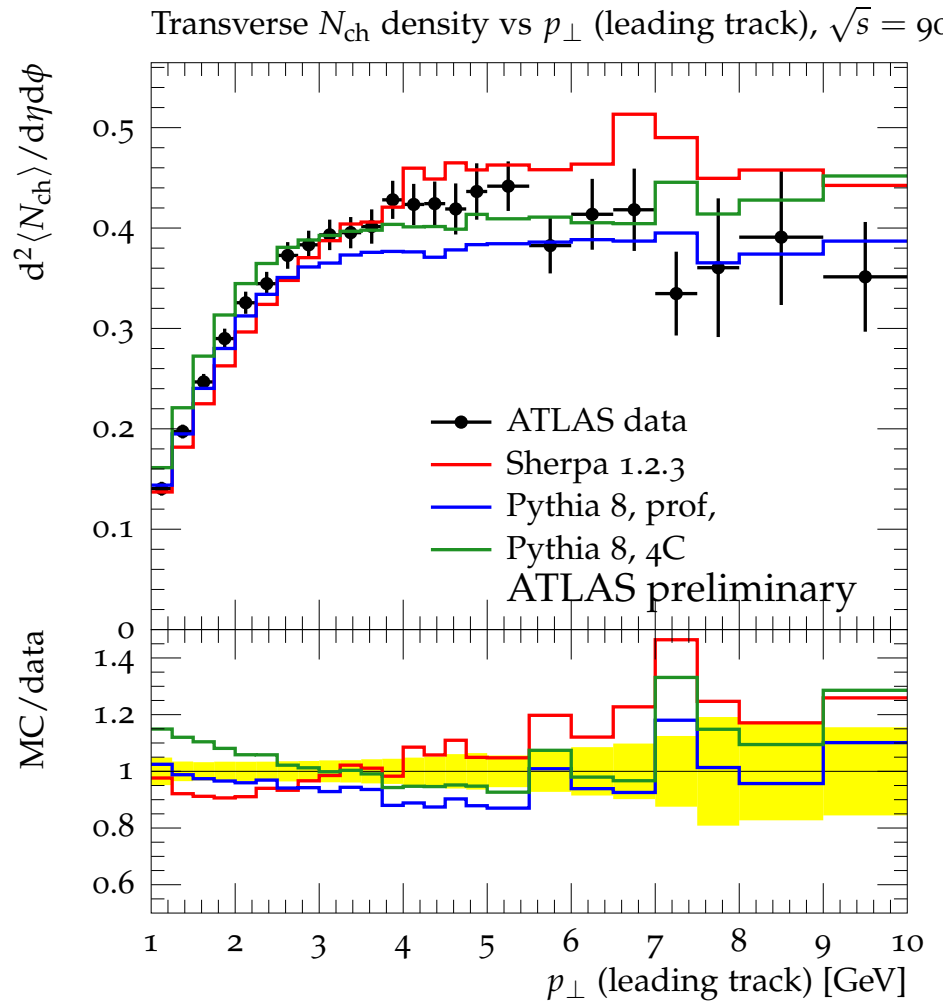
# Minbias at LHC 7000 GeV

ATLAS-CONF-2010-031



# UE at LHC 900 GeV

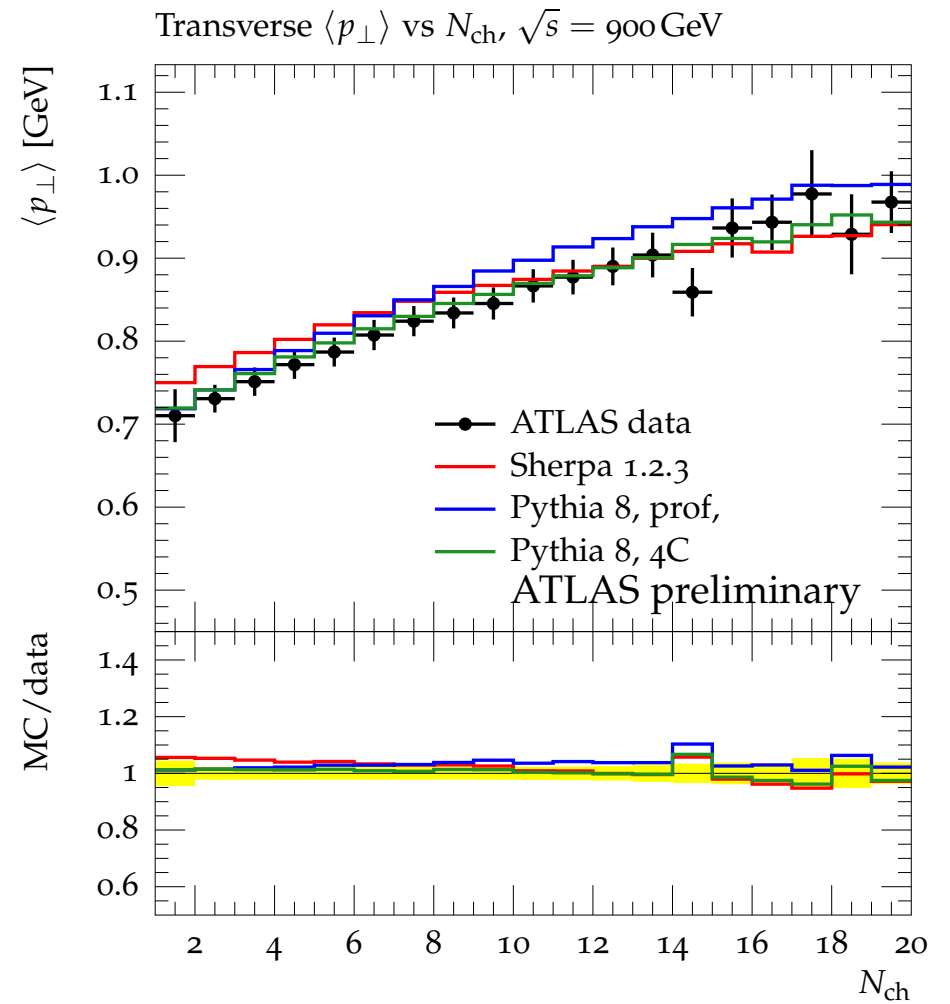
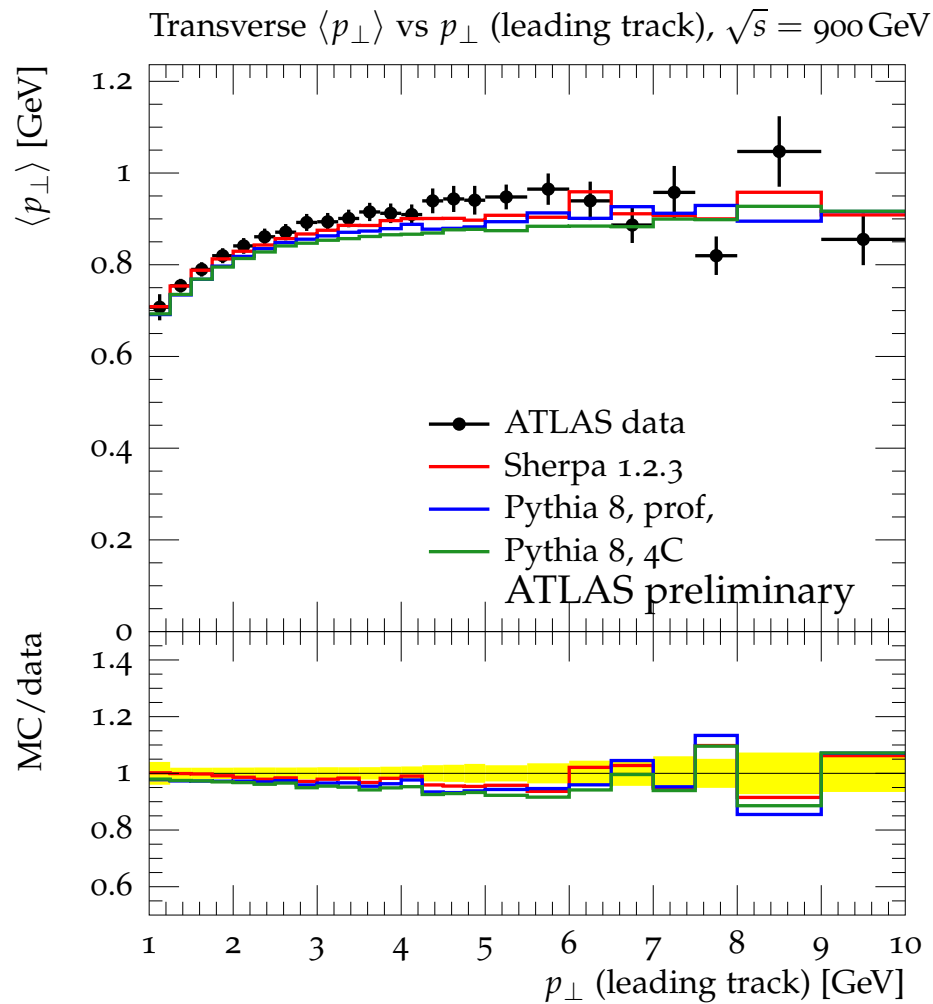
ATLAS-CONF-2010-081





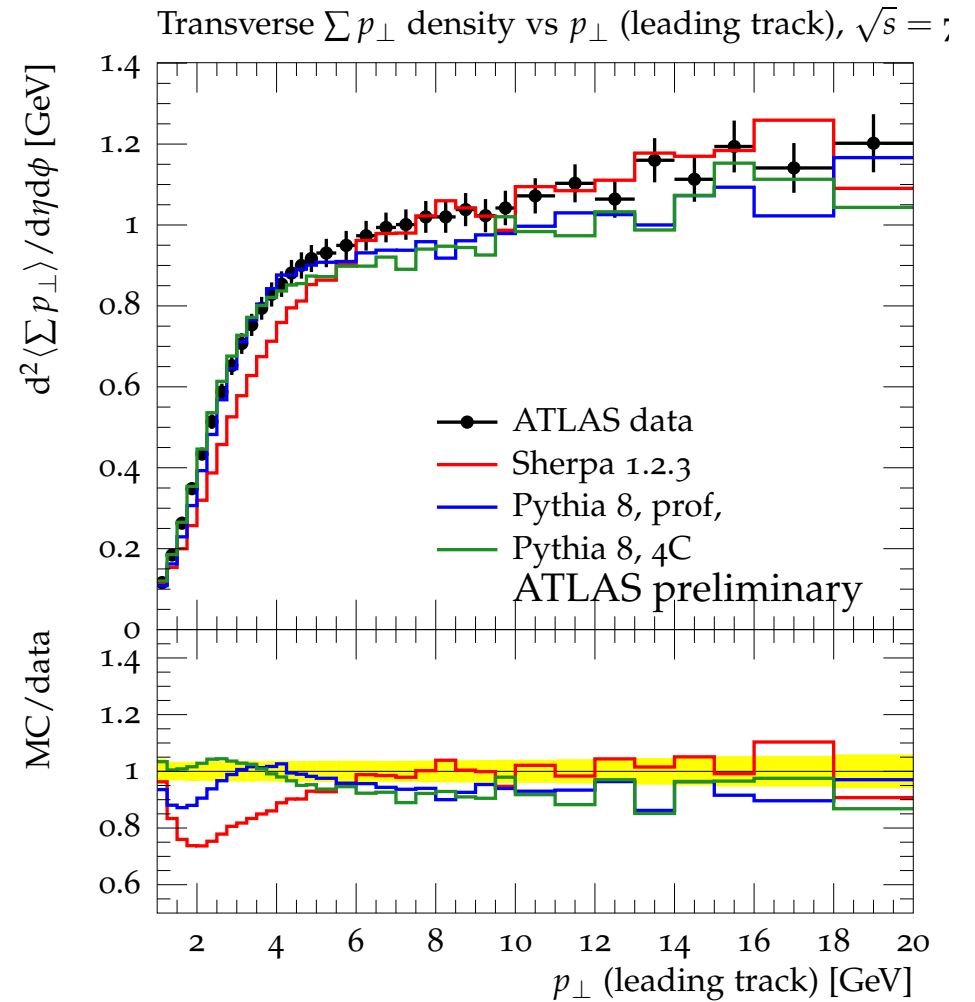
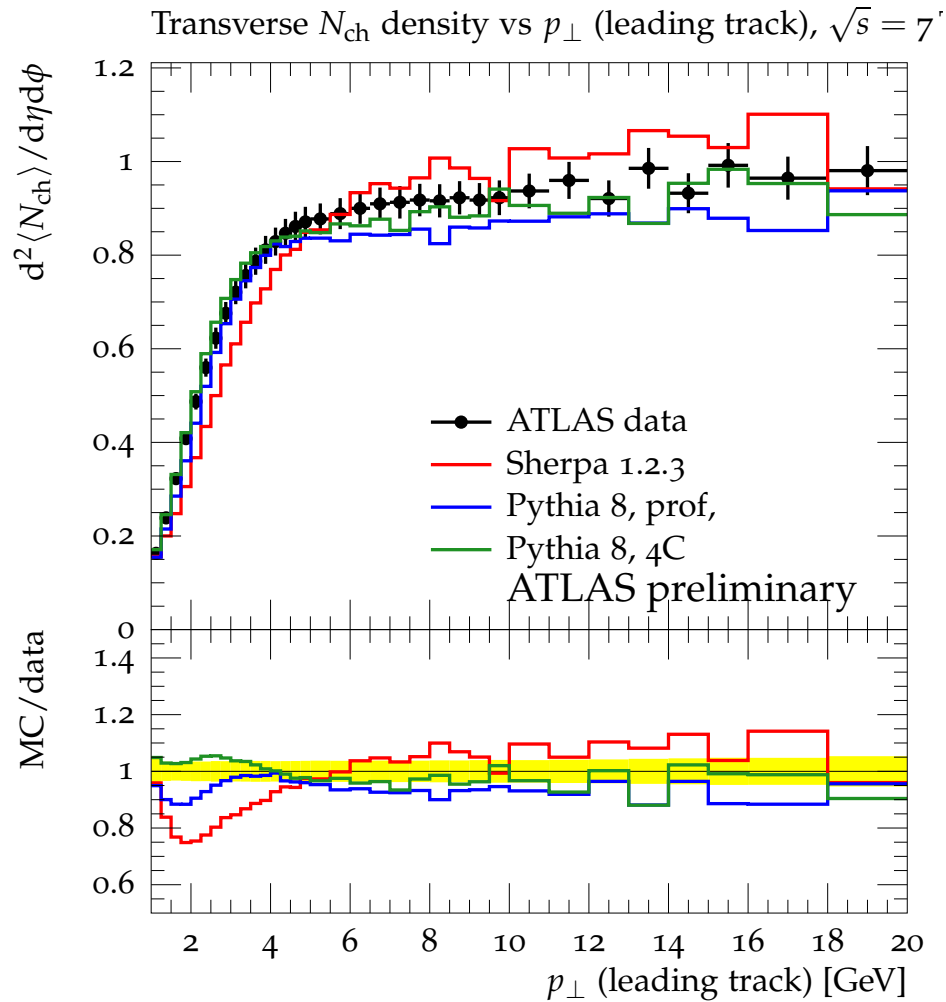
# UE at LHC 900 GeV

ATLAS-CONF-2010-081



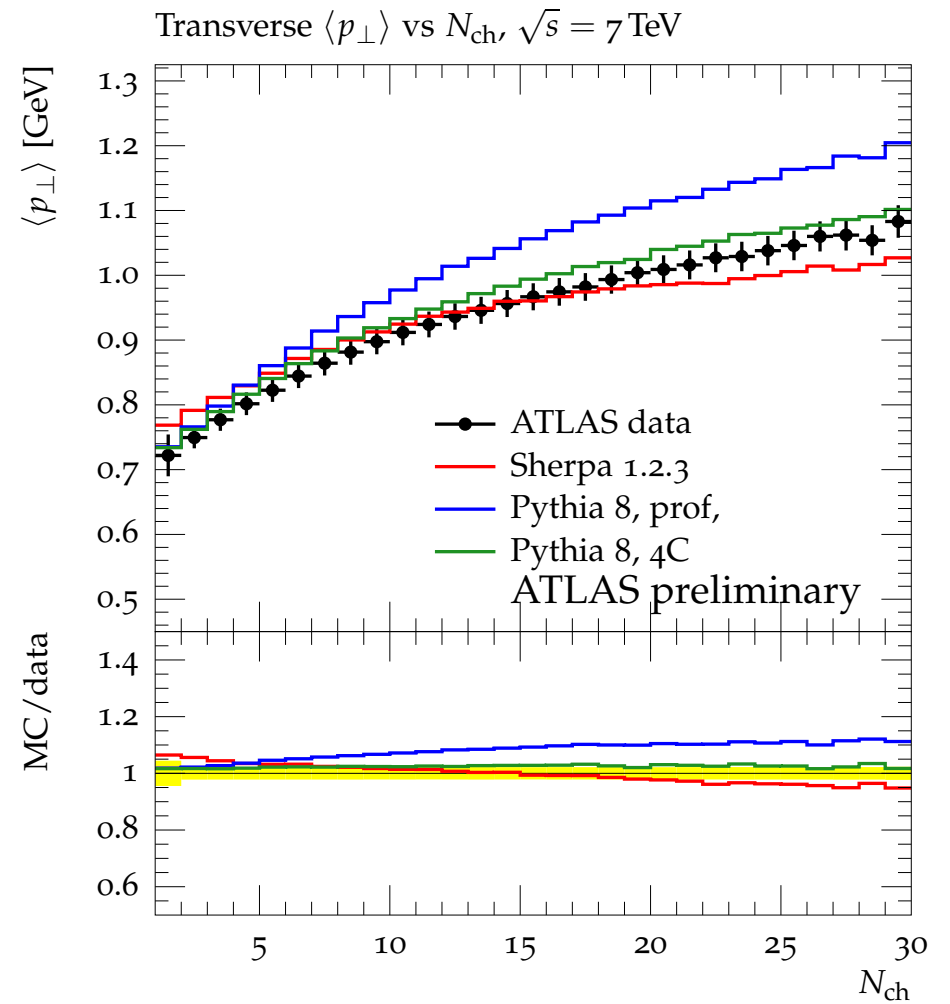
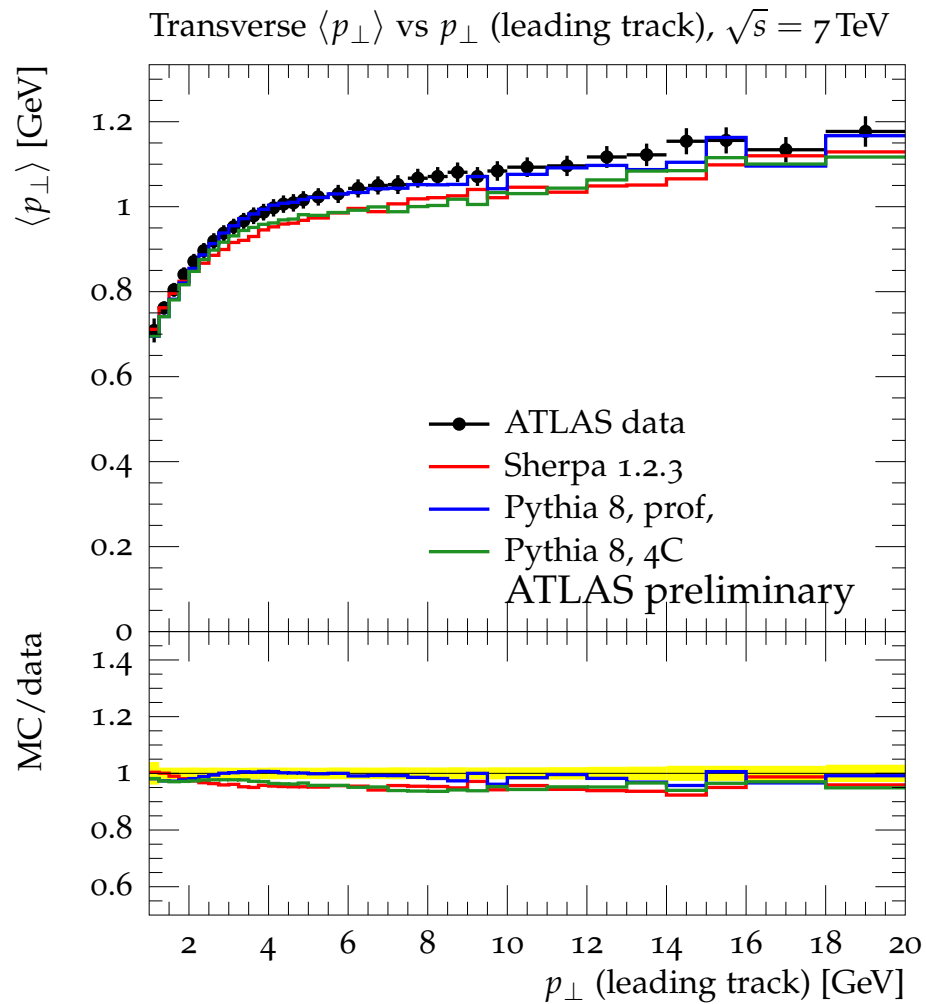
# UE at LHC 7000 GeV

ATLAS-CONF-2010-081



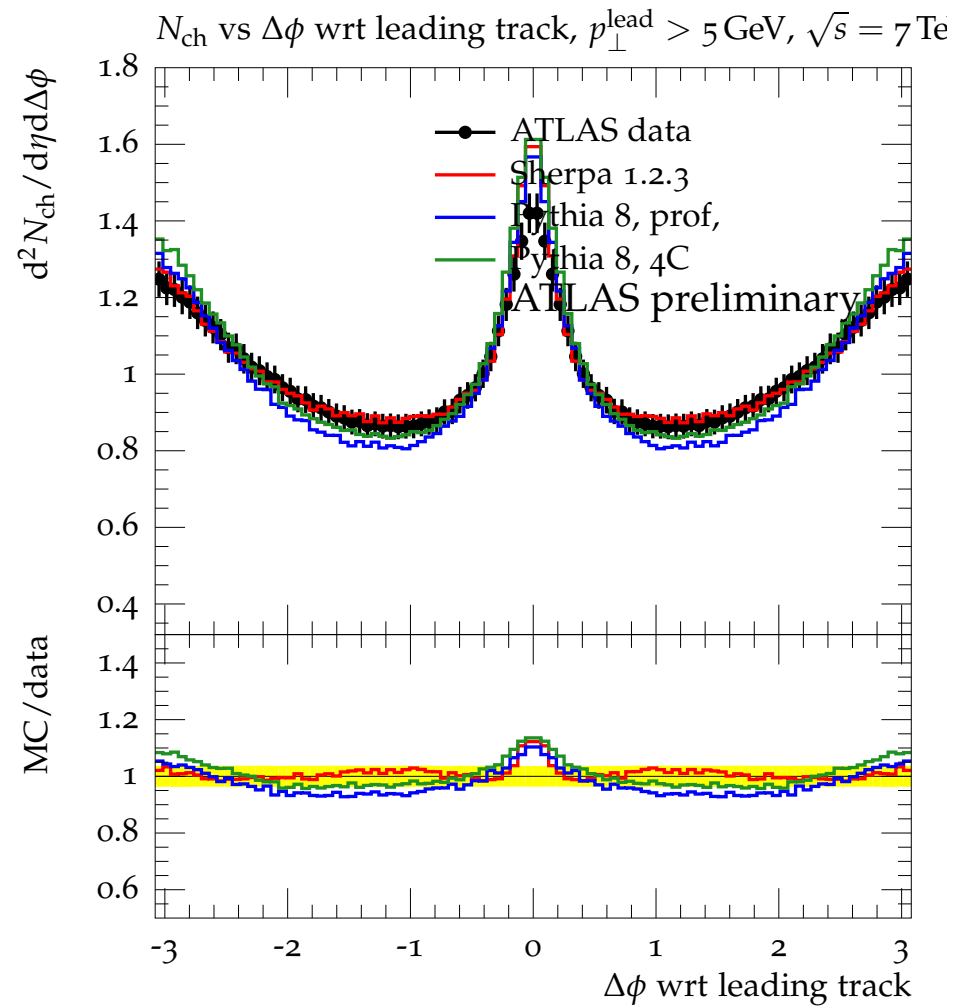
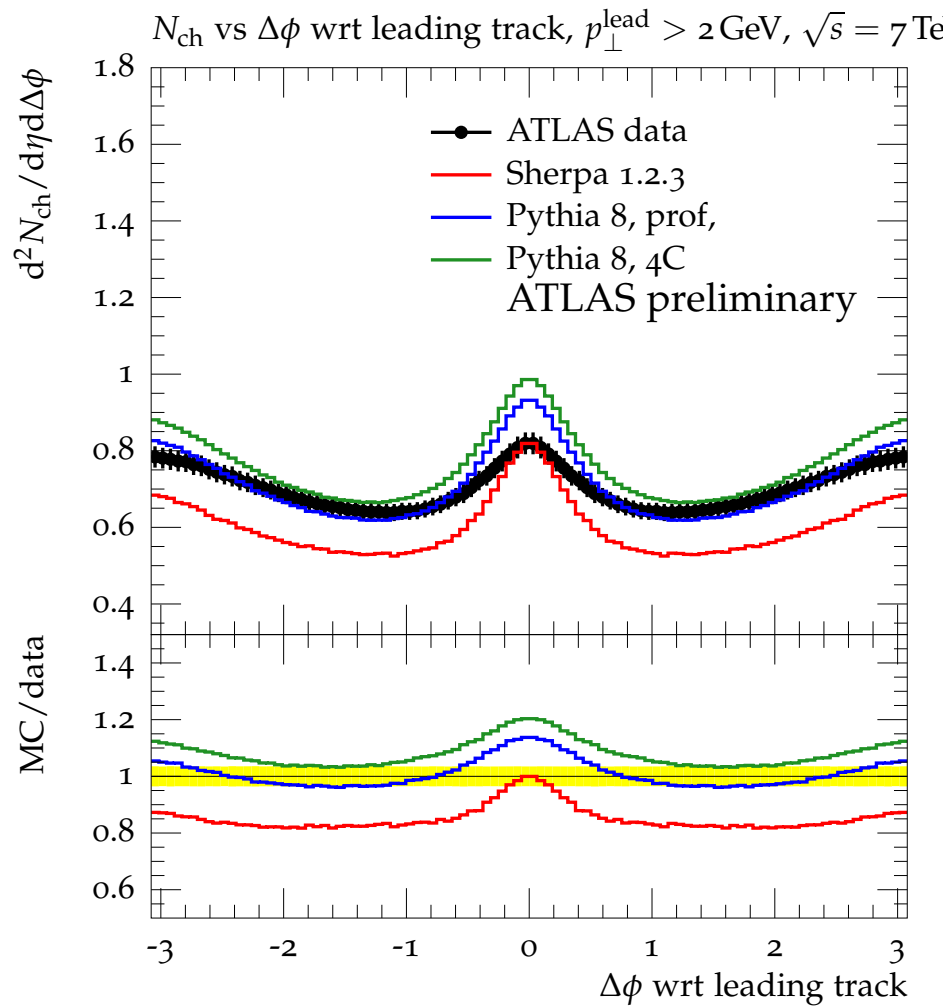
# UE at LHC 7000 GeV

ATLAS-CONF-2010-081



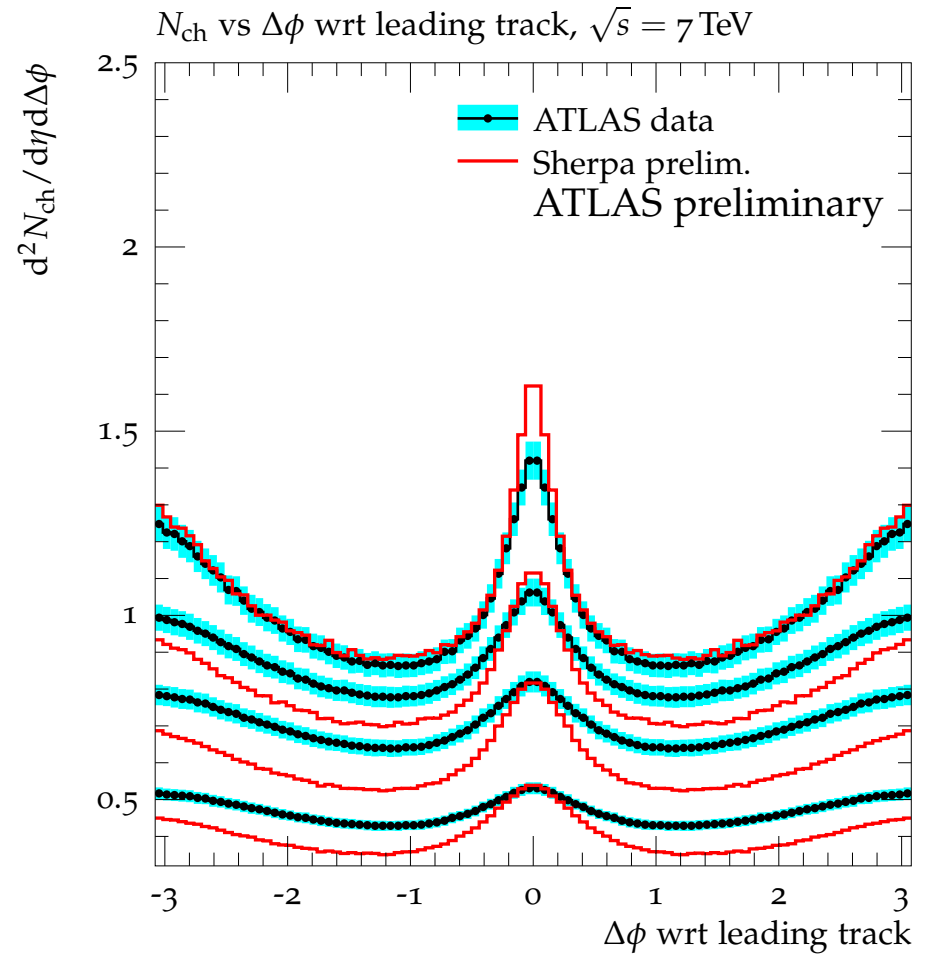
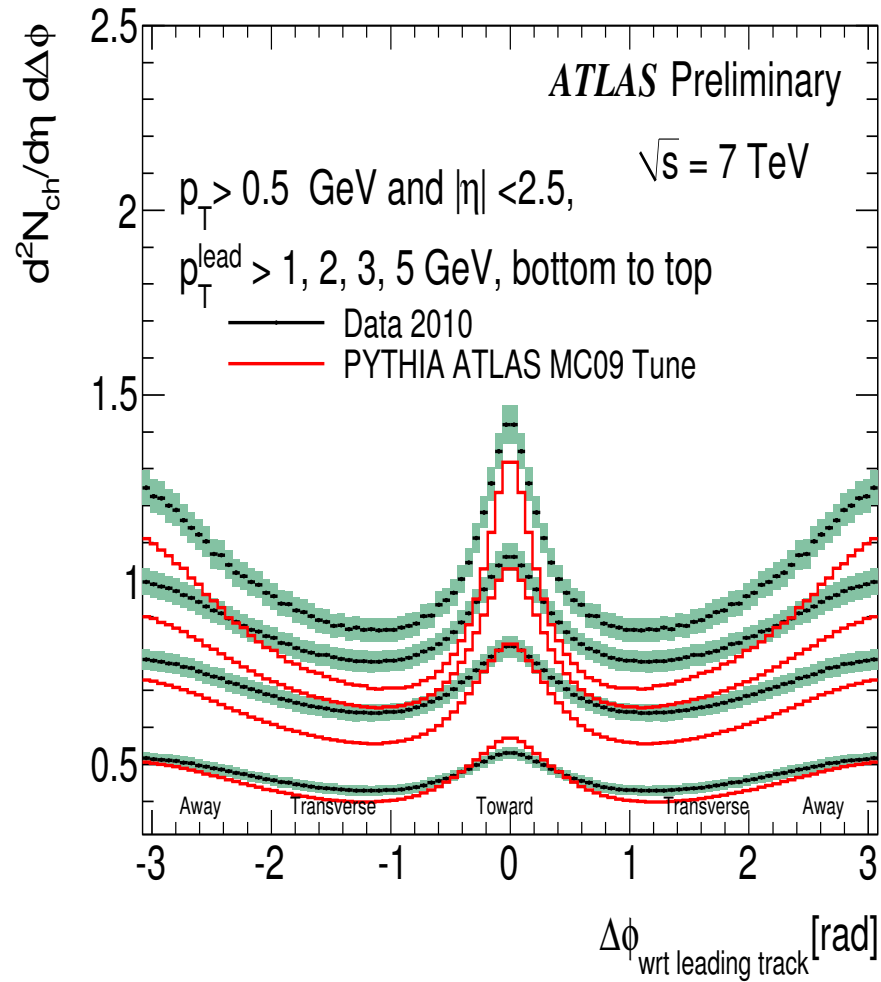
# UE at LHC 7000 GeV

ATLAS-CONF-2010-081



# UE at LHC 7000 GeV

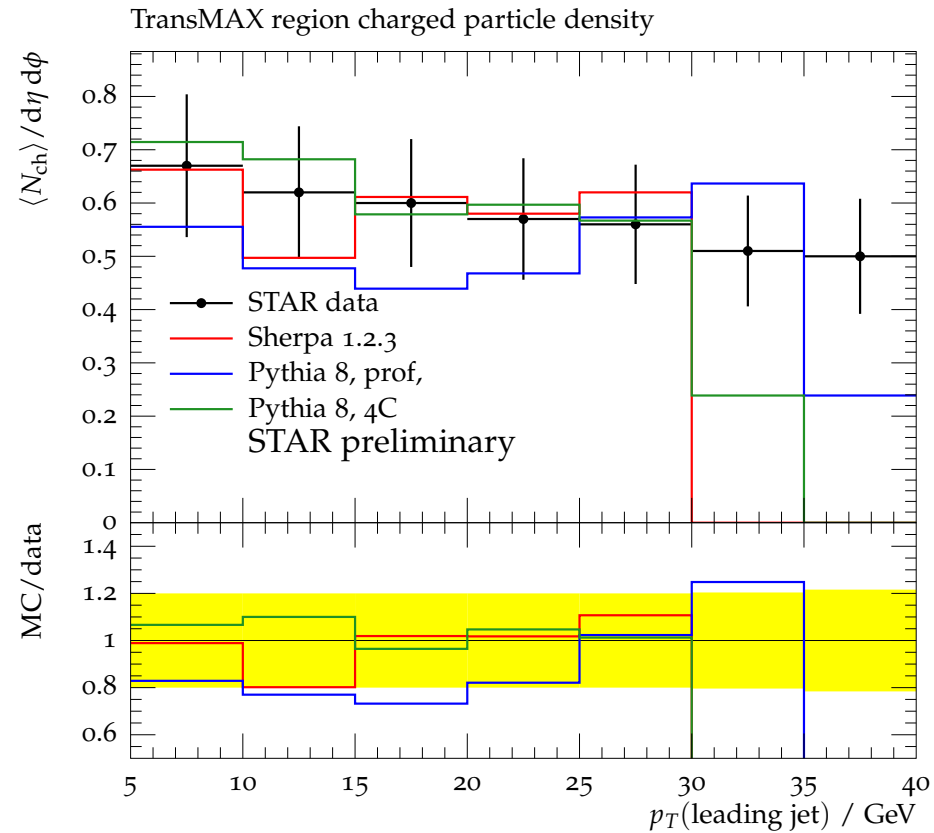
ATLAS-CONF-2010-081 – left plot taken from ATLAS note



Mythbusters proudly present: STAR  $pp$  at 200 GeV

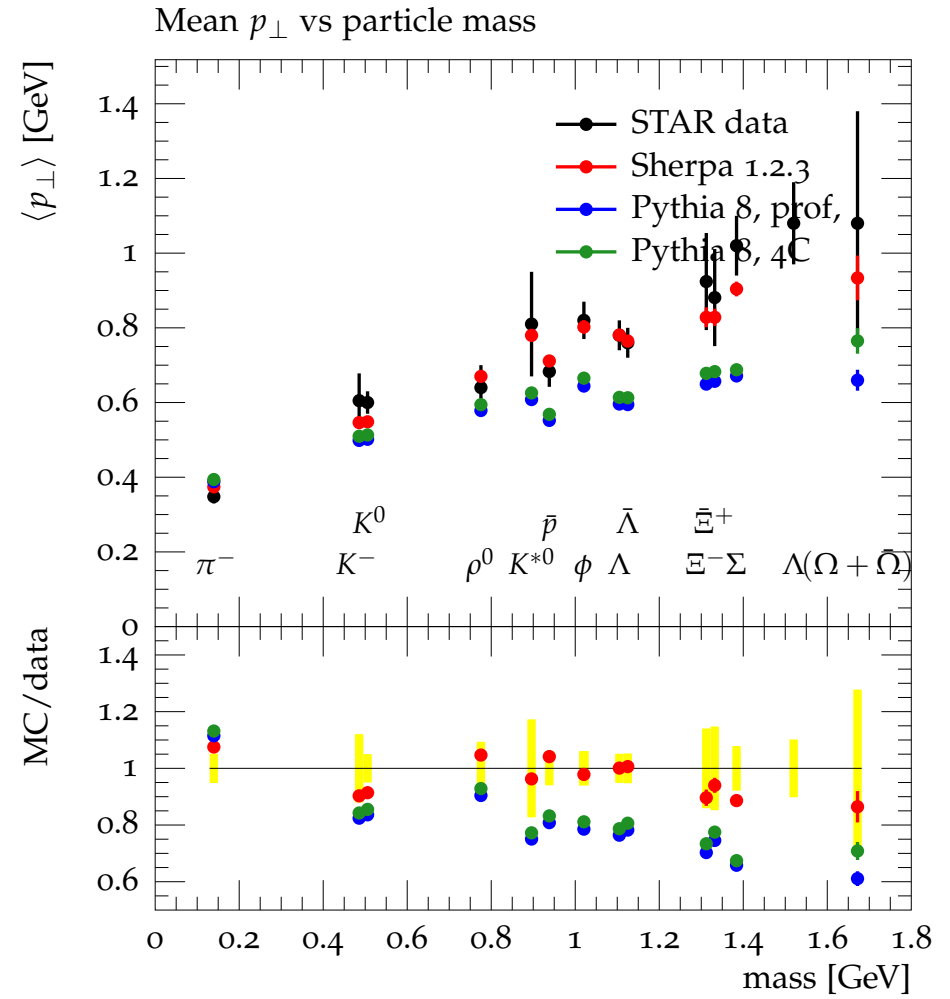
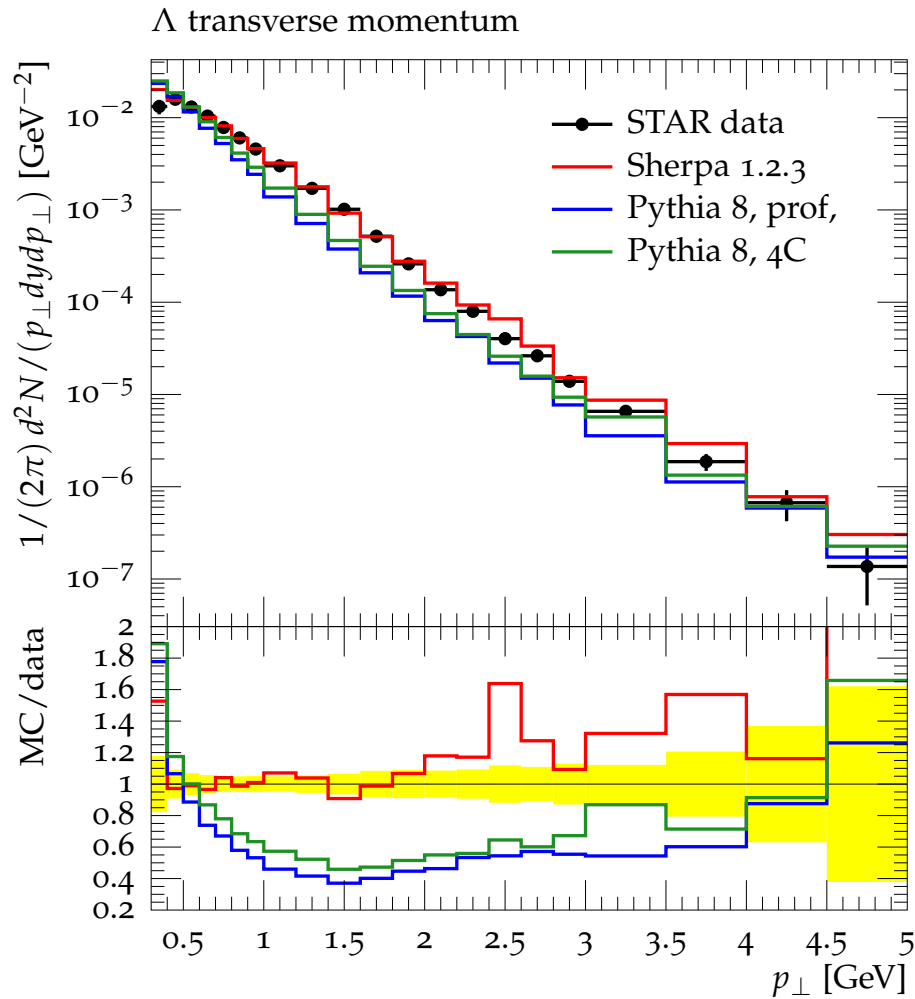
# UE at RHIC 200 GeV $pp$

arXiv:0910.5203, arXiv:0907.3460



# Strangeness at RHIC 200 GeV $pp$

Phys. Rev. C75, 064901





# Summary

- The new generation of generators is ready for production. Try them. There is no point in tuning Pythia 6 to death.
- The models available today are better than people think.
- The truth isn't always simple – we need to understand why some models/tunes show a tension between Tevatron and LHC, but it's not impossible to resolve. Same for strangeness.
- Experimentalists and MC authors depend on each other – mutually! Let's talk.