A HEAVY-ION COLLISION EVENT

Pythia8/ANGANTYR (Default) → Glauber model → Pythia8/ANGANTYR (New)

N - CR in every sub-collision → String Fragmentation + Hadronization for every sub-collision → All hadrons from all sub-collisions are combined

N- pp like sub-collisions → A heavy-ion event is simulated

All partons from all sub-collisions are combined → Spatially constrained CR performed in whole event → String Fragmentation + Hadronization
MPI based Colour reconnection, used in Pythia8/Angantyr (Default)

QCD Colour reconnection is extended with spatial constraints, used in Pythia8/Angantyr (New)

Apart from the existing constraints, the colour dipoles are spatially constrained, meaning, dipoles separated farther than the allowed range will not be colour reconnected.
pp collisions

- New changes with re-tuning are able to reproduce Pythia8 (Default) distributions
- New changes enhance baryon production due to junction topology in QCD CR
**pPb collisions**

Events are generated using the same parameters used as in *pp* collisions.

- Approx. 10% suppression in multiplicities in the **0-10%** centralities is observed, because of A) **loss** of high multiplicity events, due to technical reasons in the string fragmentation model, B) **enhanced CR** among the colour dipoles from all the sub-collisions.

In addition to *pp* tunes, secondary non-diffractive events are modified (they are introduced in the Angantyr model at the *pA* level).

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*Secondary non-diffractive (Figure 3)*
An MC model challenging the assumption of a QGP formation in HI events. *HI = Heavy-ion*  
A HI event is treated inclusively by merging sub-collisions at the parton level, instead of a collection of many pp like collisions as in Angantyr (Default)  
The model is re-tuned in pp collisions, the parameters introduced in pA collisions are re-tuned in pA collisions, **No tuning** at AA collisions

**OPPORTUNITY**  
A model with a new method of sub-collisions handling is ready to be tested against HI collision experiments observables

**LIMITATIONS**  
In pA and AA type collisions, high multiplicity events are more often aborted compared to low multiplicity events, which introduces a bias in simulation  
- Angantyr (Default) Pb-Pb @ 2.76 TeV ~ 0.59 s/event  
- Angantyr (New) Pb-Pb @ 2.76 TeV ~ 272 s/event  
- Angantyr (Default) Xe-Xe @ 5.44 TeV ~ 0.44 s/event  
- Angantyr (New) Xe-Xe @ 5.44 TeV ~ 159 s/event

**OUTLOOK**  
Work in progress to reduce the bias in HI events simulation, and the event simulation time