# The Angantyr model for Heavy-ion physics in PYTHIA8

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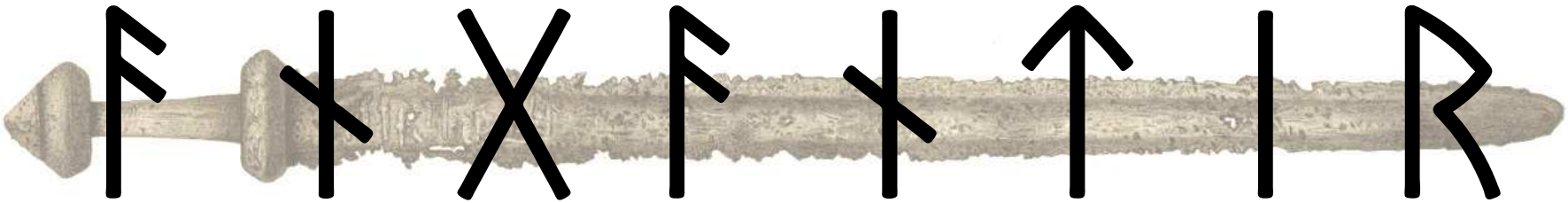
# Outline


1. Introduction
   - Conflict
2. Angantyr: a model for heavy-ion physics in Pythia8
   - Angantyr in Nutshell
3. Results
4. Summary

# What is Angatyr?



# Conflict

- Key observations from HI experiments : Collectivity, flow, strangeness enhancement , jet quenching
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**Can we explain physics from pp to AA without assuming QGP production?**

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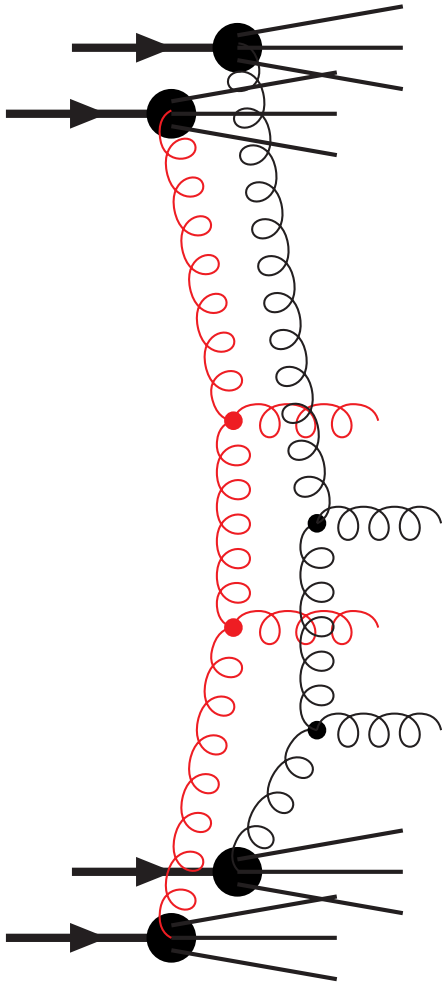
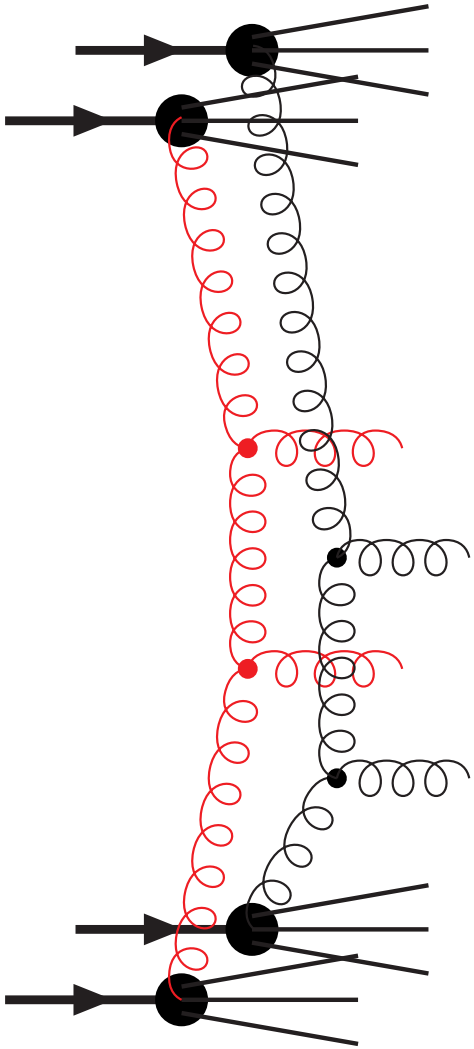
- ND : Non-diffractive : Minimum bias : absorptive

# A schematics of multi-nucleon collision



(a)



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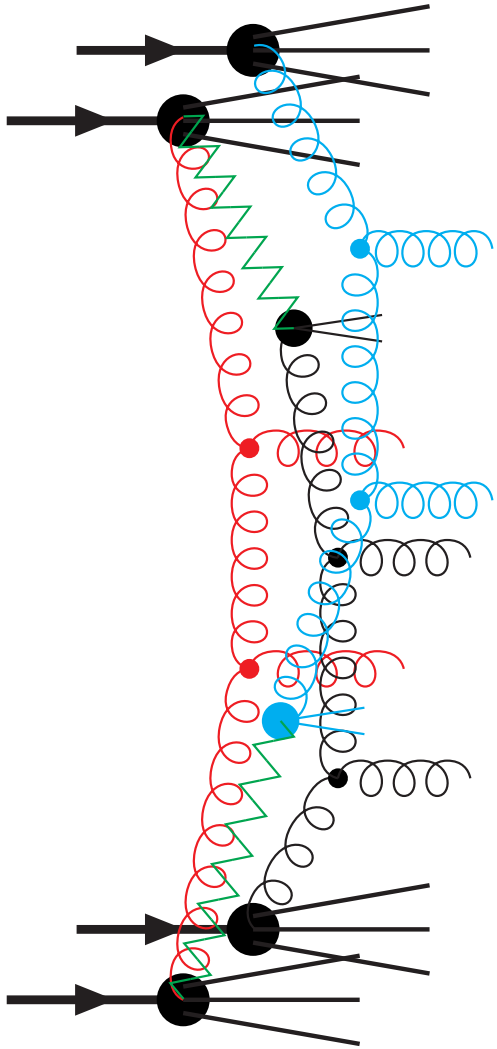
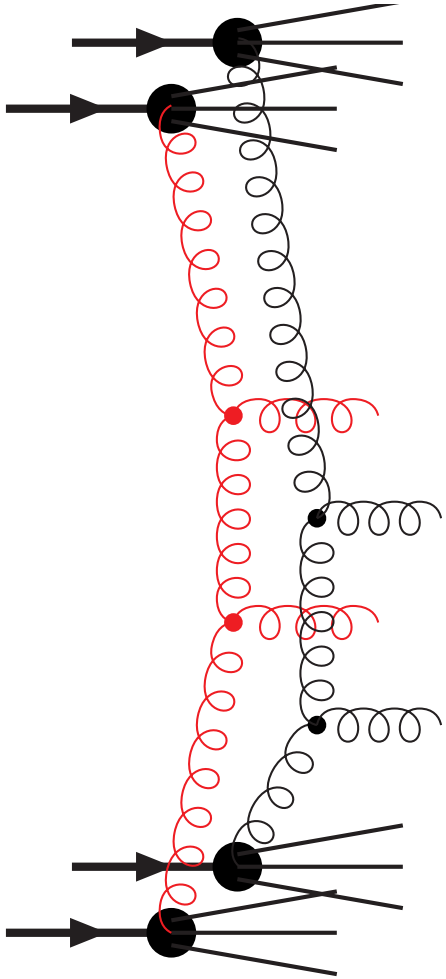


(b)



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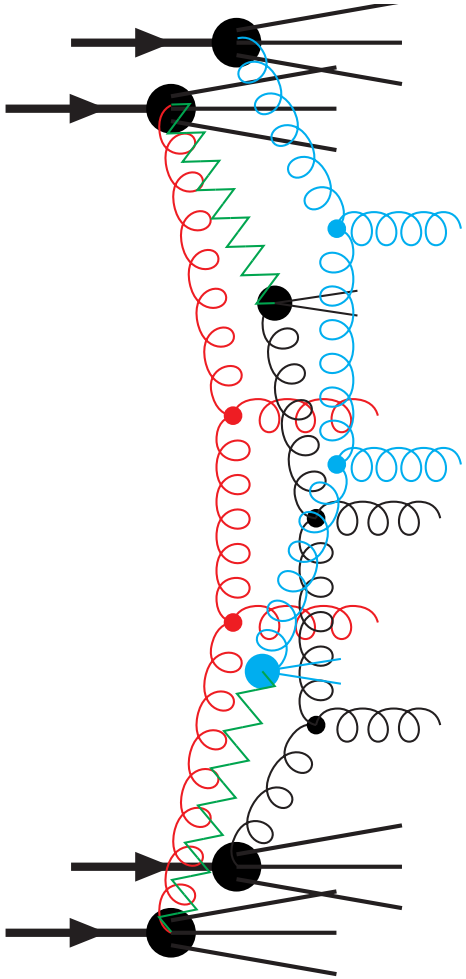

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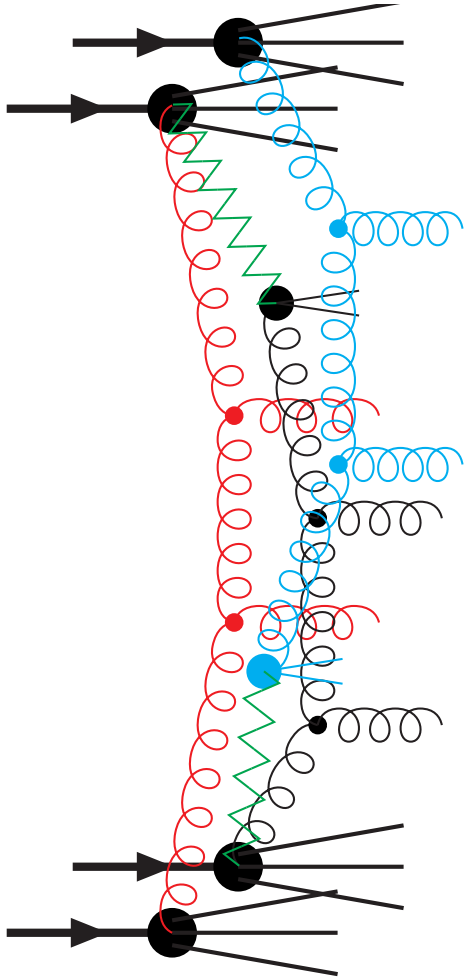
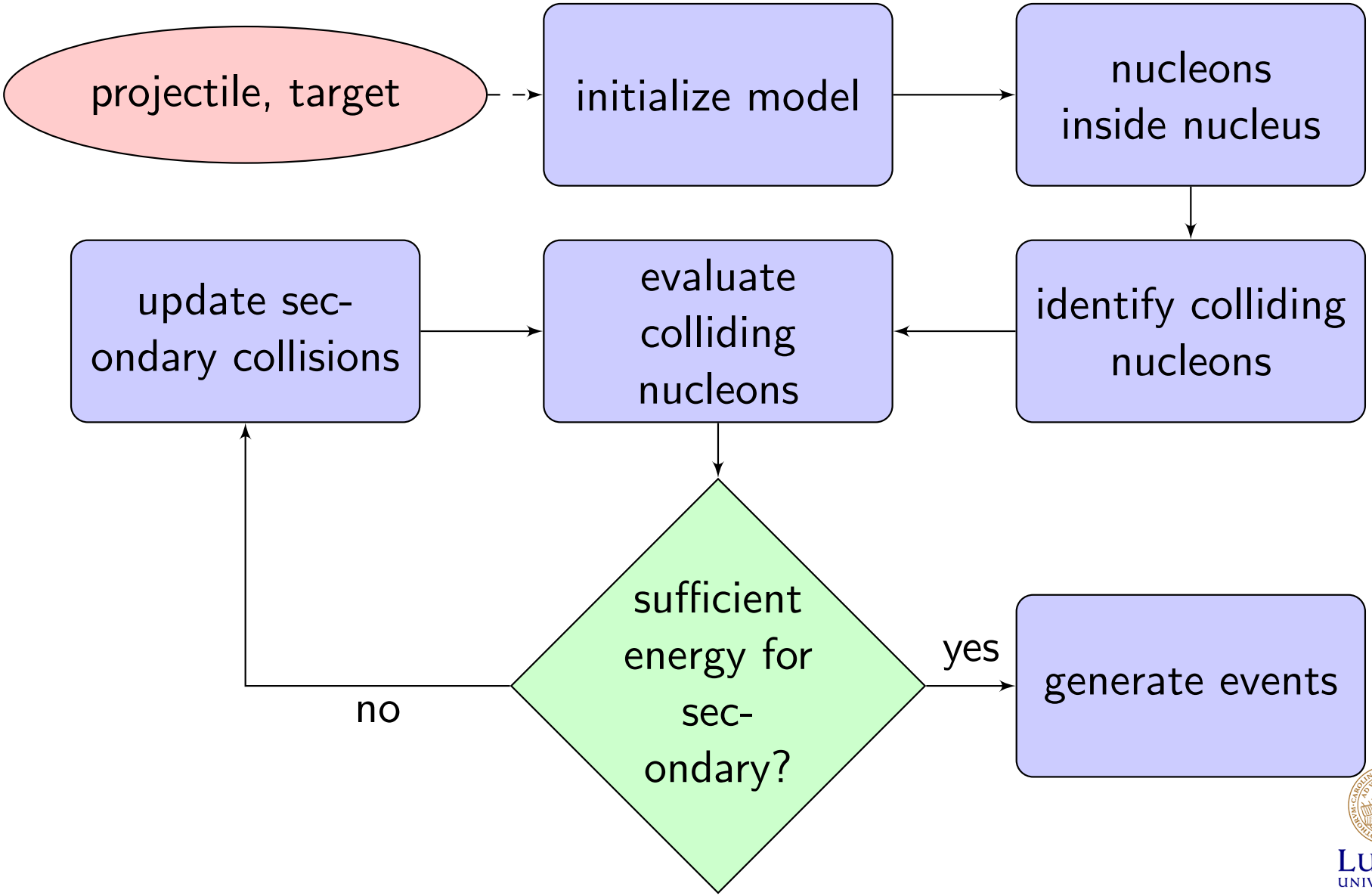
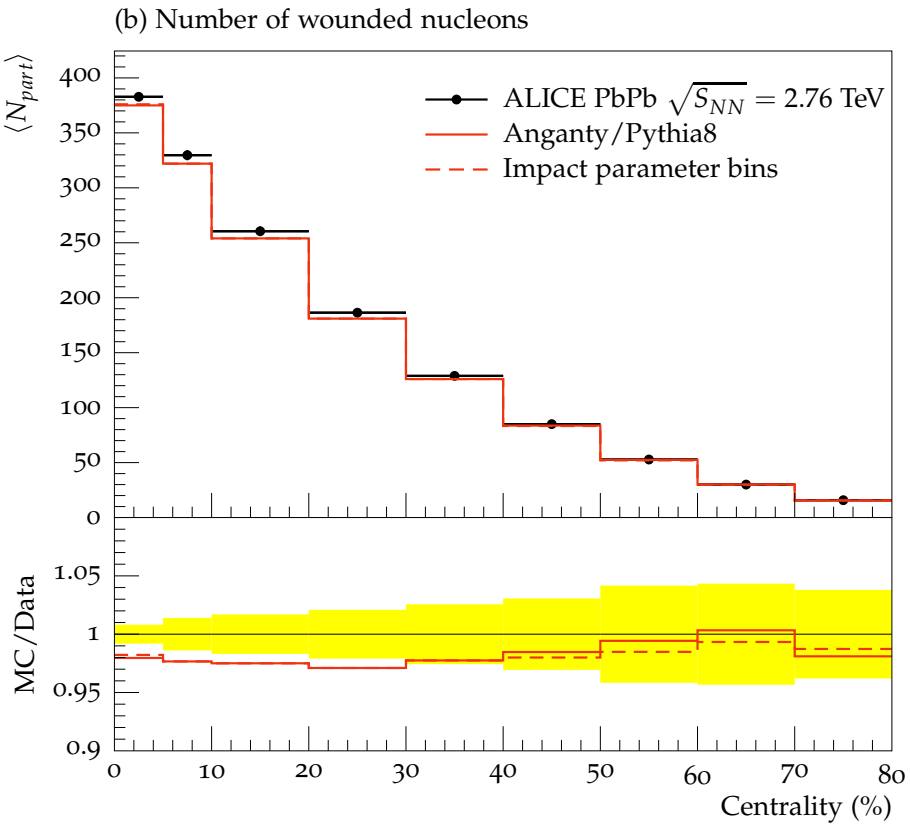


(c)

# Angantyr in Nutshell

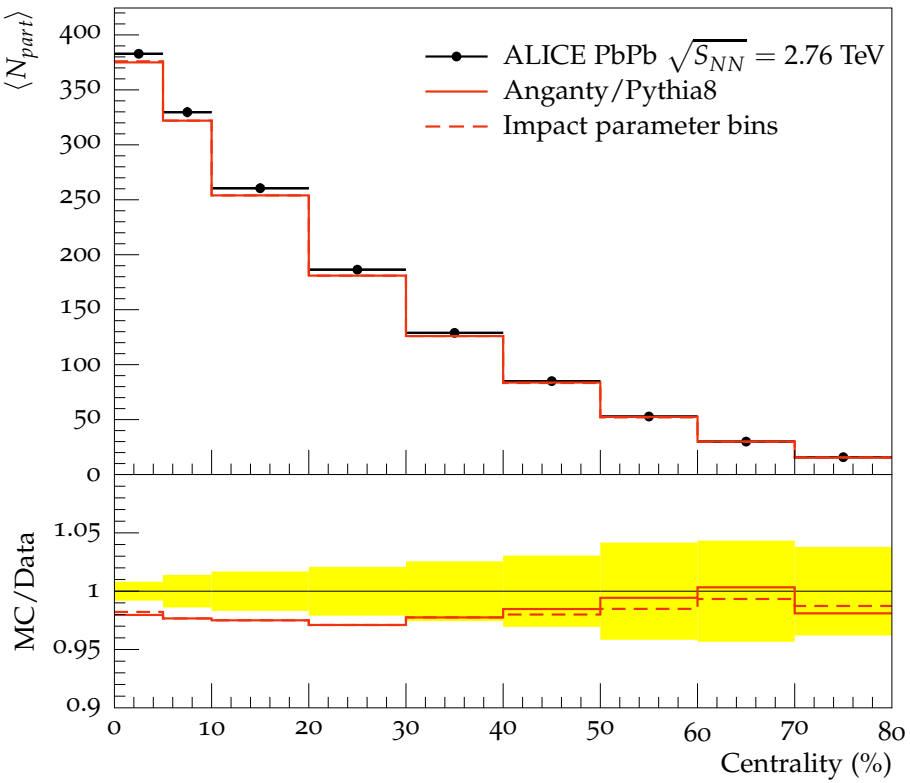


# Results

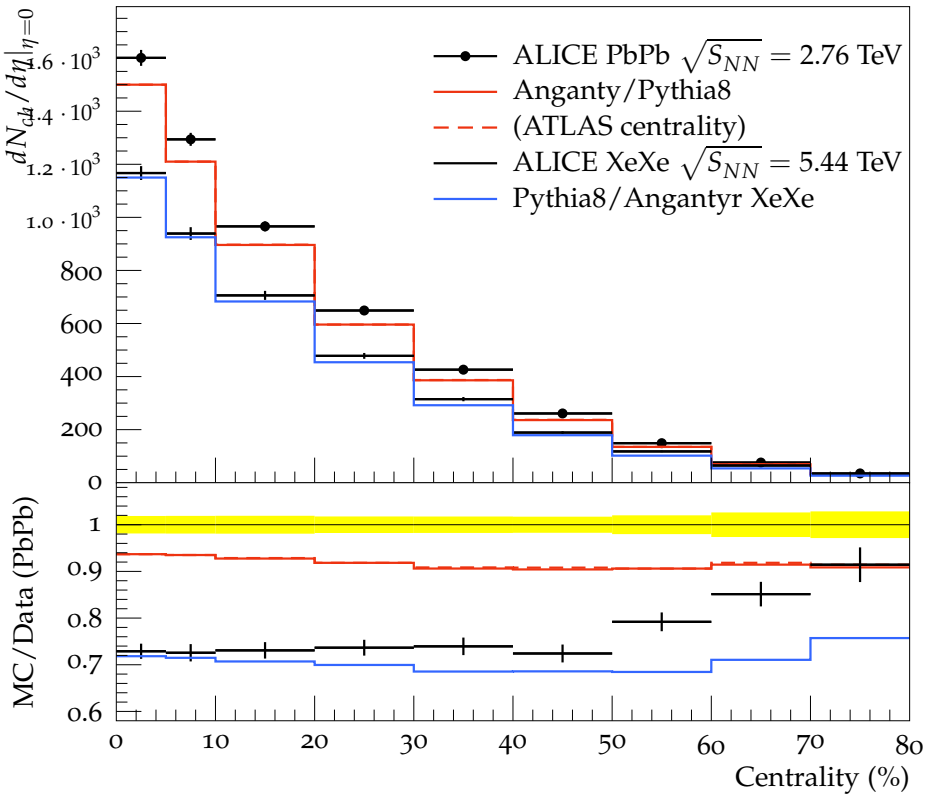

(b) Number of wounded nucleons
$\langle N_{part} \rangle$
ALICE PbPb $\sqrt{S_{NN}} = 2.76$ TeV
Anganty/Pythia8
Impact parameter bins
MC/Data
Centrality (%)

# Results

(b) Number of wounded nucleons




(a) Central Multiplicity



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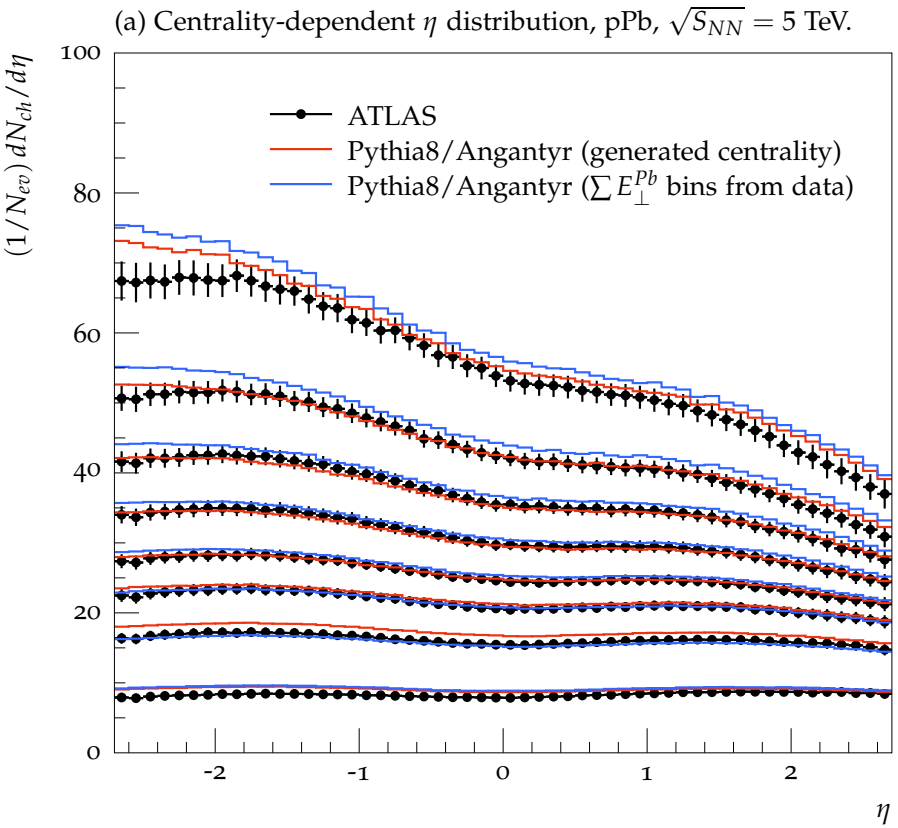
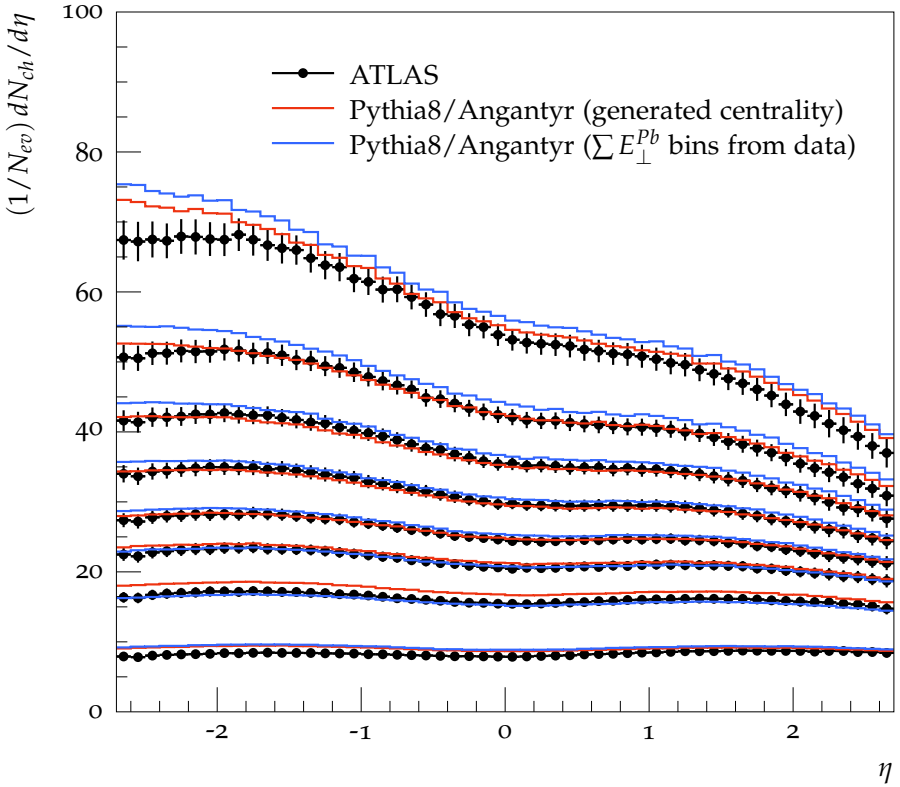
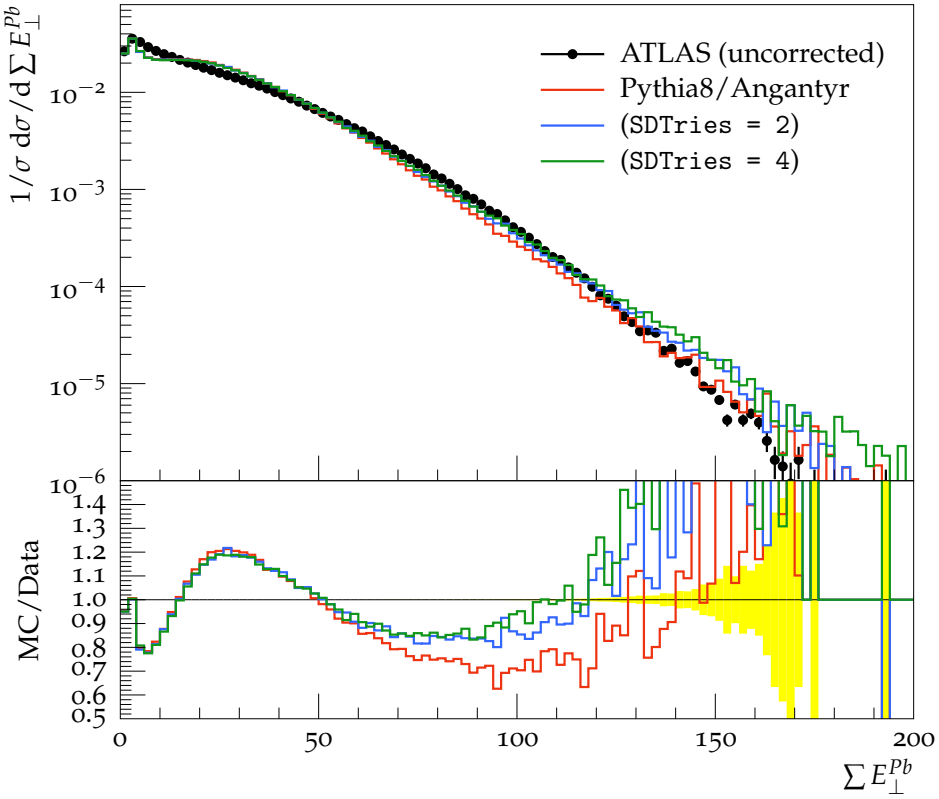

(a) Centrality-dependent $\eta$ distribution, pPb, $\sqrt{S_{NN}} = 5$ TeV.
$(1/N_{ev})\, dN_{ch}/d\eta$
ATLAS
Pythia8/Angantyr (generated centrality)
Pythia8/Angantyr ($\sum E_{\perp}^{Pb}$ bins from data)
100
80
60
40
20
0
-2
-1
0
1
2
$\eta$

# Results

(a) Centrality-dependent $\eta$ distribution, pPb, $\sqrt{S_{NN}} = 5$ TeV.




Sum $E_{\perp}^{Pb}$ distribution, pPb, $\sqrt{S_{NN}} = 5$ TeV.



# summary

- The Angantyr model for heavy-ion physics, is implemented in the Pythia8[1]
- The model includes fluctuations in initial state and it generates hadronic final states of multi-nucleon collisions without assuming thermalized plasma
- It is able to provide a good description of general final state properties comparable to experimental results (arxiv:1805.04432v1)

[1] arxiv:1806.10820v1

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**Outline**

- To implement colour reconnection between sub events in pA and AA collisions in Angantyr model

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IT'S COFFEE TIME!!

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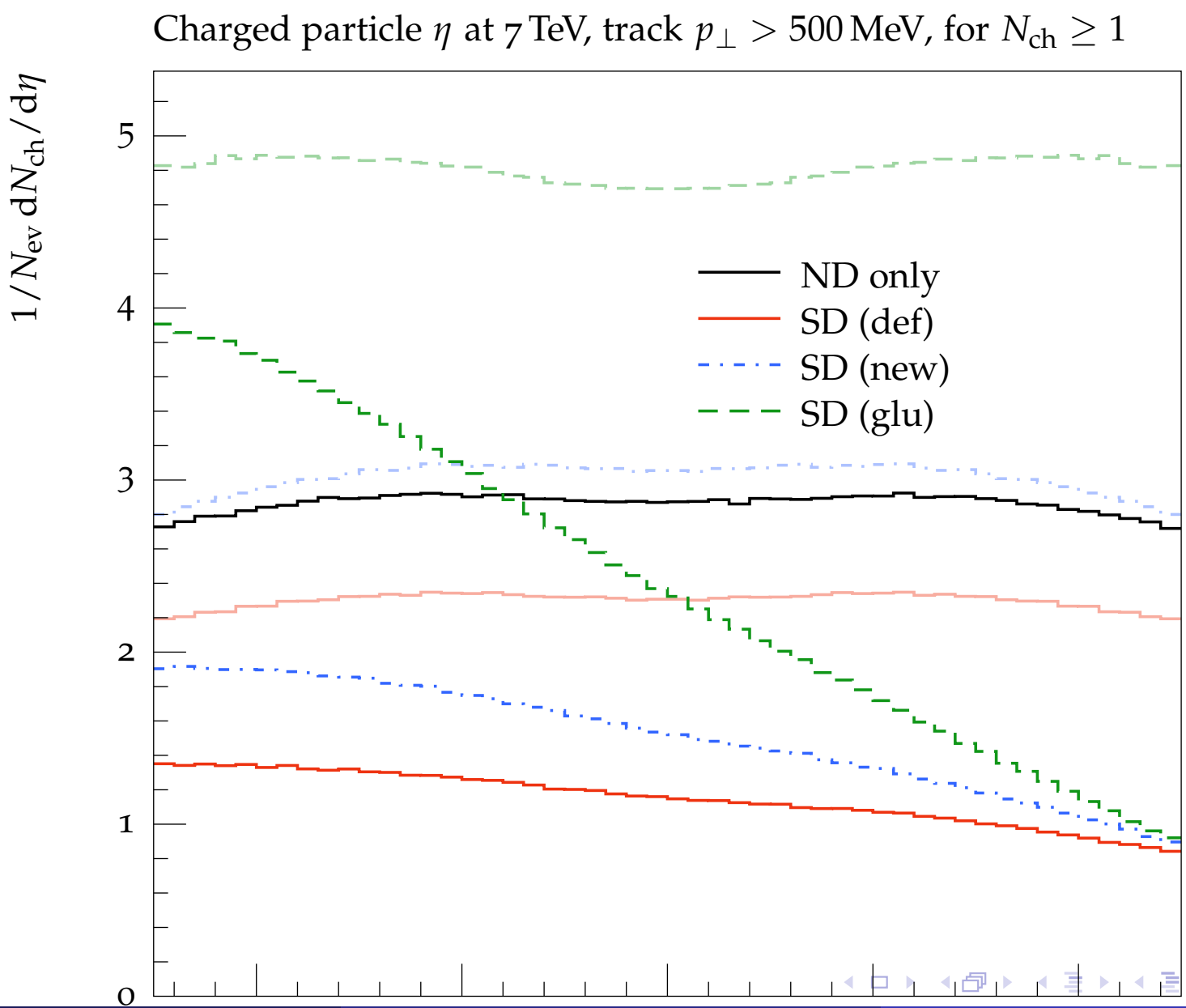
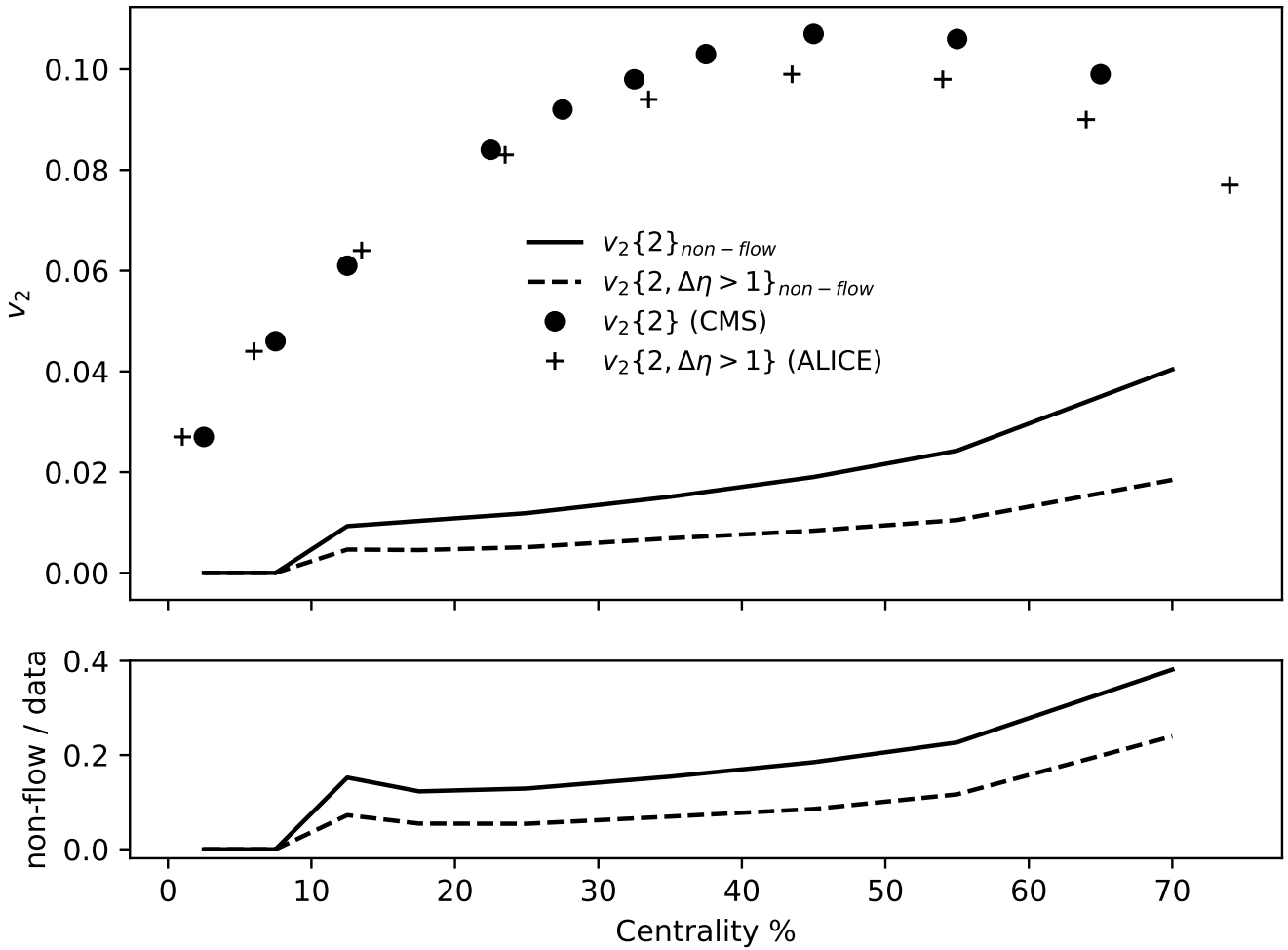
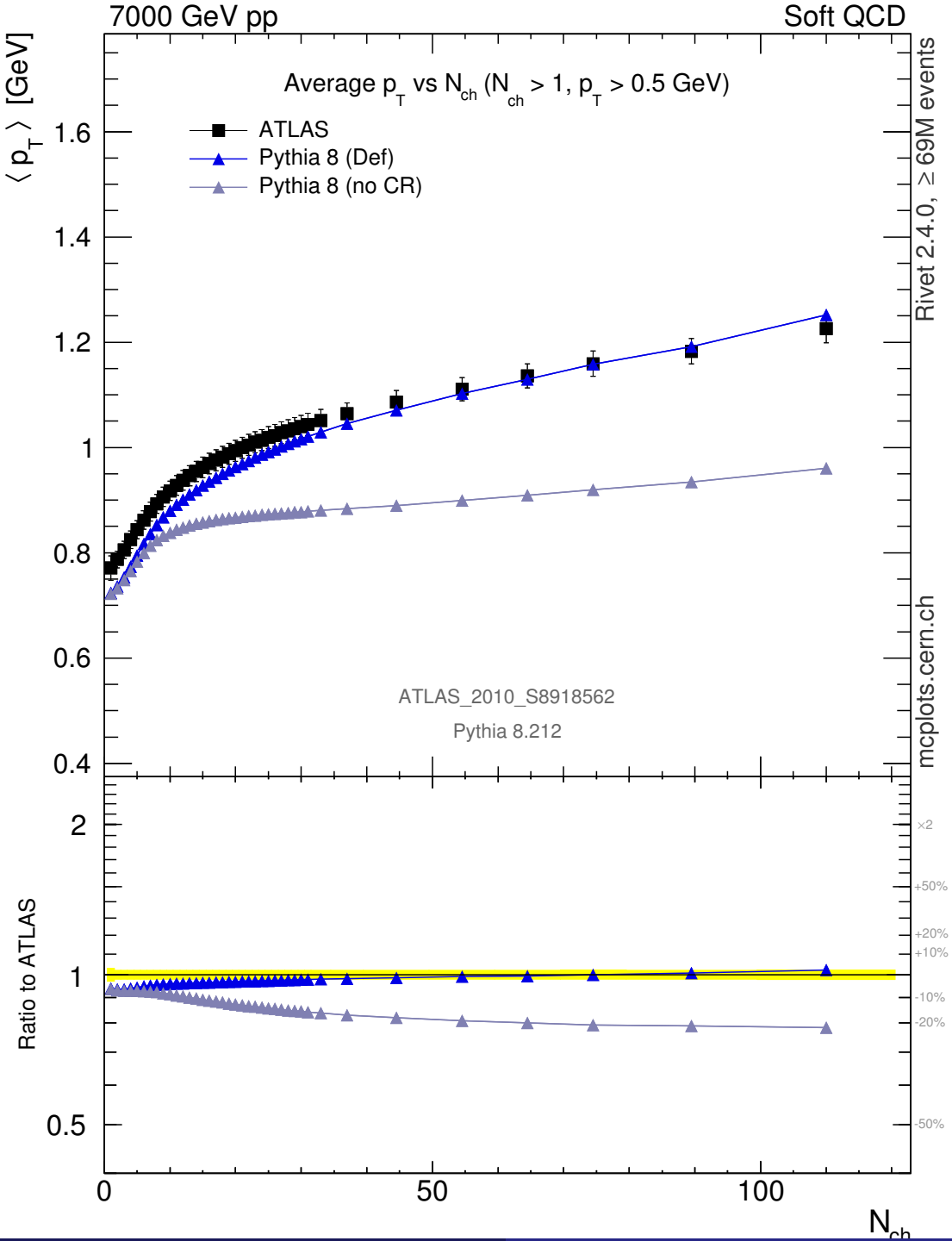
# Extra fun


Charged particle $\eta$ at 7 TeV, track $p_\perp > 500$ MeV, for $N_{\mathrm{ch}} \geq 1$
$1/N_{\mathrm{ev}}\, \mathrm{d}N_{\mathrm{ch}}/\mathrm{d}\eta$
0
1
2
3
4
5
ND only
SD (def)
SD (new)
SD (glu)


0.10
0.08
0.06
0.04
0.02
0.00
$v_2$
$v_2\{2\}_{non-flow}$
$v_2\{2, \Delta\eta > 1\}_{non-flow}$
$v_2\{2\}$ (CMS)
$v_2\{2, \Delta\eta > 1\}$ (ALICE)
0.4
0.2
0.0
non-flow / data
0
10
20
30
40
50
60
70
Centrality %


7000 GeV pp
Soft QCD
Average $p_T$ vs $N_{ch}$ ($N_{ch} > 1$, $p_T > 0.5$ GeV)
ATLAS
Pythia 8 (Def)
Pythia 8 (no CR)
$\langle p_T \rangle$ [GeV]
Rivet 2.4.0, ≥ 69M events
mcplots.cern.ch
ATLAS_2010_S8918562
Pythia 8.212
Ratio to ATLAS
×2
+50%
+20%
+10%
-10%
-20%
-50%
$N_{ch}$

MAY THE
FORCE
BE WITH
YOU