$dN_{ch}/d\eta$ update

Hao-Ren Jheng

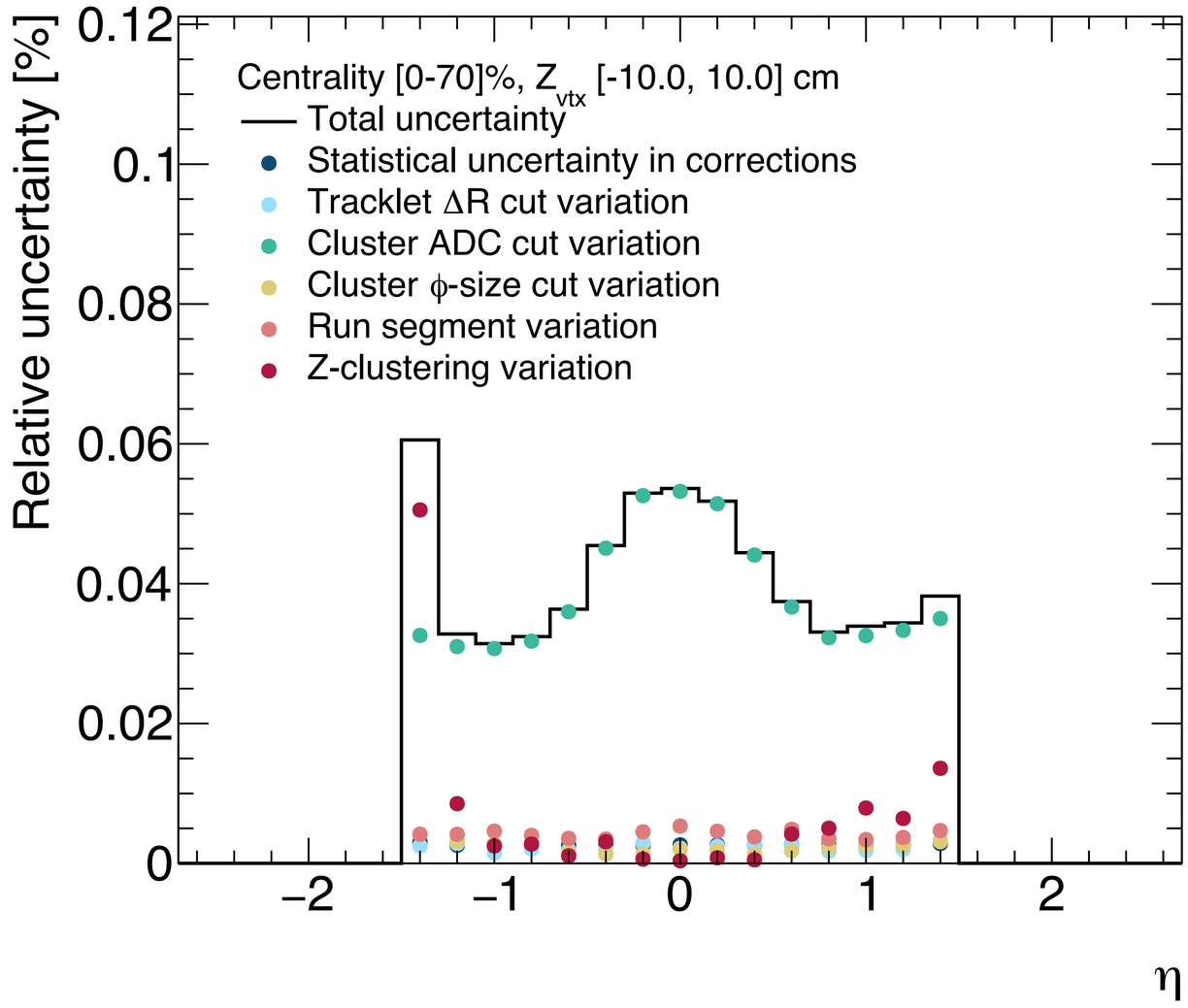
Global Object Selections (updating)

■ Selections on global physics objects and variables should be synchronized

Category	Criteria	
Trigger	▪ Trigger bit 10 (MBD S&N≥2)	▪ Scaled trigger ▪ Exclude failed reconstruction ▪ Symmetric cluster η distribution with a narrow Z vertex range
Vertex	▪ Valid reconstructed vertex (non-null value) ▪ MBD & INTT |Zvtx| ≤ 10cm	
Centrality	▪ Inclusive 0-70% (?) ▪ PHOBOS interval [0, 3, 6, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70] (?)	▪ To be finalized when the bug in the MB classifier/centrality calibration is fixed & have calibration for HIJING
Global variable	▪ Is minimum bias event	▪ The MB and trigger bit requirements remove a large fraction of background
Cluster	▪ Cluster ADC > 35 (baseline) ▪ No cluster ϕ-size cut as baseline	▪ Non-0 ADC bit ▪ Systematic uncertainty on cluster ϕ-size and ADC cuts
Event BCO	▪ BCO difference between two adjacent events > 61 BCOs	▪ Incorrect hit assignment: the second trigger signal happens within the INTT “open time”(60 BCOs) of the first signal + 1 hit BCO

Systematic uncertainty

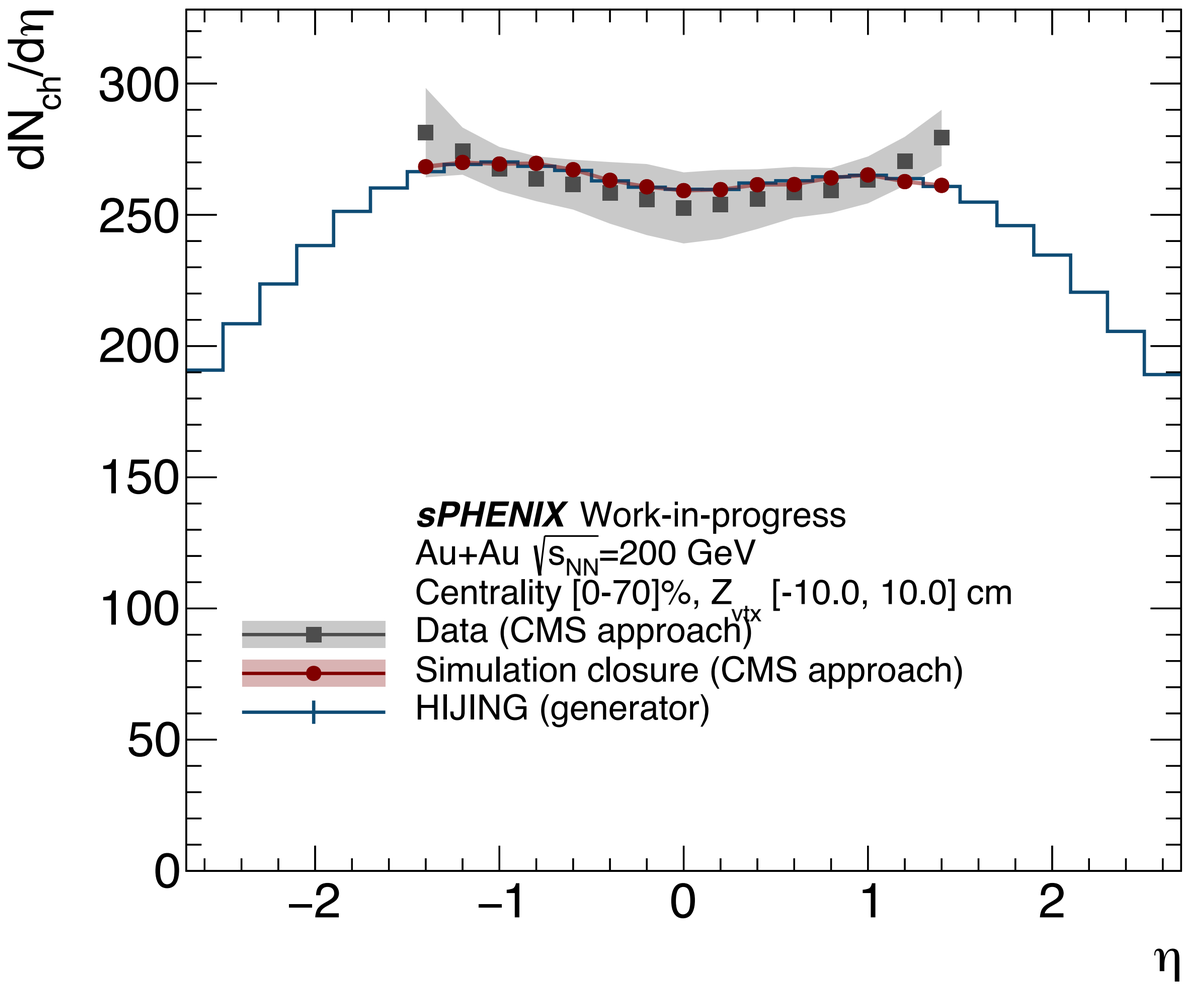
- Statistical uncertainty (a bug was found and fixed)
- Tracklet ΔR cut
- Cluster ADC cut (dominant)
- Cluster ϕ-size cut
- Run segments
- Z-clustering (diagonal adjacency not allowed)
- (TO-DO) Event generator



Results

- Results of centrality 0-70% with most of the systematic uncertainties included
  - Symmetric, apart from $|\eta| > 1$
  - In general consistent with HIJING within syst. uncertainty for $|\eta| < 1$
- Results of other centrality intervals are also available
  - See some large variations for $|\eta| > 1$ bins

    → Do we want to further restrict the η range, say $|\eta| < 1$ to simplify things?



Summary & Plans

- Checked in with JaeBeom earlier today: he will try to finalize the centrality calibration this week. There seems to be a very subtle issue in the calibration framework...
- Unfortunately the QM talk was not accepted → should still stick to the plan to make this analysis publication/preliminary in the timescale of QM (included in the plenary talk and poster). Proposed plan as follows:
  - ☐ **Analysis converge in mid-January (next dNdEta meeting on 15th Jan.)**, systematic uncertainties (and/or centrality) included
  - ☐ **Bulk TG meeting on 21th Jan**: present results from both analyses including systematic uncertainties (and/or centrality), the plan for preliminary/publication, logistics of the internal review, e.t.c...
  - ☐ **Internal review starting February/as early as possible** (to be discussed with Bulk TG conveners)
- During the collaboration meeting Itaru proposed something similar to our November workfest to make productive progress → any further thoughts?

Simulation production (updating)

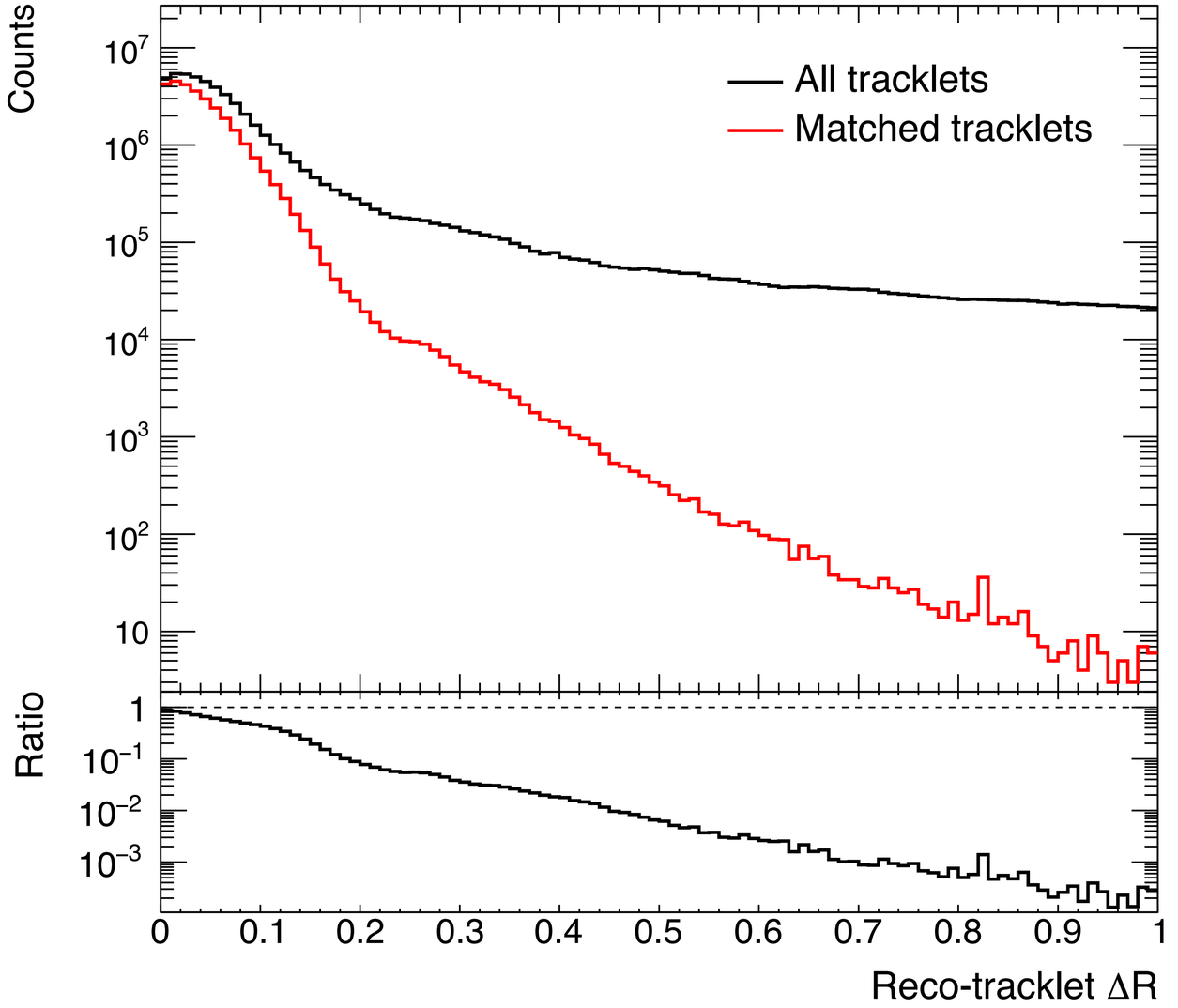
- New simulation samples with 500k events
- Some modifications and fixes to the simulation macro and dNdEta analyzer due to F4A macro/software changes
  - Please let me know if you see anything strange

		Path
Without Z-clustering	DST	/sphenix/tg/tg01/bulk/dNdeta_INTT_run2023/data/simulation/ana.457/HIJING/fullSim/magOff/detectorAligned/dstSet_00000
	Ntuple	
With Z-clustering	DST	
	Ntuple	

Backup

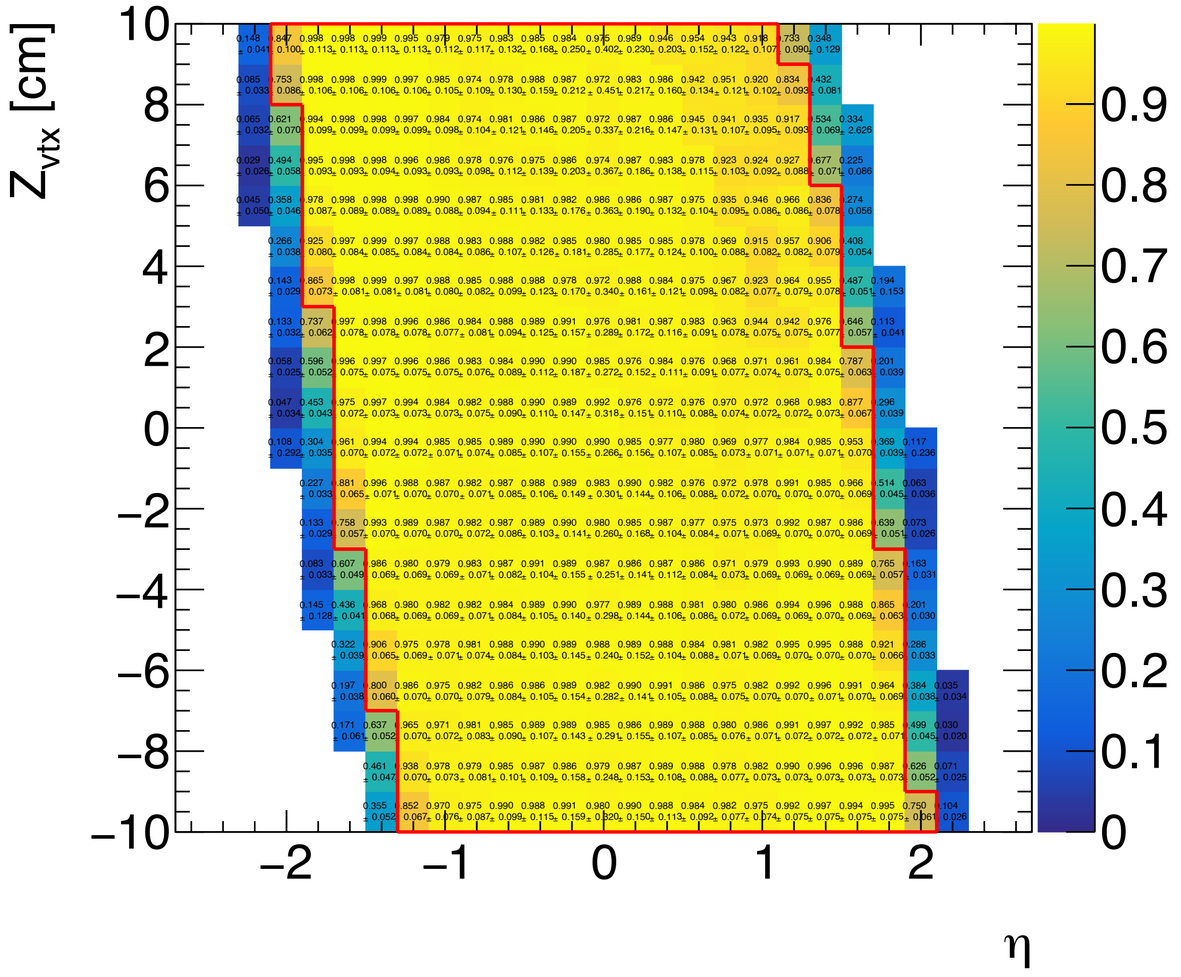
Generator truth matching

- Quantify how many reconstructed tracklets are true tracks
  - Matched tracklets are tracklets with 2 constituent clusters from the same PHG4Particle (same track id)
- At ΔR~0.5, ~1% of reconstructed tracklets match to a PHG4Particle



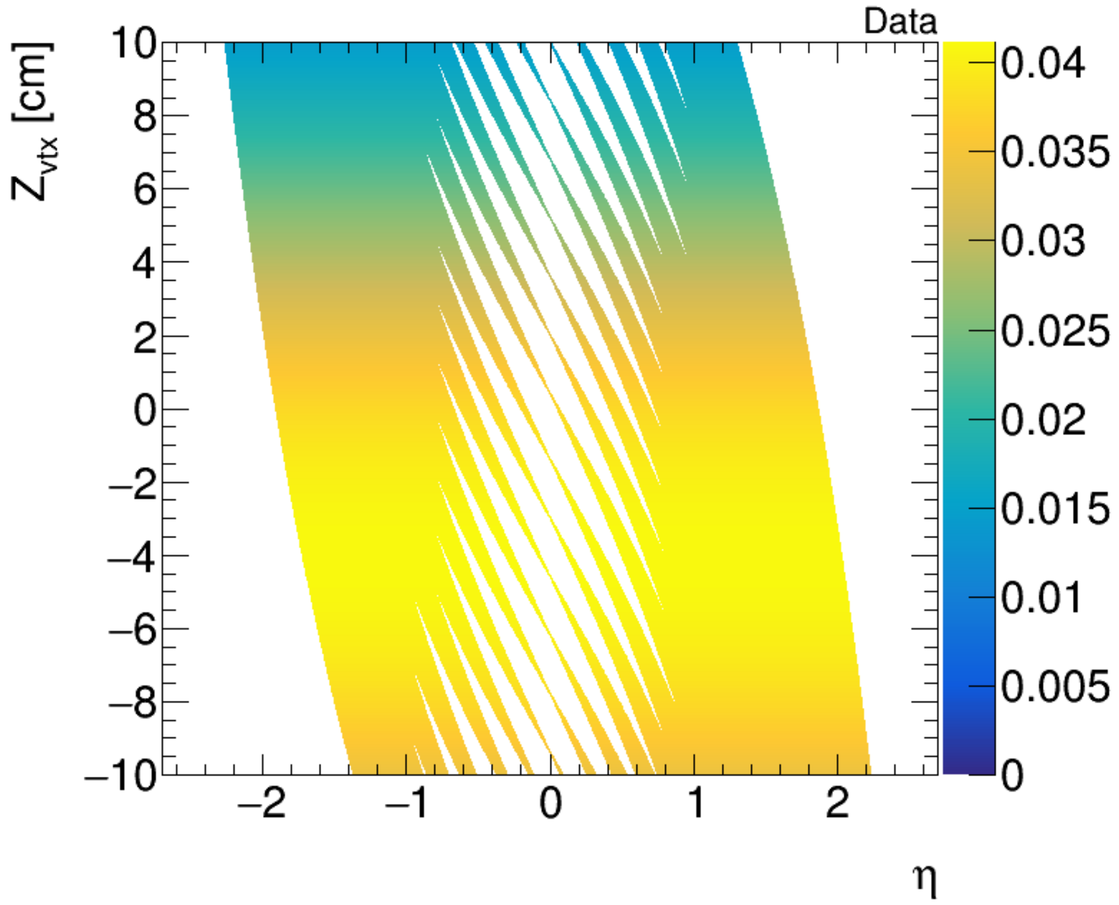
Geometric acceptance correction

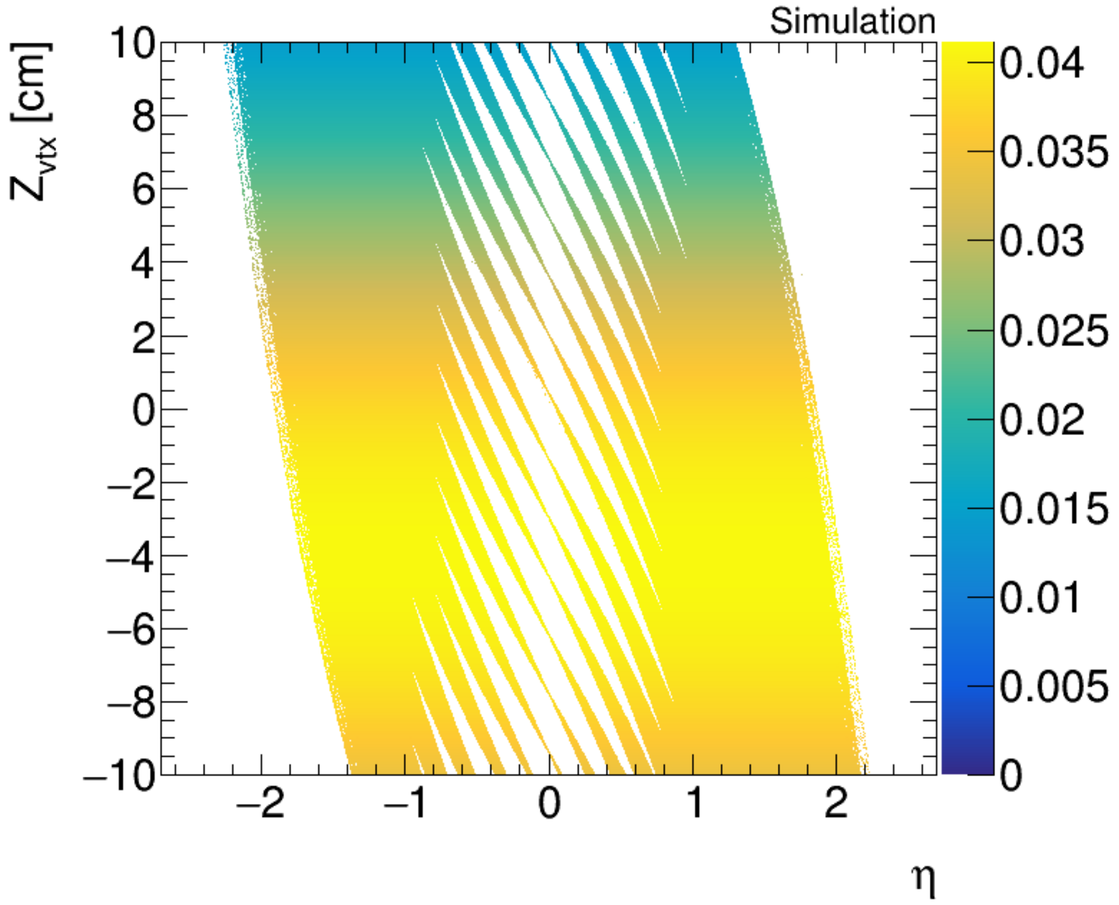
- To account for the geometry difference between data and simulation
- Derived in the following steps:
  1) Reconstruct tracklets using a uniformly random vertex distribution (from -10 to 10 cm) → all possible tracklets not passing through a gap can be reconstructed
  2) The acceptance is defined by the (η, v_Z) region where at least one tracklet can be reconstructed
  3) The acceptance region is then weighted by the vertex distribution in data
  4) The final correction factor is the ratio of the distribution in simulation to data
- Regions where the correction factor is less than 0.75 or larger than 1.25 are excluded from the analysis (these regions are where the geometry difference is large)



Geometric acceptance correction

- Reconstructed tracklets using a uniformly random vertex distribution





Acceptance&Efficiency correction

- Acceptance correction: correct for the vertex dependence of the number of reconstructed tracklets
- Efficiency correction (α factor): correct for the inefficiency of reconstructing tracklets