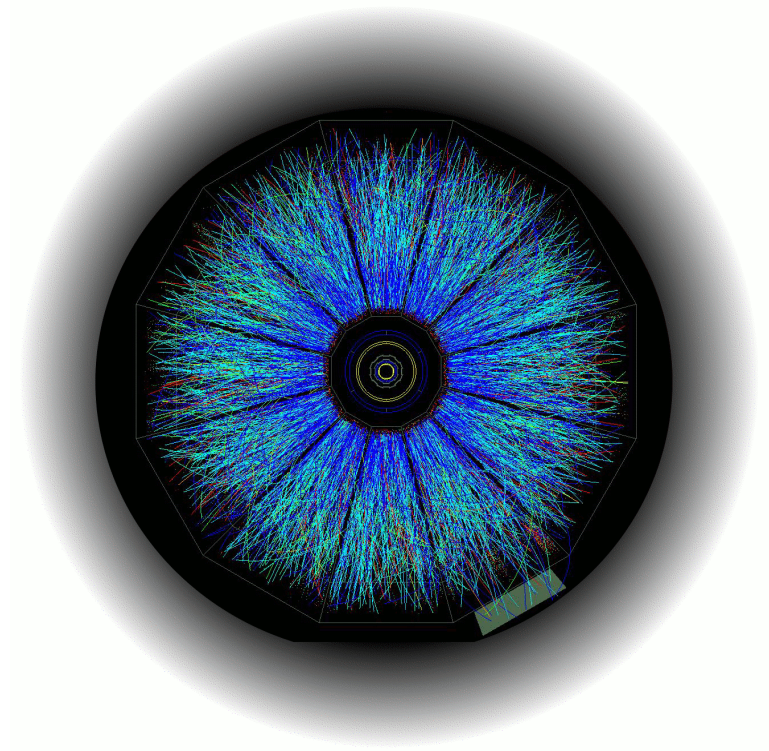# Simulating minimum bias events

# Status report

**DESY – ATLAS – Meeting**

**28.01.2008**

# Overview

- Comparing different Generators for minimum bias.

- Comparing local versions of PHOJET and PYTHIA with the ATHENA 13.0.30 versions.

- Summary

- Outlook

# Comparing different generators

I compared six different MC-generators.

PHOJET, PYTHIA, DPMJET III, NEXUS, QGSJET 01 and SYBILL

Because one can not separate single diffractive from double diff. without bias, I used the nsd-tuning and switched the single diff. processes on.

PHOJET: with processes 1,4,5,6,7 (nd, dpom, sd1, sd2, dd).

PYTHIA: nsd tuning, but with single diff. on.

The other generators had all processes on (I only got data files).
These generators are normally used to simulate cosmic events.
Here they were tuned to LHC - parameters.

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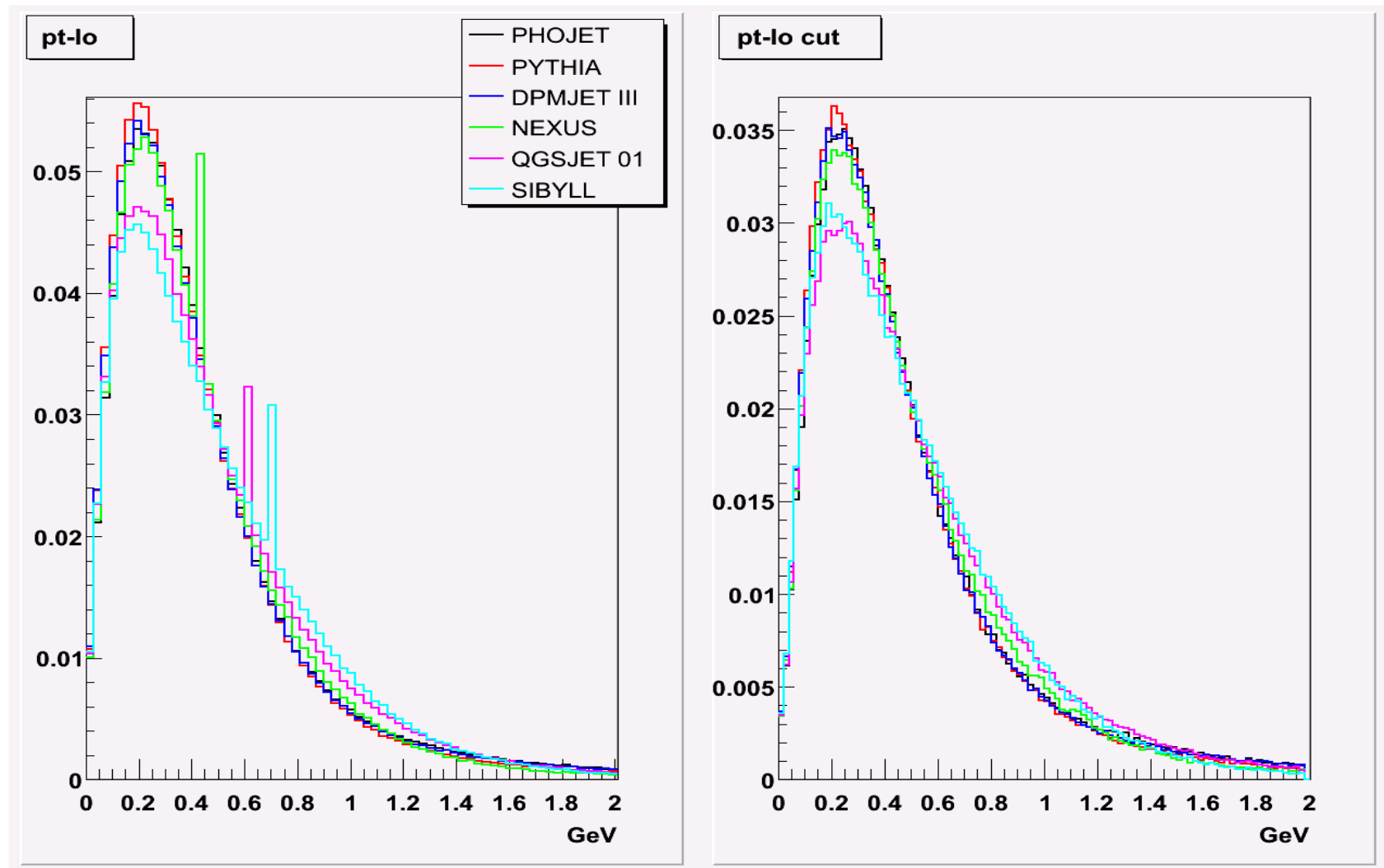PYTHIA: nsd tuning, but with single diff. on.

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# Comparing different generators

Pt-distribution normalized by the integral over the distribution.
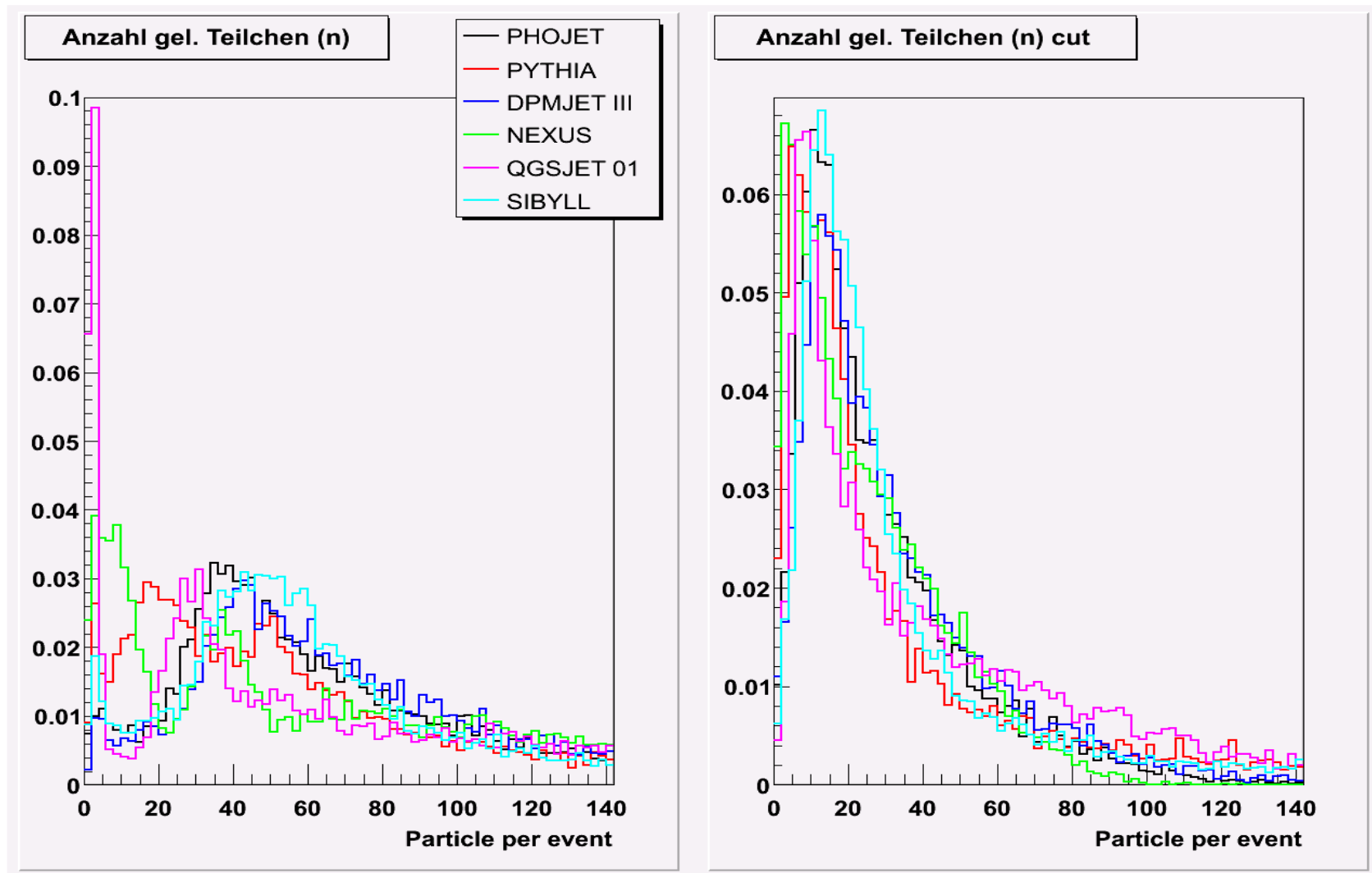
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# Comparing different generators

Charged particle distribution normalized by <n>.

Cut means, only particles with -2.5 < eta < 2.5 count.

# Comparing different generators

The huge differences between the generators gets much smaller, if one looks only for particles in the inner detector.

Nevertheless, the cosmic generators are not well documented and in an early development state.

In my work I will first concentrate to create minimum bias events with PYTHIA and PHOJET.

# Local vs. ATHENA

To be sure that both versions (ATHENA 13.0.30 and STANDALONE) of PYTHIA and PHOJET do the same, I compared different MC – runs.

Here I only show examples with minimum bias tuning.

To analyze the generator output I get myself deeper in to ATHENA and had some problems with the histogramming.

After I solved the histogramming I found that there is a pt-cut off at 400MeV in the standard CBNT_Truth-file.

Also unstable particles are filled in the histograms.

So one has to edit the CBNT_Truth-file.

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## PHOJET:

The implemented PHOJET version in ATHENA 13.030 is not really "tunable", so one has to make a patch to solve this problem.
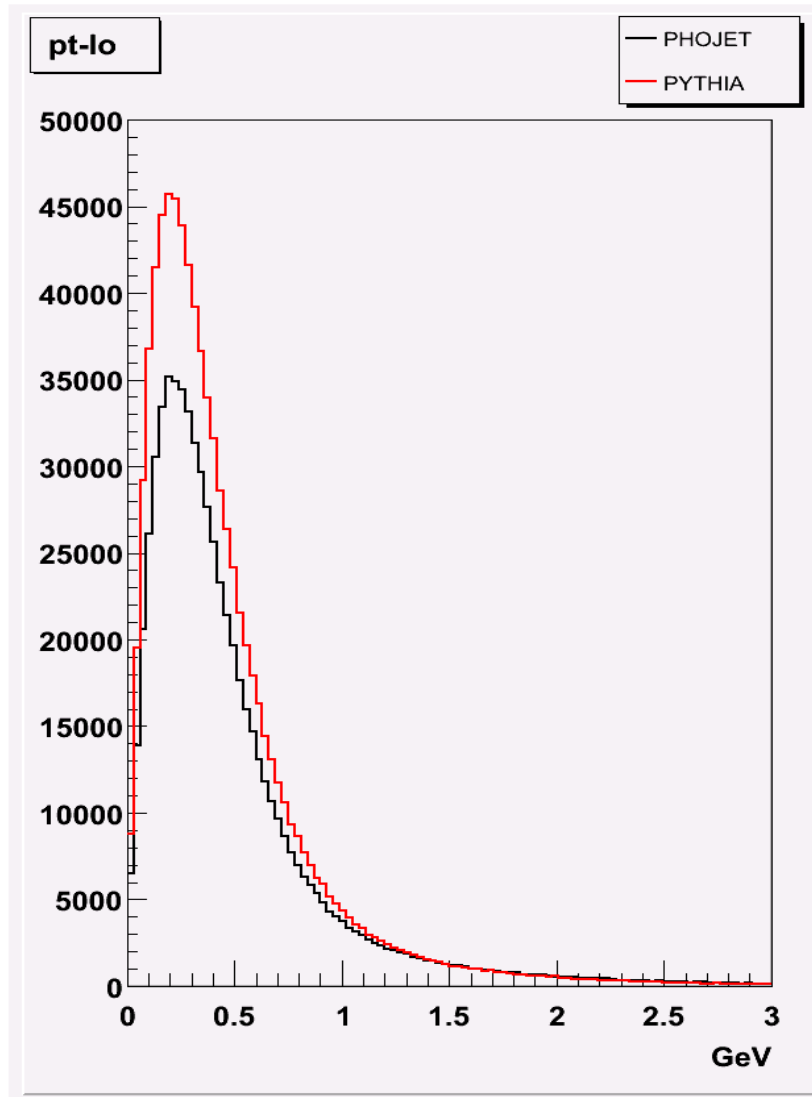
If one tries to produce only the double pomeron process(4) with PHOJET in ATHENA, the generator crashes.

Comparing of the cross-sections shows that process(4) is generated in the minimum bias tuning.
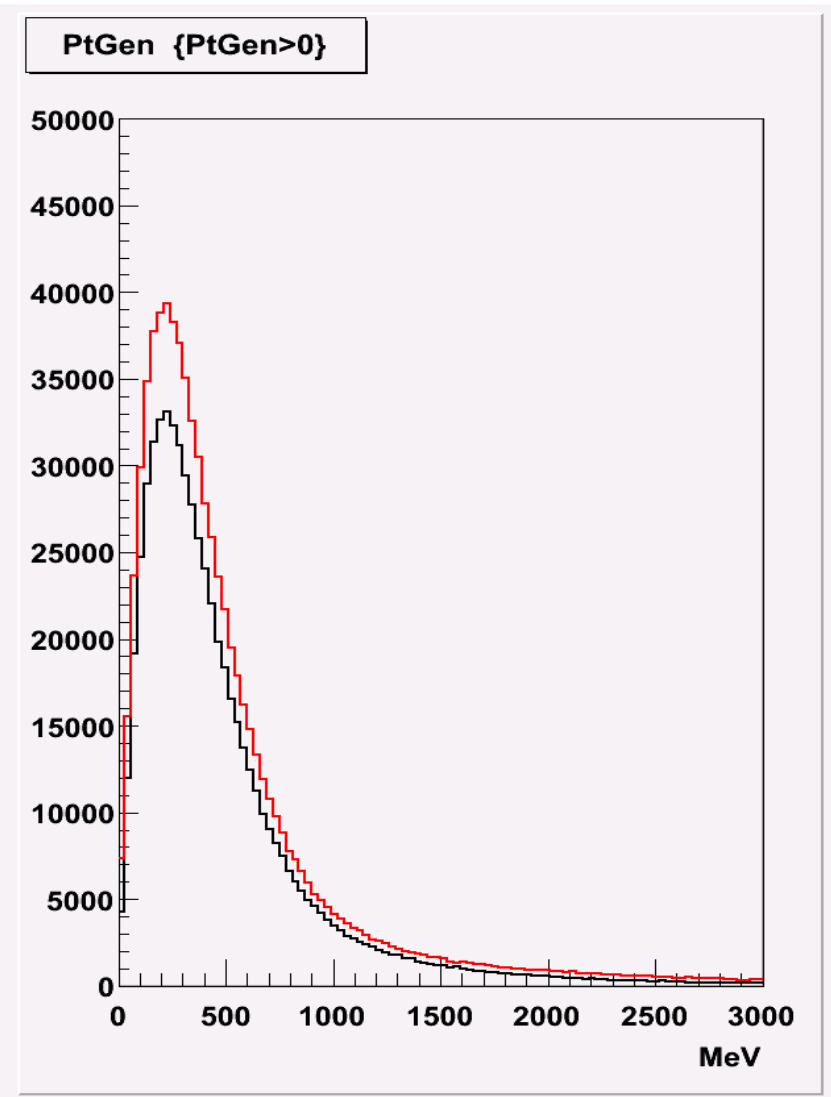
## PYTHIA:

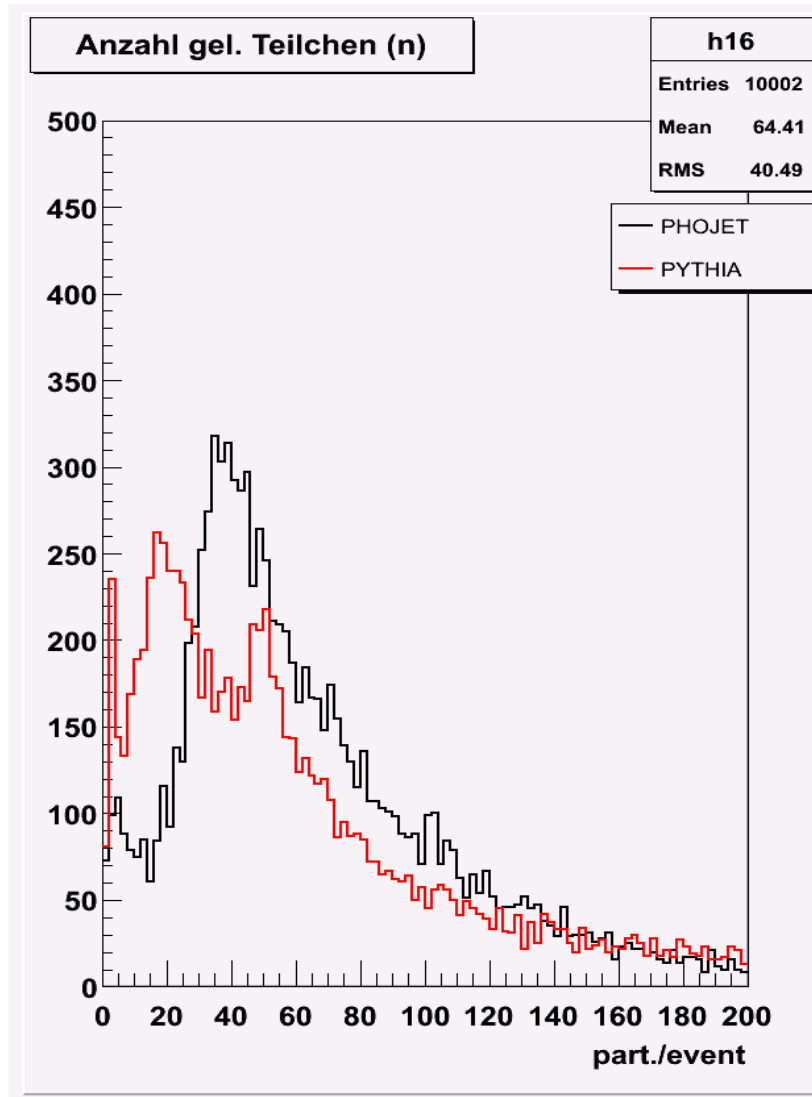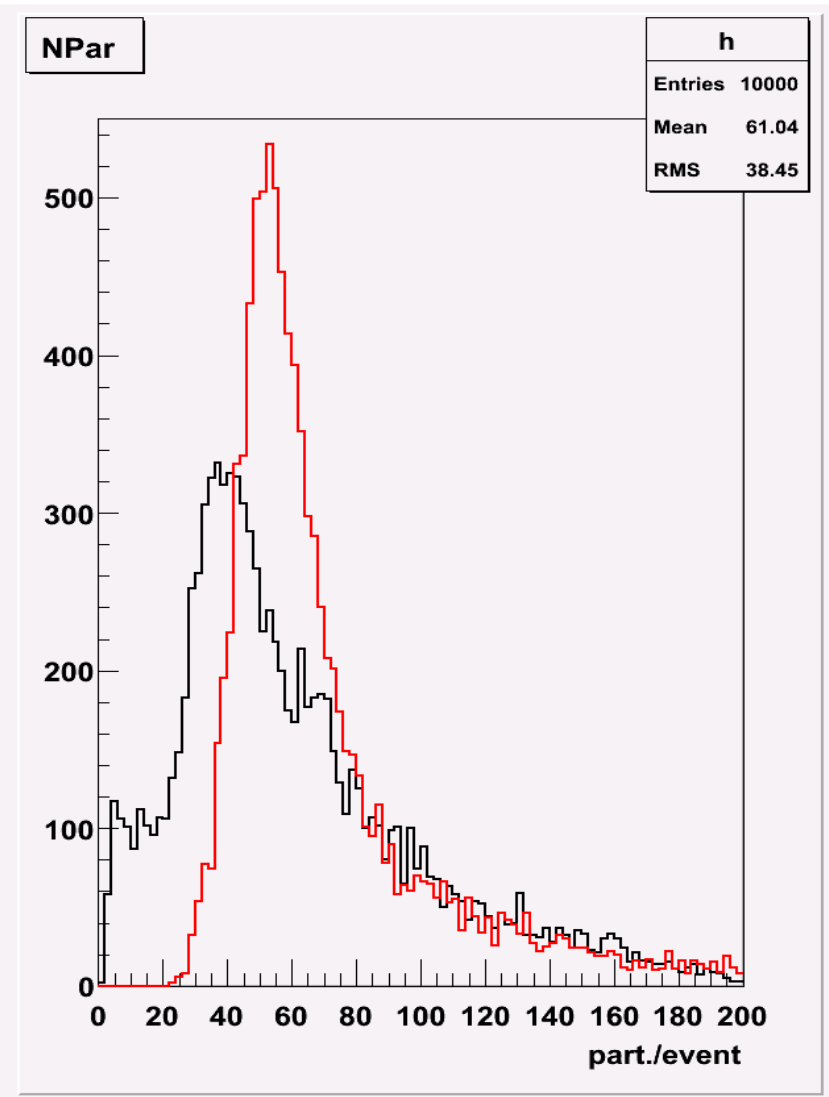Works fine but with different results. Cause is unknown so far, might be me.

# Local vs. ATHENA

STANDALONE                          ATHENA

# Local vs. ATHENA

STANDALONE

ATHENA

# Summary

The most promising MC-generators for simulating minimum bias events are PYTHIA and PHOJET.

The cosmic generators are also interesting and one should have a look at newer versions, which are coming soon.

The differences between the generators gets much smaller, in the eta range  $-2.5 < \eta < 2.5$

As far as I can see, PHOJET is working fine in ATHENA.

I got different results with PYTHIA, I will have a look at it.

After ensuring that the Generators do what I expect, I will make some full chain runs and create minimum bias AODs.

Also comparing full chain with fast sim.

I will look at the existing minimum bias data samples.

And I am looking forward to the first FDR, to get more minimum bias data samples.

# THANK YOU!