$\begin{array}{l} \mbox{Update on 00 event selection} \\ \mbox{for R_{AA} 00 and data format} \end{array}$

Charged hadron R_{AA} OO meeting May 20th 2025

From last 00 meeting discussion

Data processing strategy



Skimming layer:

computation of the event selection quantities (e.g. leading HF PF energy,)
Track-selection bits

https://github.com/ginnocen/MITHIGAnalysis2024/pull/110



Hijing sample for 00

Sample: 1M Hijing events

/eos/cms/store/group/phys_heavyions/wangj/Forest2025/Hijing_MinimumBias_b015_OO_5362GeV/ crab_HiForest_250520_Hijing_MinimumBias_b015_OO_5362GeV_250518.root

Event selection:

• for gen-level distributions, no selection applied







Hijing sample for 00

Sample: 1M Hijing events

/eos/cms/store/group/phys_heavyions/wangj/Forest2025/Hijing_MinimumBias_b015_OO_5362GeV/ crab_HiForest_250520_Hijing_MinimumBias_b015_OO_5362GeV_250518.root

Event selection:

 PVFilter == 1 && abs(VZ)<15 && nVtx > 0 && ClusterCompatibilityFilter == 1 (not final selection - e.g. noFake missing, just added to the skimmer)







Single-diffractive STARLIGHT events

Sample: Single-Diffractive Starlight events (photonuclear + single diffractive) /eos/cms/store/group/phys_heavyions/wangj/Forest2025/Starlight_SingleDiffraction_NoTuneCP5_OO_5362GeV/ crab_HiForest_250514_Starlight_SingleDiffraction_OO_5362GeV_1505PR47944.root

Event selection:

PVFilter == 1 && abs(VZ)<15 && nVtx > 0 && ClusterCompatibilityFilter == 1







Update on the event-selection strategy

"Minimalistic" strategy: moderate p_T tracks

As discussed during the last OO R_{AA} meeting, by focusing on moderate p_T tracks (e.g. 5-50 GeV)

- reduce the uncertainty associated to track reconstruction and selection
- minimize the impact of species-dependent tracking efficiency
- limit the effect of fake tracks
- minimize the bias due to the event selection

noderate p⊤ tracks (e.g. 5-50 GeV) and selection ency



"Minimalistic" strategy: moderate p_T tracks

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- reduce the uncertainty associated to track reconstruction and selection
- minimize the impact of species-dependent tracking efficiency
- limit the effect of fake tracks
- minimize the bias due to the event selection
- \rightarrow Possible (baseline) strategy to make sure we get a result for IS2025
- → It can be of course expanded to lower or higher pT based on the results of additional studies



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Event selection efficiency for different leading p_T track cuts



Sample: 1M Hijing events

/eos/cms/store/group/phys_heavyions/wangj/Forest2025/Hijing_MinimumBias_b015_OO_5362GeV/crab_HiForest_250520_Hijing_MinimumBias_b015_OO_5362GeV_250518.root Event selection: PVFilter == 1 && abs(VZ)<15 && nVtx > 0 && ClusterCompatibilityFilter == 1







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Next steps

Finalizing skim content:

- adding all relevant event selection information
- track quantities
- track and event selection variations for systematic studies
- sync needed with tracking experts to integrate the correction maps
- \rightarrow share the skimmed datasets for anyone interested in having a look

Contamination vs efficiency studies :

• using Hadronic, single-diffractive, double-diffractive samples weigthed for their corresponding cross sections

Goal by next week:

Later on:

 \rightarrow more sophisticated selection for lower p_T tracks

First look at spectra and corrected yields

 \rightarrow discuss with the other people involved to integrate correction maps →

\rightarrow identify a working event selection strategy (without ZDC selection) for intermediate-p_T tracks (e.g. p_T>= 5 GeV)







Today's update



Skimmer content (work in progress)

- VY, VY, VZ: 3D position of the best vertex
- VXError, VYError, VZError: 3D error of the best vertex
- hiBin: centrality now updated according to the calibration table developed by Jing
- hiHF_pf: HF E_{T,sum} (quantity used for the centrality calibration)
- isFakeVtx
- **nVtx**: number of reconstructed vertices
- **HFEMaxPlus**: Max energy of the PF candidates (HF plus) $3 < \eta < 6$
- **HFEMaxMinus**: Max energy of the PF candidates (HF minus) $-6 < \eta < -3$
- mMaxL1HFAdcPlus, mMaxL1HFAdcMinus
- Ncoll, Npart
- leadingPtEta1p0_sel (computed considering only highPurity tracks)
- trkPt, trkPtError, trkEta, highPurity



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- trkPt, trkPtError, trkEta, highPurity

Being added:

- isData
- **sampleType** (Hijing, Starlight SD, Starlight DD, GammaUPC,..)
- **processID** (inherited from the MC production)
- **xsectionweightMC**: for normalization of the different MC samples
- trkPhi, trkNLayers
- HFEMaxPlus2, HFEMaxPlus3 (second and third highest E PF candidates within $3 < \eta < 6$
- HFEMaxMinus2, HFEMaxMinus3 (second and third highest E PF candidates within $3 < \eta < 6$
- ptSumVtx, nTracksVtx, ndofVtx, chi2Vtx for the best vertex
- As debug option, list of all the reconstructed vertex positions with corresponding properties





Updated centrality distribution





Updated centrality distribution





HF-condition efficiency vs centrality











Event selection efficiency in Hijing MC











Single-track p_{T} shape for Hijing and Starlight SD events

Self-normalized distributions of single-track distributions



Event selections:

- PVFilter == 1
- abs(VZ)<15
- isFakeVtx == 0
- ClusterCompatibilityFilter
- NO HF conditions applied

Track selections:

- lηl<1.0
- high-purity

Next steps:

- weight events according to their luminosity
- test the different event-selection strategies
- evaluate bias on the track p_T /eta distribution as ratios



