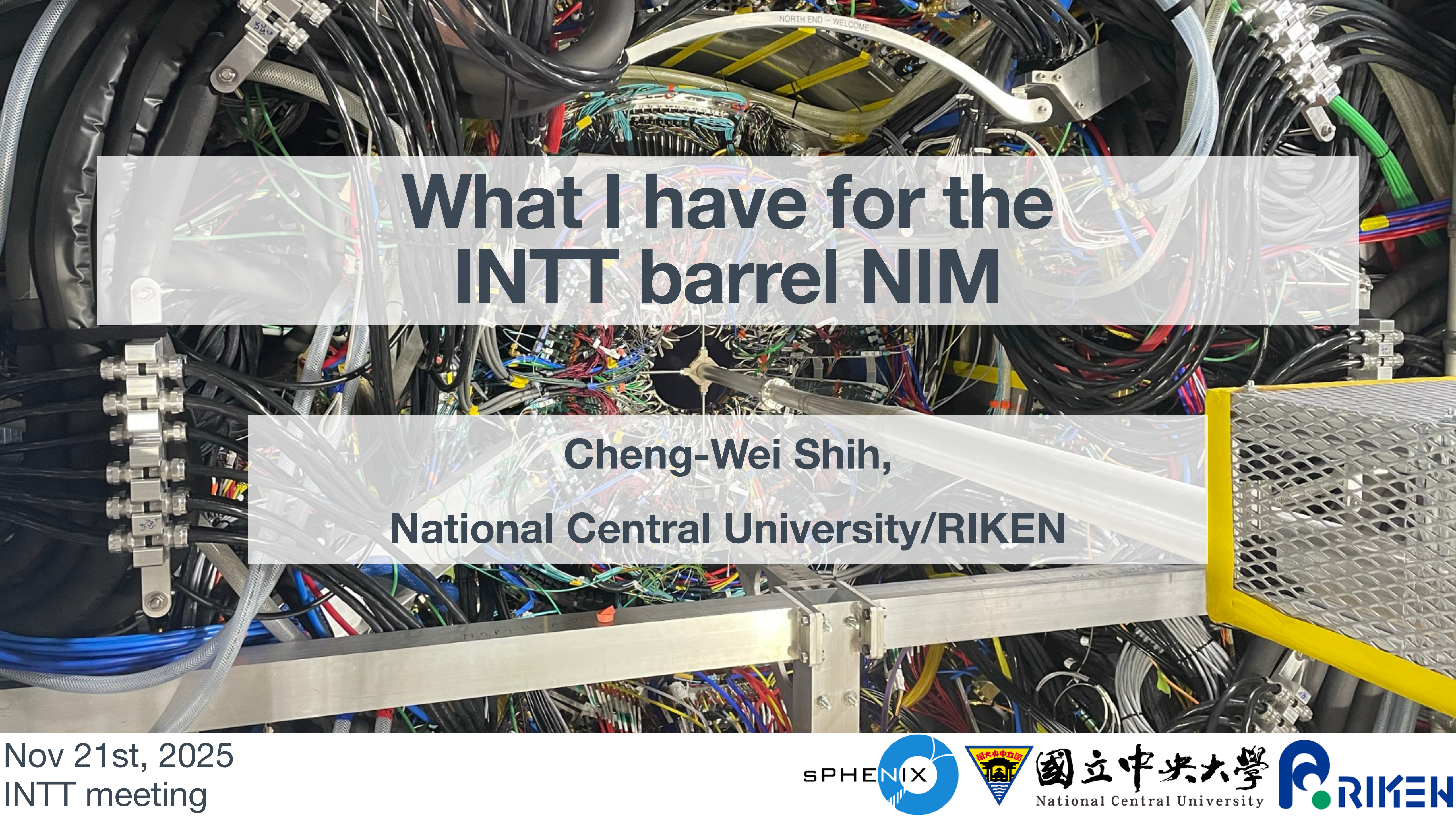




What I have for the INTT barrel NIM

Cheng-Wei Shih,
National Central University/RIKEN

Nov 21st, 2025
INTT meeting



國立中央大學
National Central University



What I have for the barrel paper

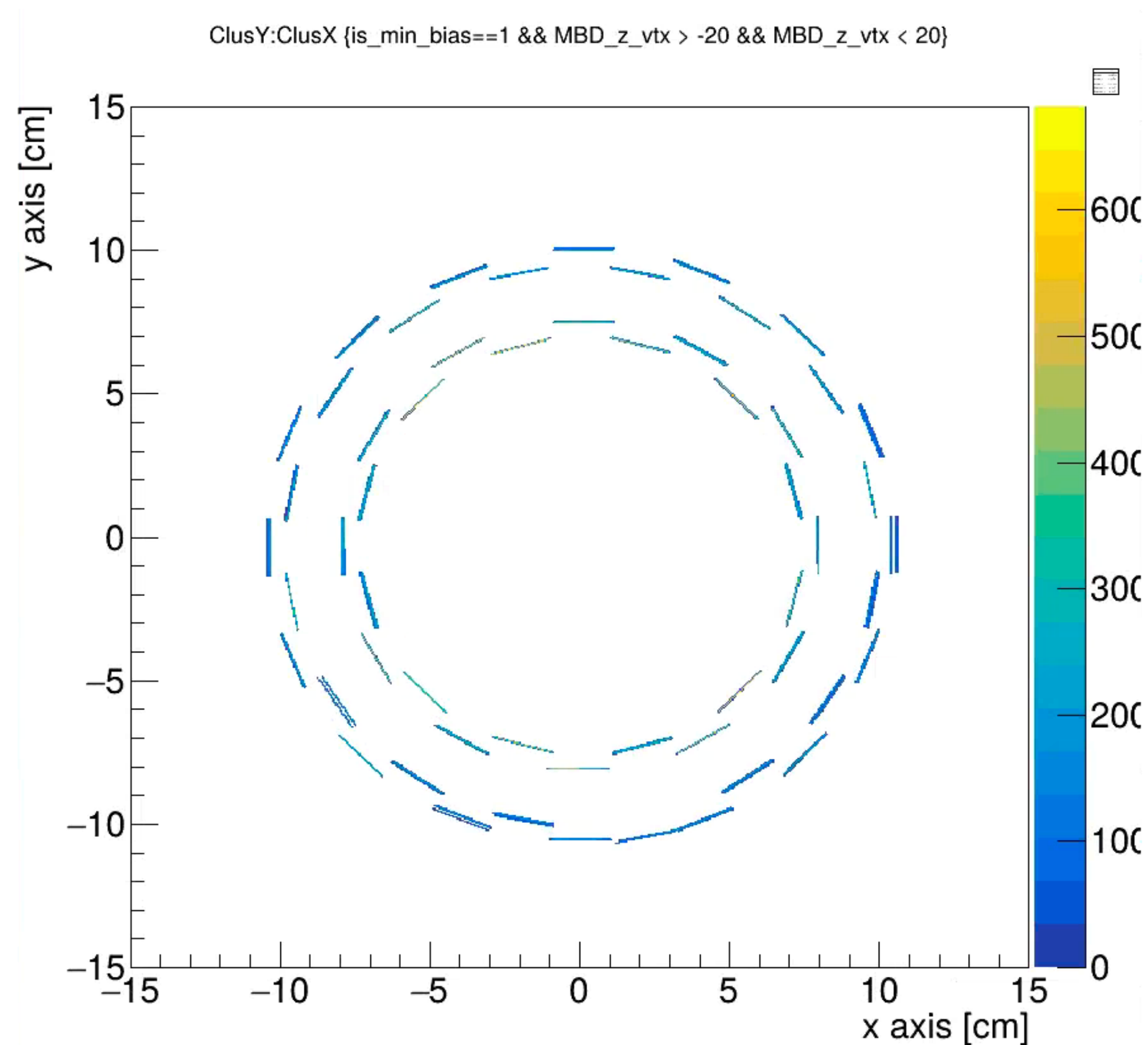


- Using run 54280 (Au+Au collision, used by PPG02) with the latest INTT geometry
 - Average xy-vertex (beam spot) reconstruction
 - Eveny-by-event z-vertex reconstruction
 - Multiplicity correlation
 - Signal-to-noise ratio
- Using Run24 Au+Au collision DAC-Scan data
 - MIP peak
- Cosmic event display

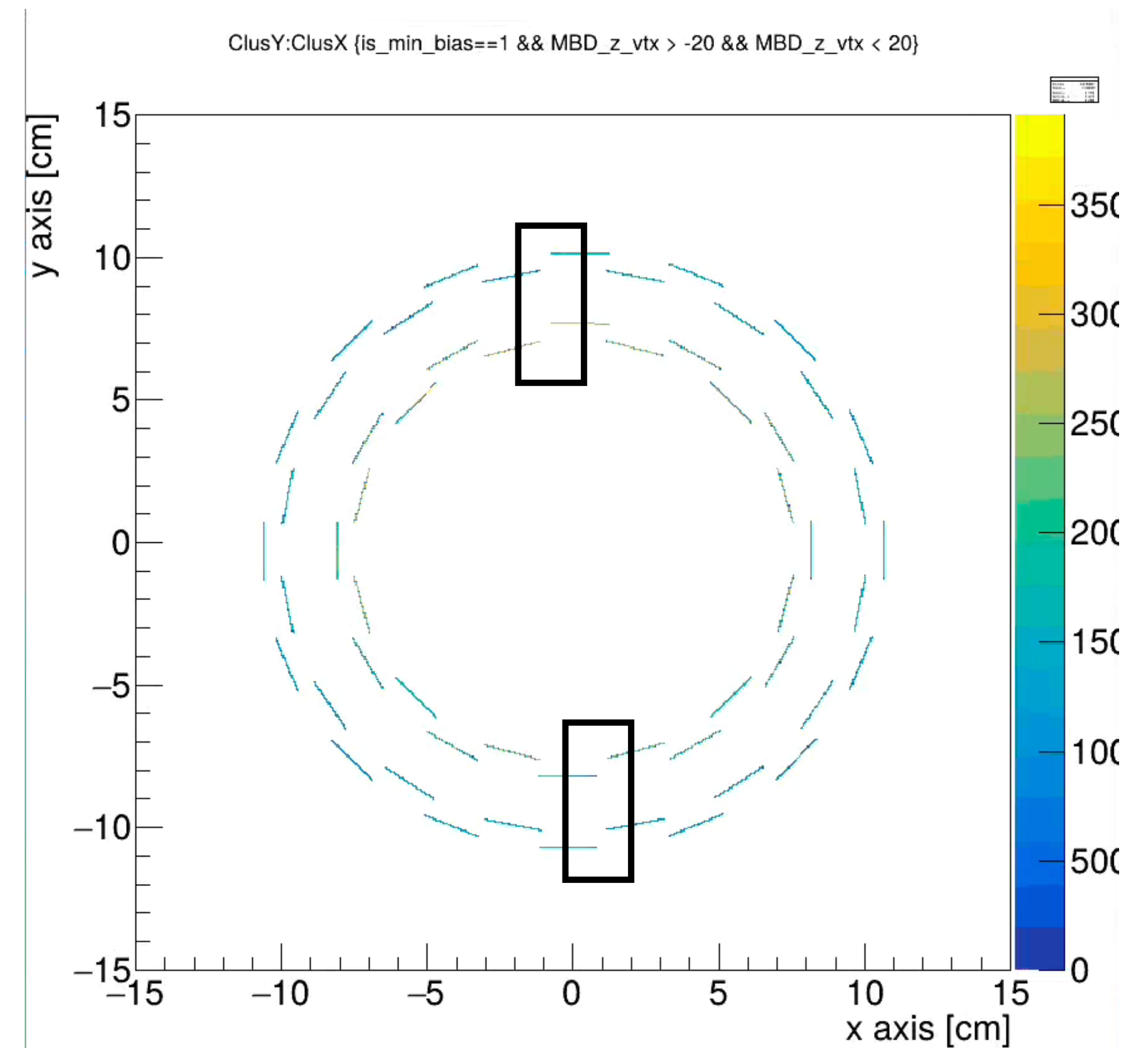
Geometry comparison

Run 54280 (zero field, Au+Au collisions, 56 x 56 bunches)

w/ the latest alignment parameter file



NO alignment correction

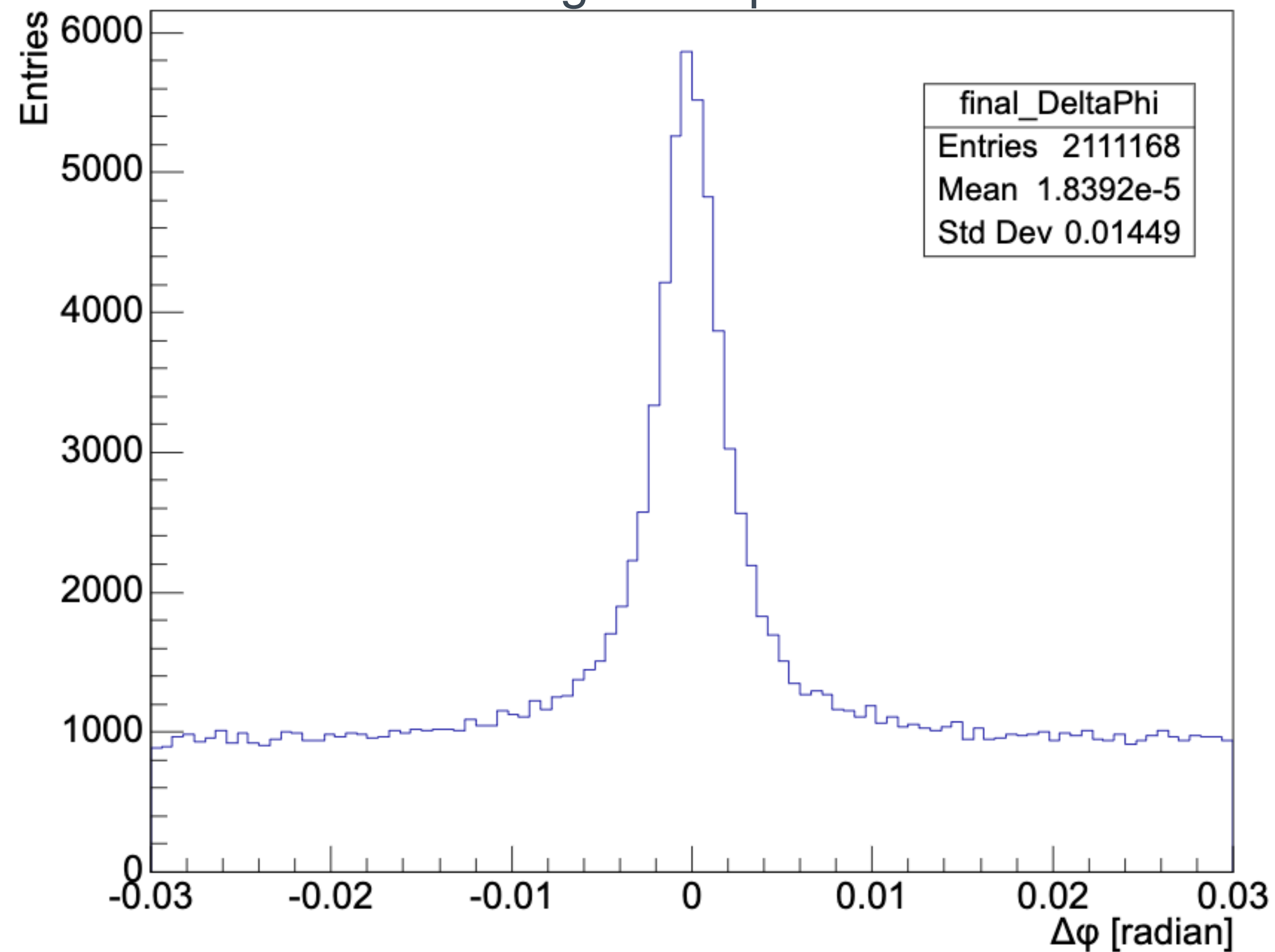


Current alignment correction has no radial constraints

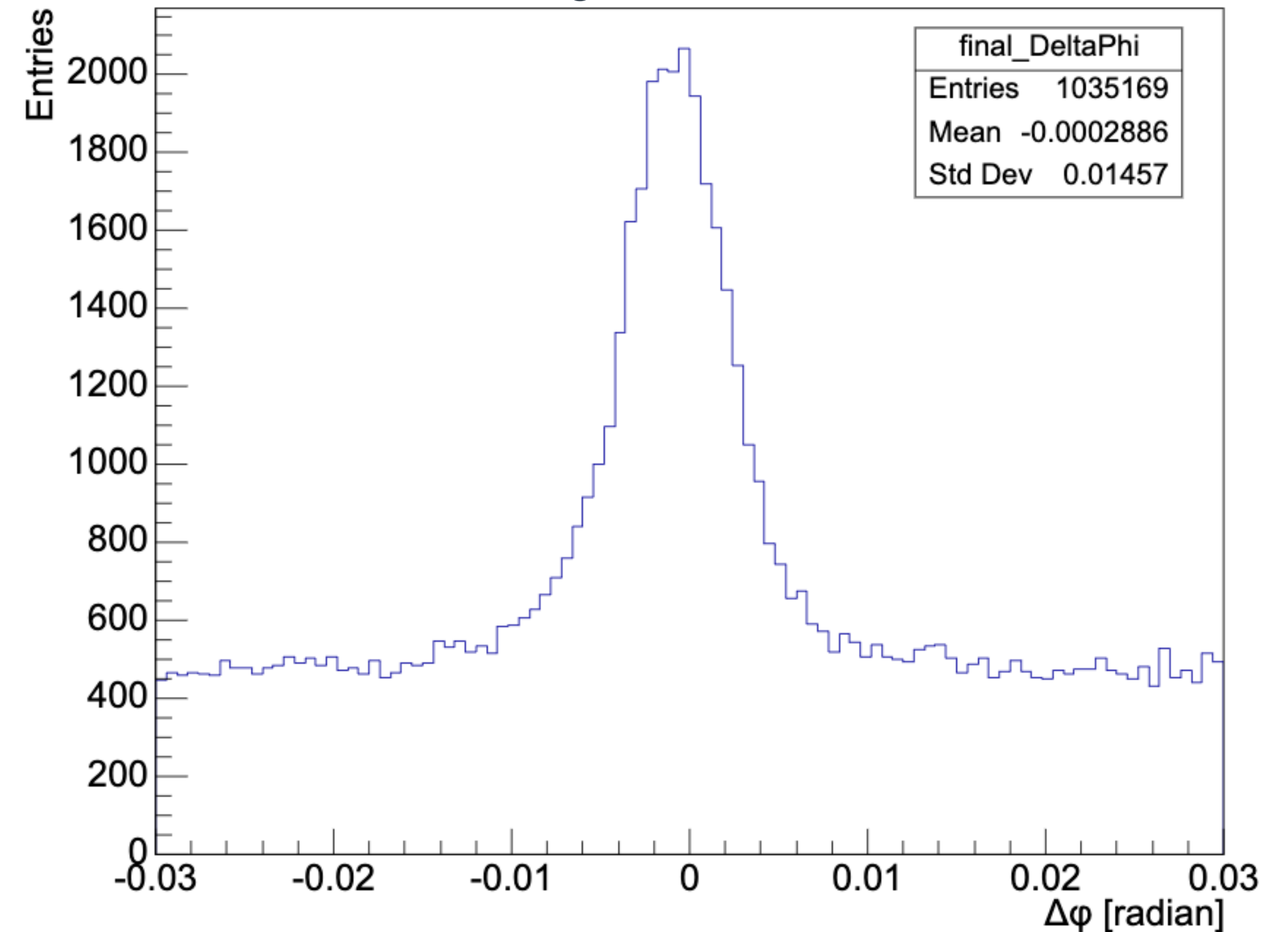
Geometry comparison

Run 54280 (zero field, Au+Au collisions, 56 x 56 bunches)

w/ the latest alignment parameter file



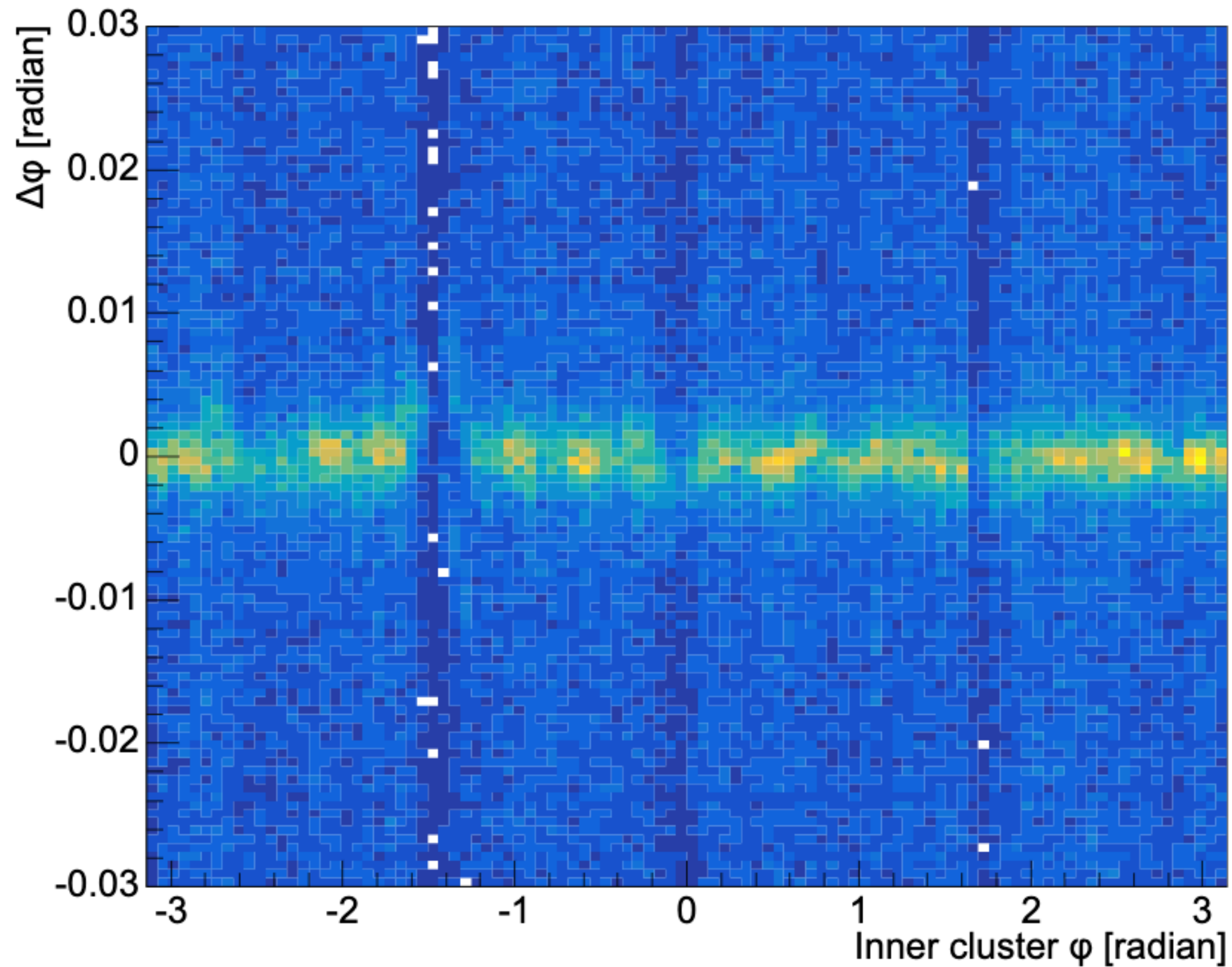
NO alignment correction



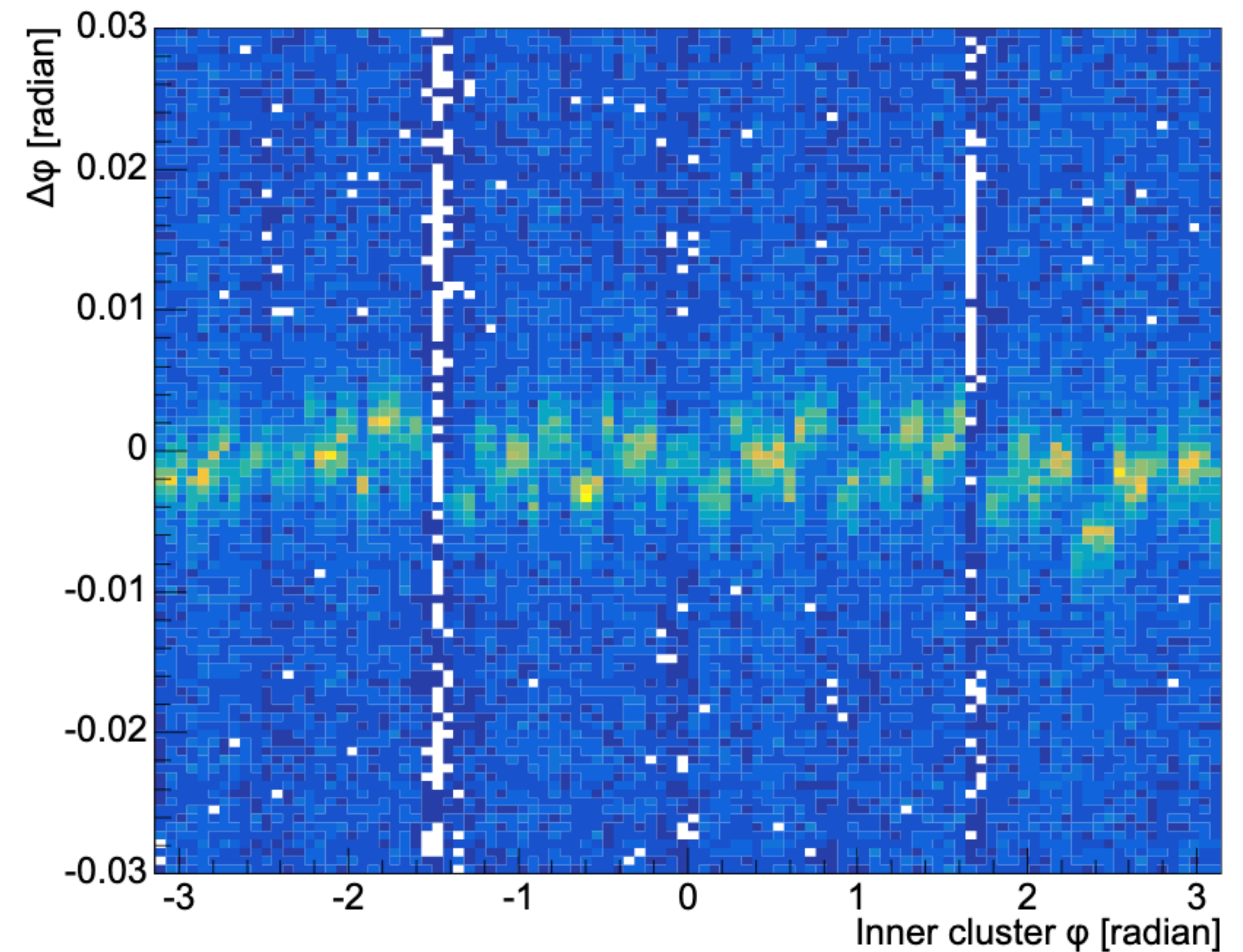
Geometry comparison

Run 54280 (zero field, Au+Au collisions, 56 x 56 bunches)

w/ the latest alignment parameter file



NO alignment correction

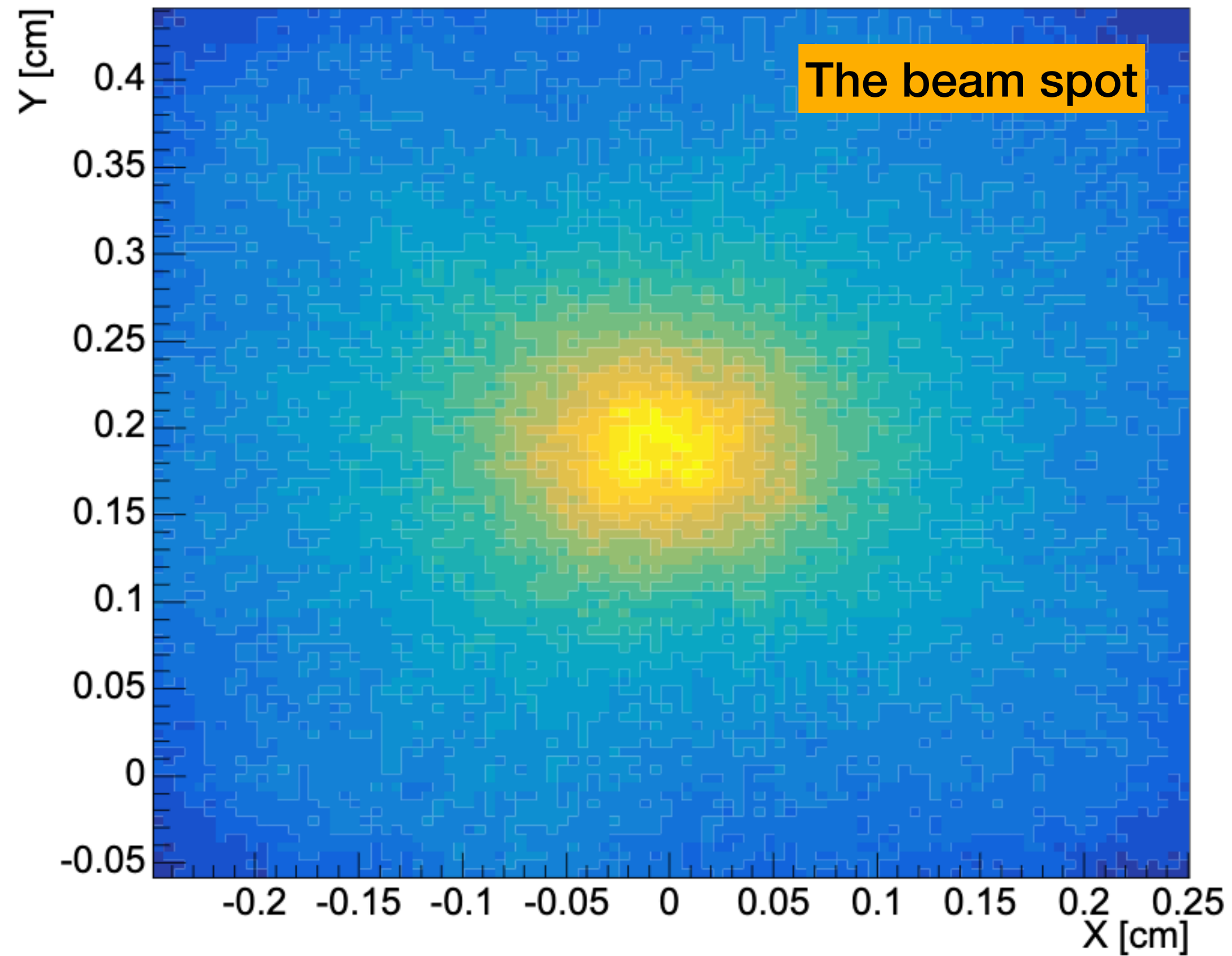


The alignment correction works quite well!

Geometry comparison - the beam spot

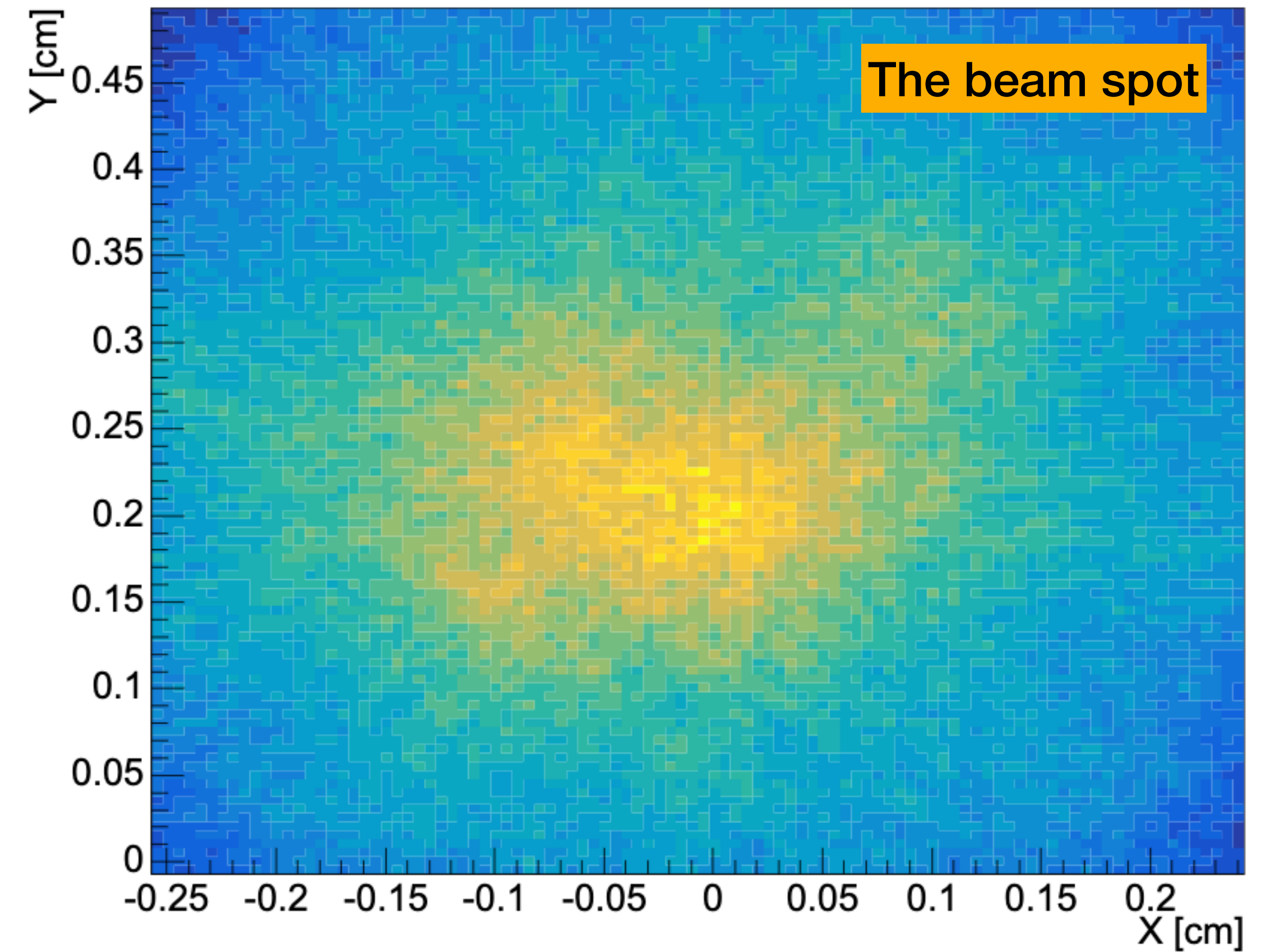
Run 54280 (zero field, Au+Au collisions, 56 x 56 bunches)

w/ the latest alignment parameter file



avg: $\{-0.00453413, 0.190553\}$ [cm]

NO alignment correction

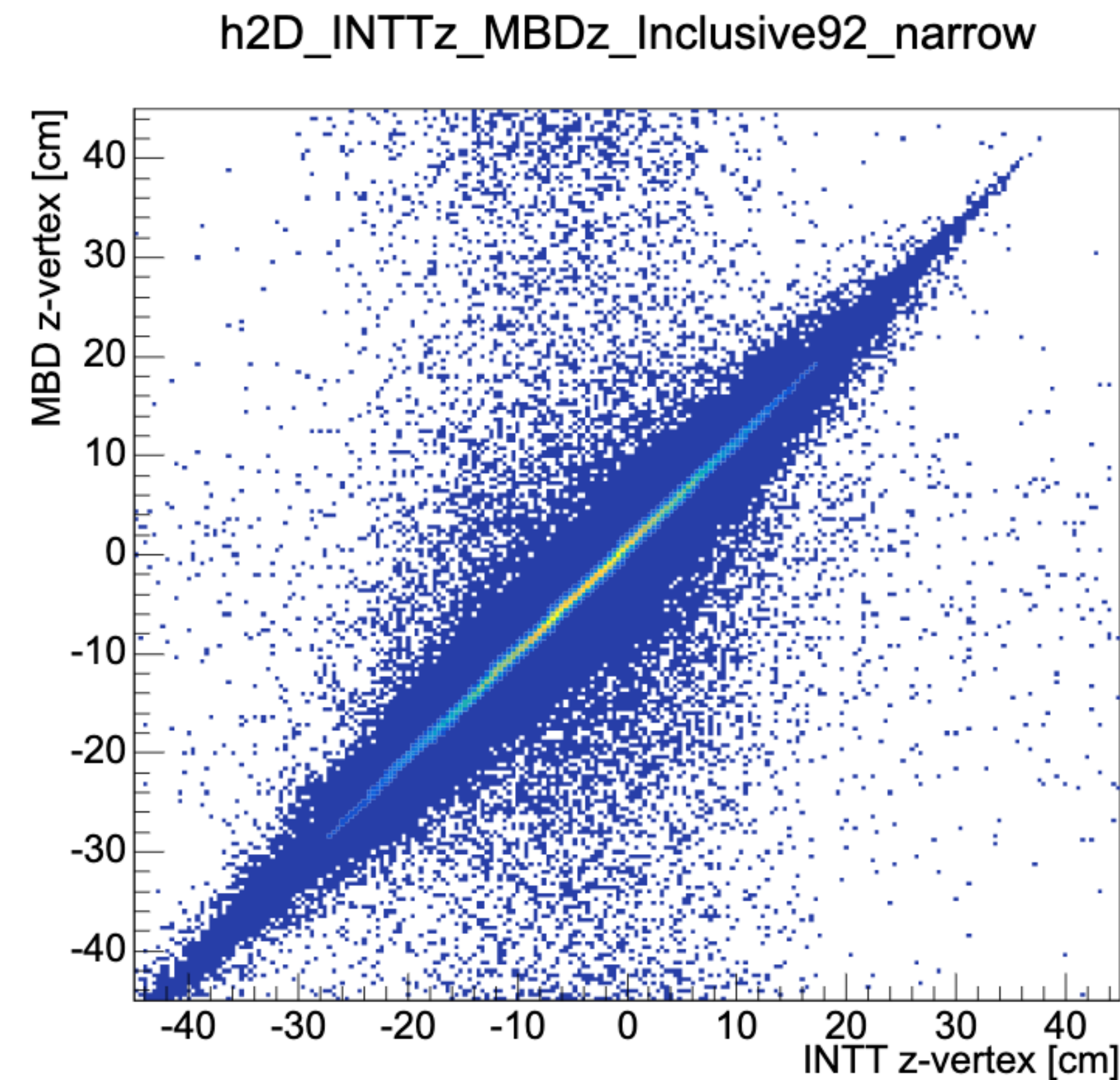


avg $\{-0.0220728, 0.222956\}$ [cm]

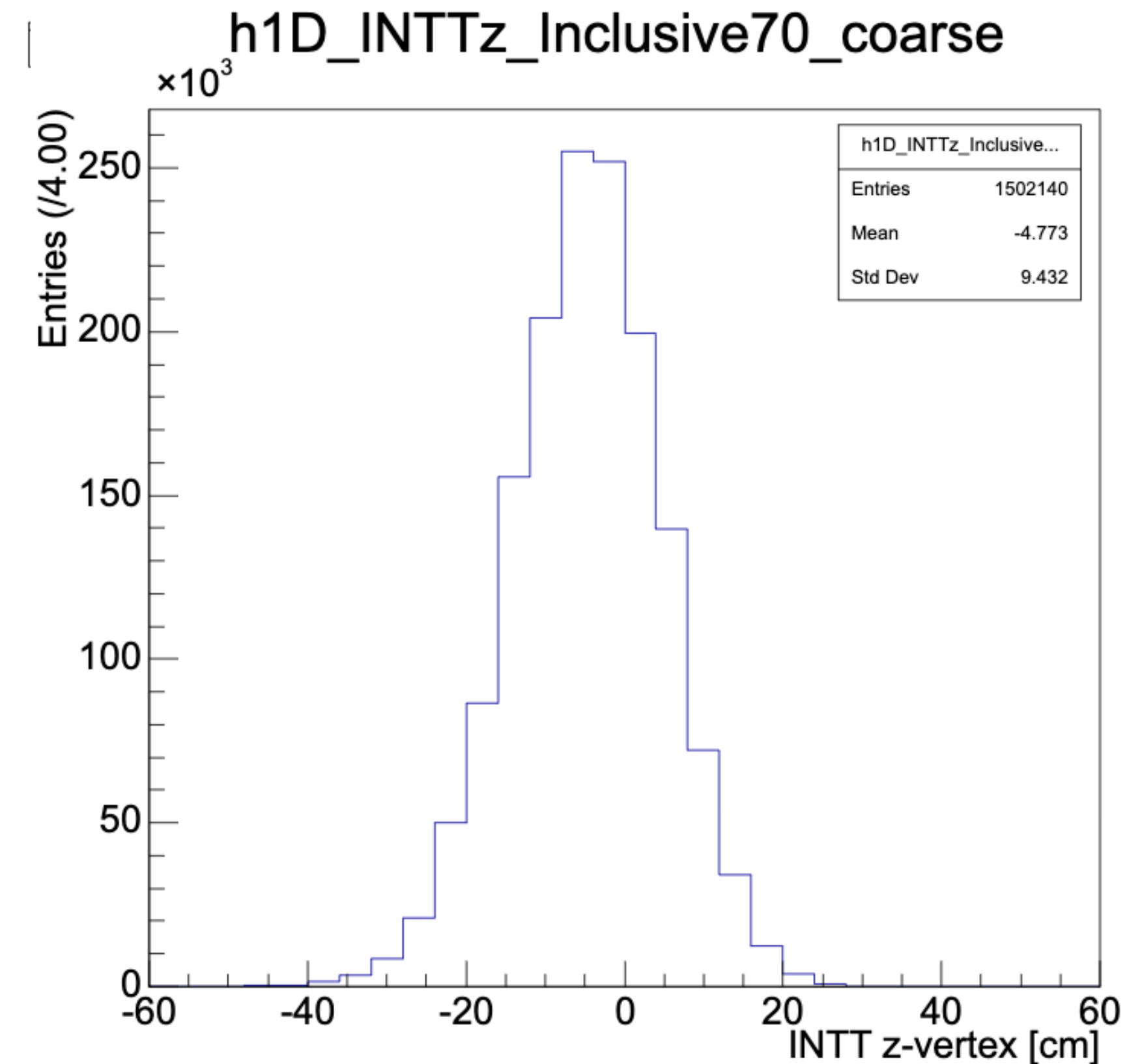
z-vertex reconstruction

Run 54280 (zero field, Au+Au collisions, 56 x 56 bunches)

Event Selection:
is_min_bias == 1
MBD z-vertex reconstructable
INTT z-vertex reconstructable
MBD centrality has value
Event interval ≥ 61 BCOs
INTT vtxZ QA
MBD charge asymmetry cut

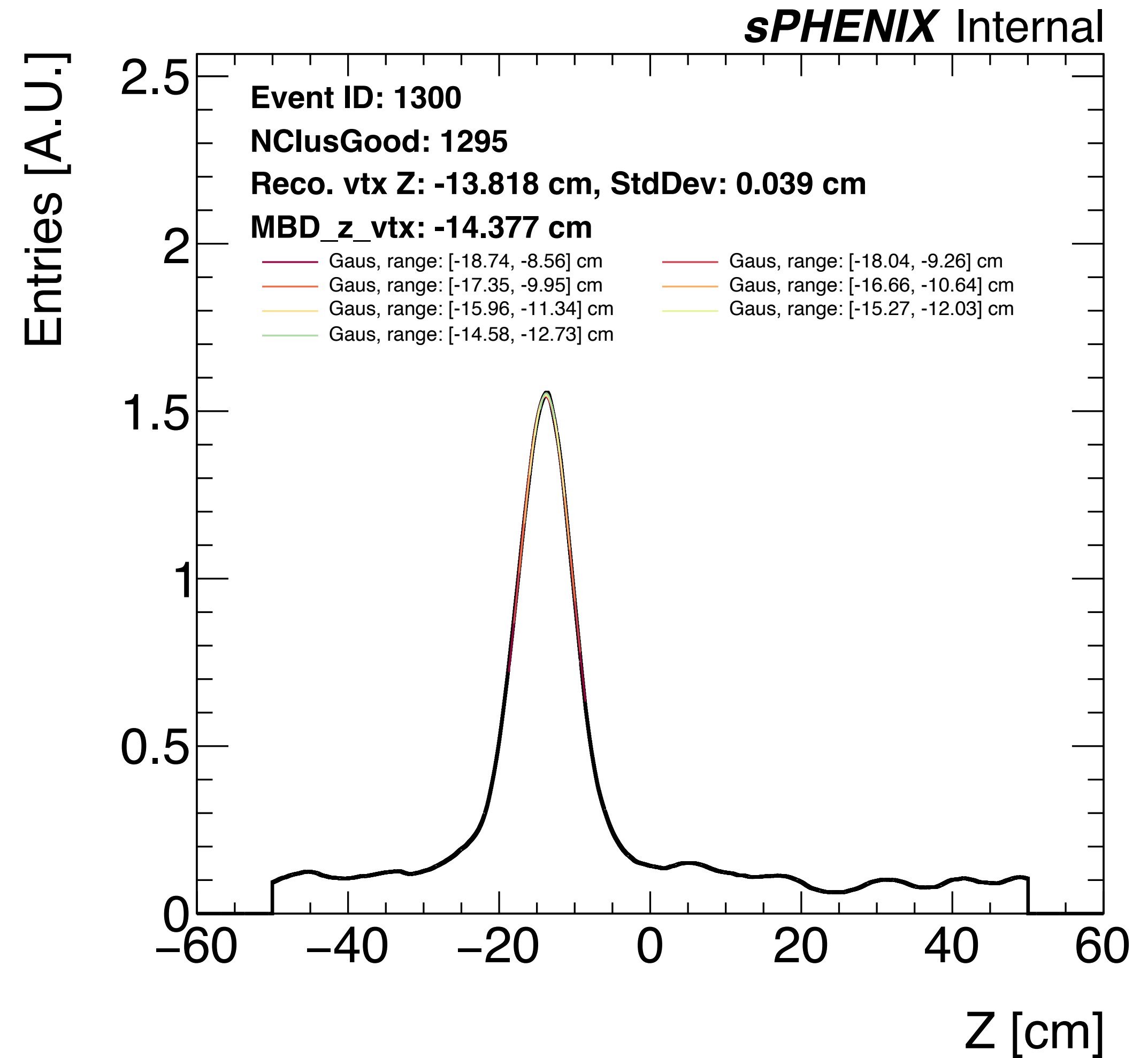


Centrality ≤ 92



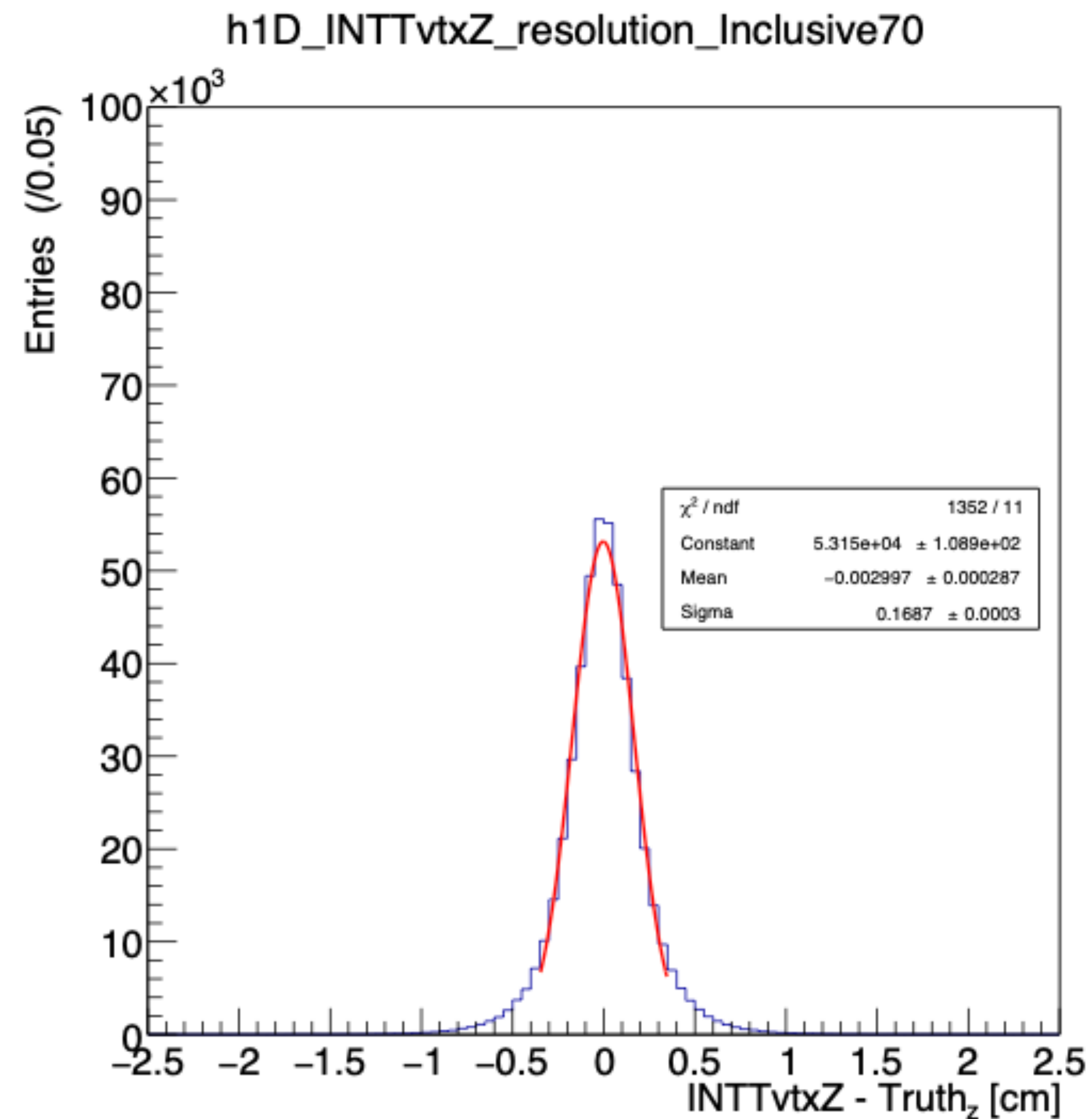
Centrality ≤ 70

Single event



z-vertex reconstruction, resolution

Evaluated using HIJING MC simulation



between the INTT ladder and the beamline. In contrast, the z-vertex variation is significantly

– 6 –

larger, approximately 9.4 cm. Determining the z-vertex on an event-by-event basis is crucial for accurately establishing the tracklet kinematics. This is achieved with a reconstruction resolution of 0.17 cm for the selected centrality interval as determined in simulation.

JHEP08(2025)075

This value of 0.17 cm is quoted in the paper (Au+Au collisions)
May be interesting to use the three-value method to obtain a data-driven value (doable)

Multiplicity correlation

Run 54280 (zero field, Au+Au collisions, 56 x 56 bunches)

Event Selection:

is_min_bias == 1

MBD z-vertex reconstructable

INTT z-vertex reconstructable

MBD centrality has value

Event interval ≥ 61 BCOs

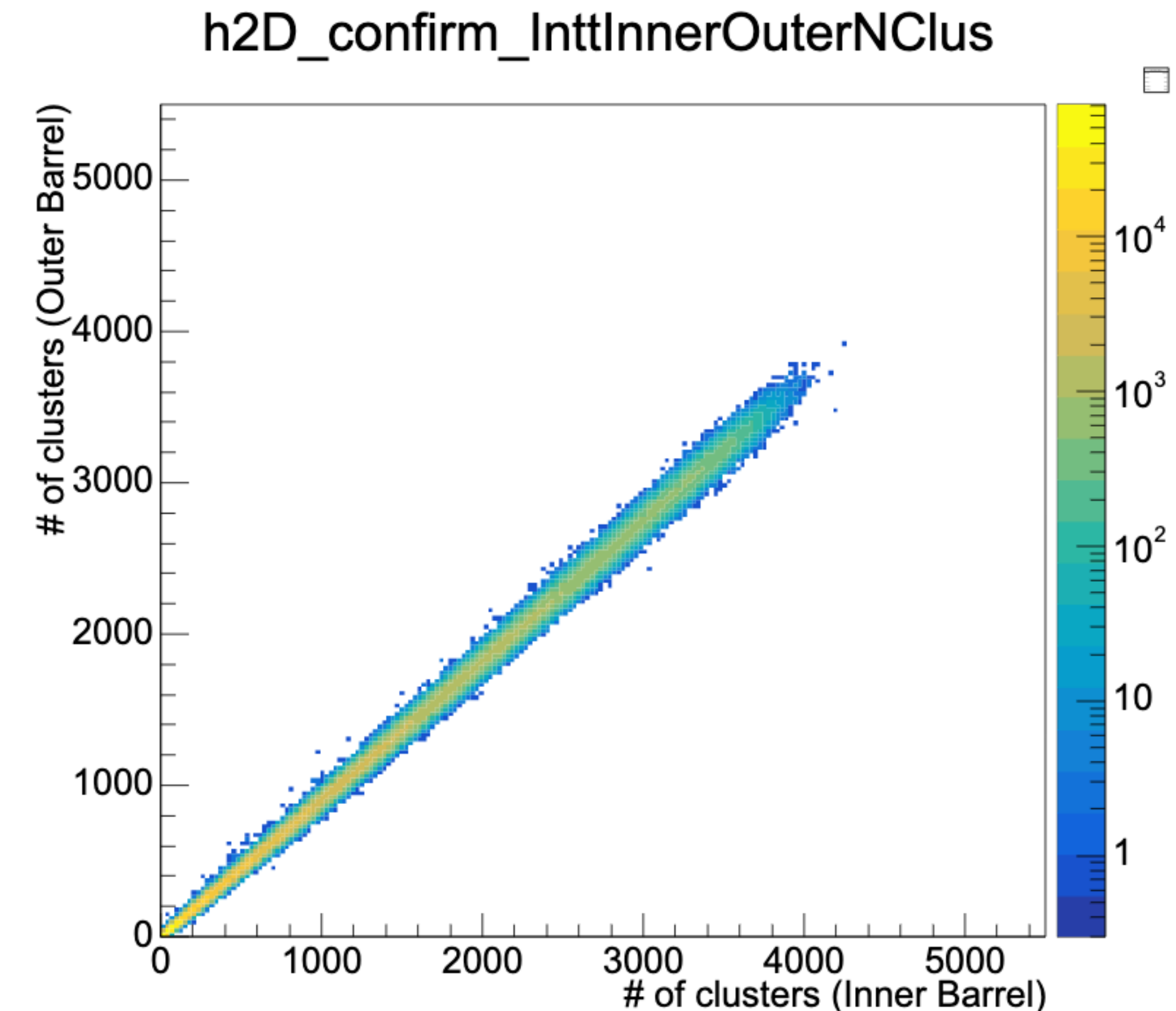
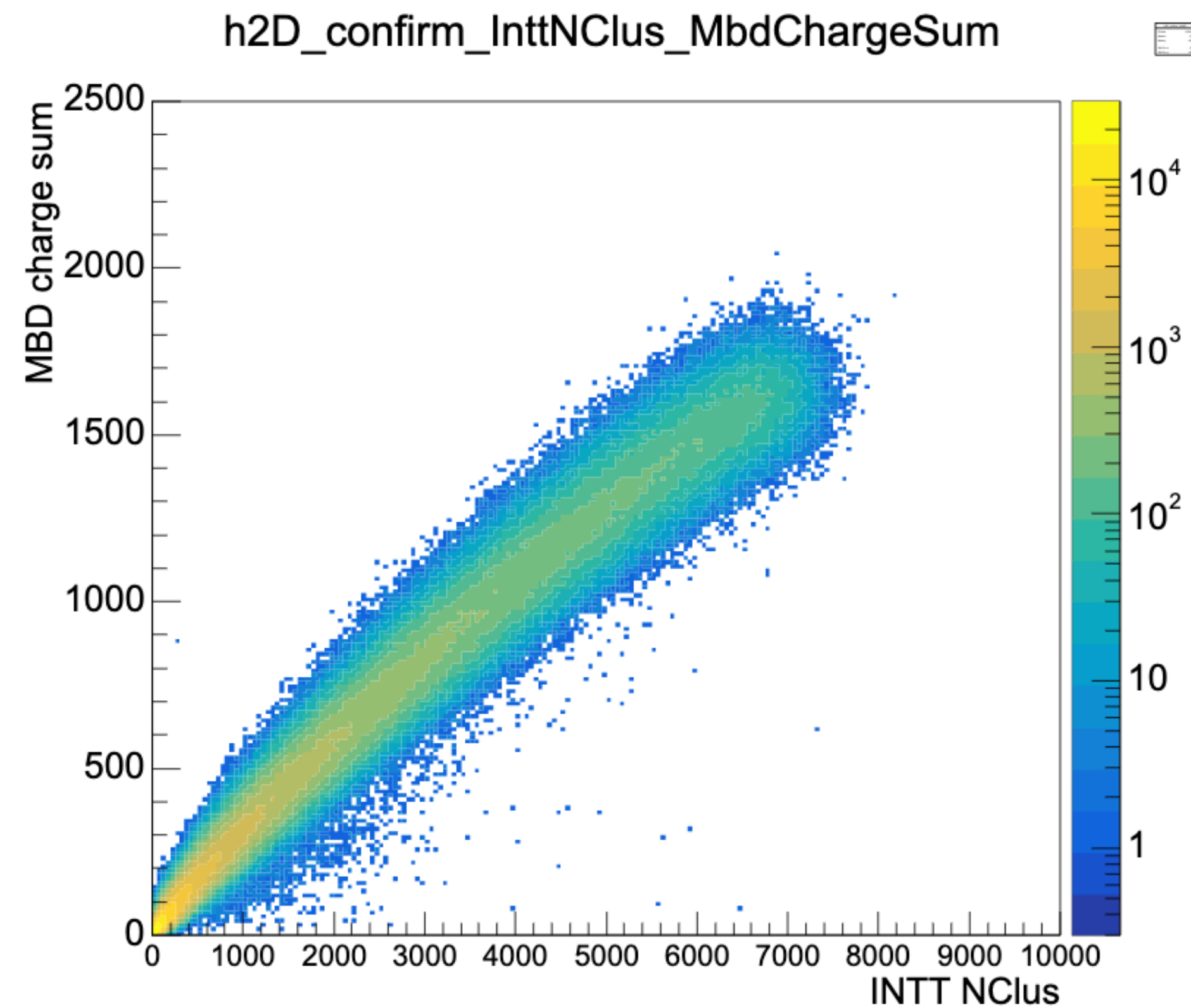
INTT vtxZ QA

MBD charge asymmetry cut

INTT cluster cut:

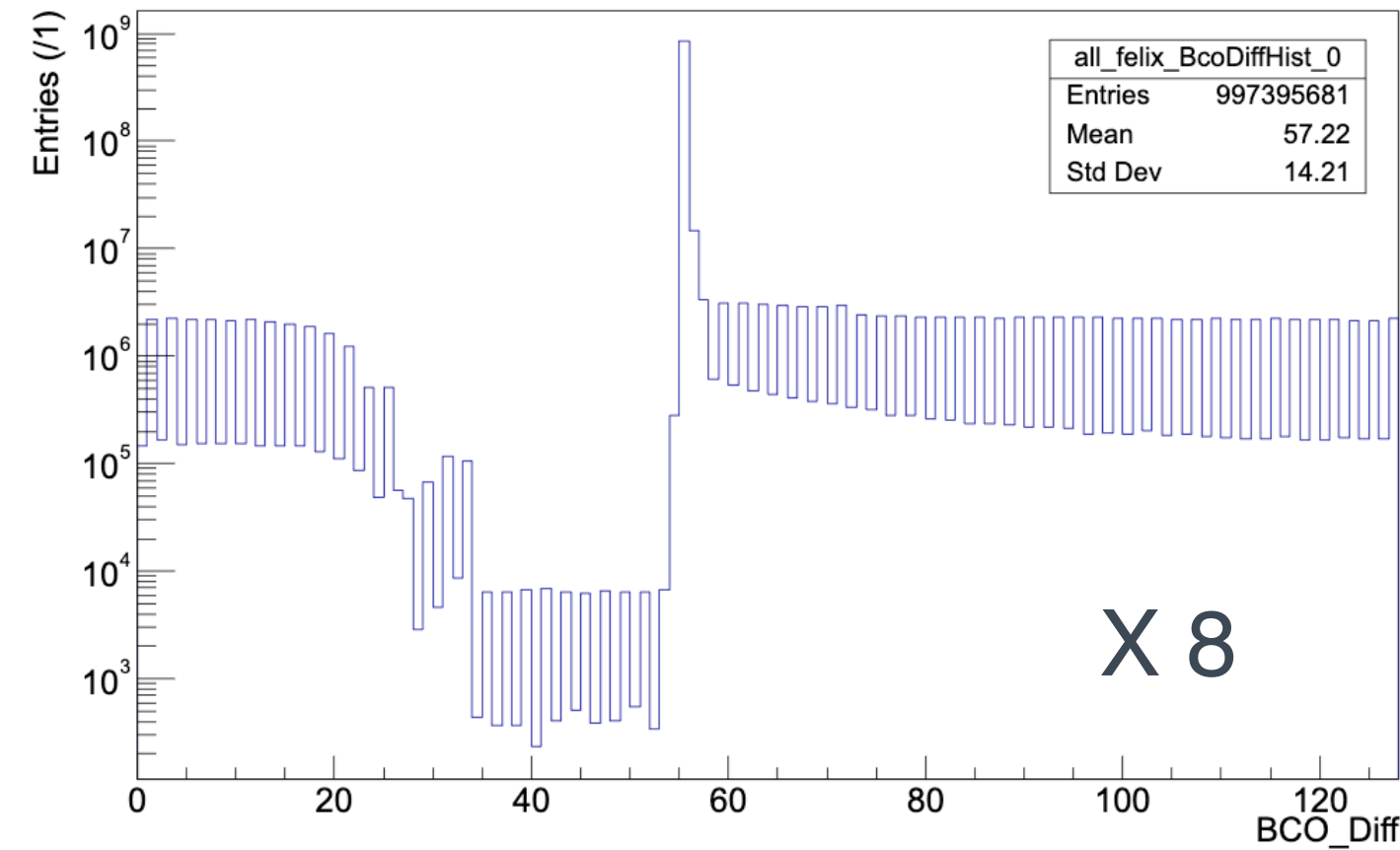
cluster ADC > 35

cluster size ≤ 40

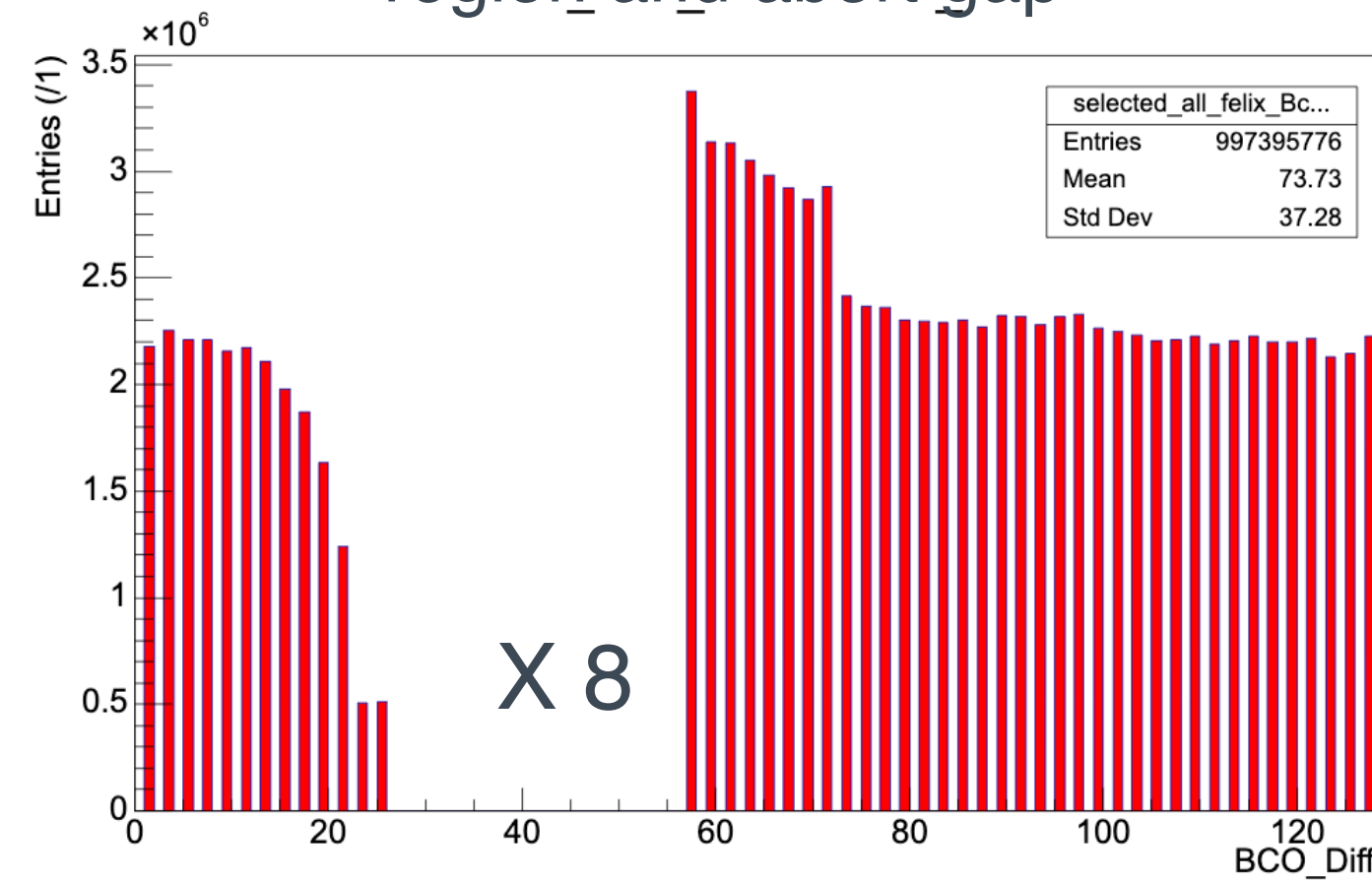


Only events with MBDNS_VtxZ30cm_trig live trigger are included (1683940 events)

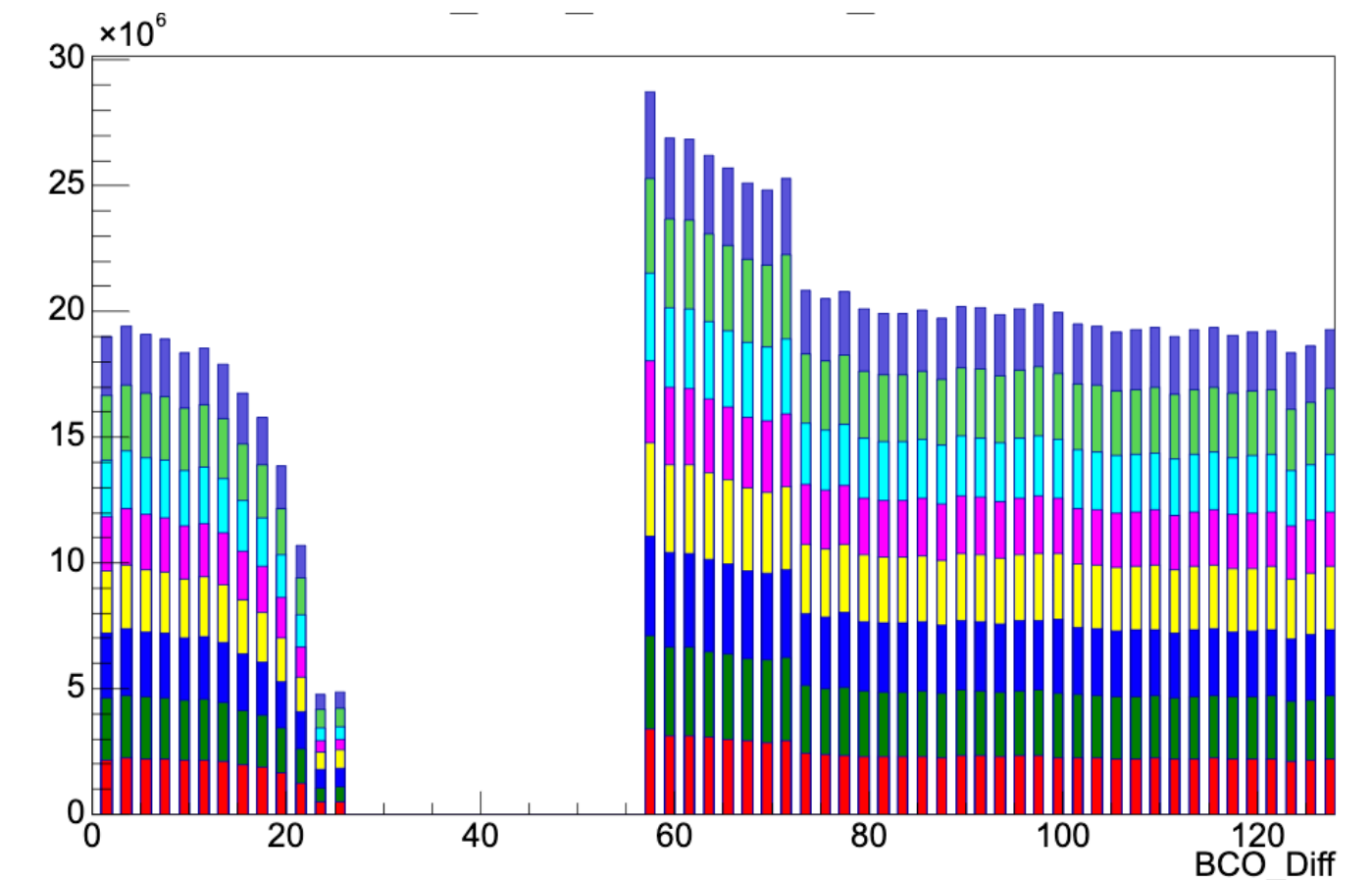
1. Time_bucket distribution for each FELIX



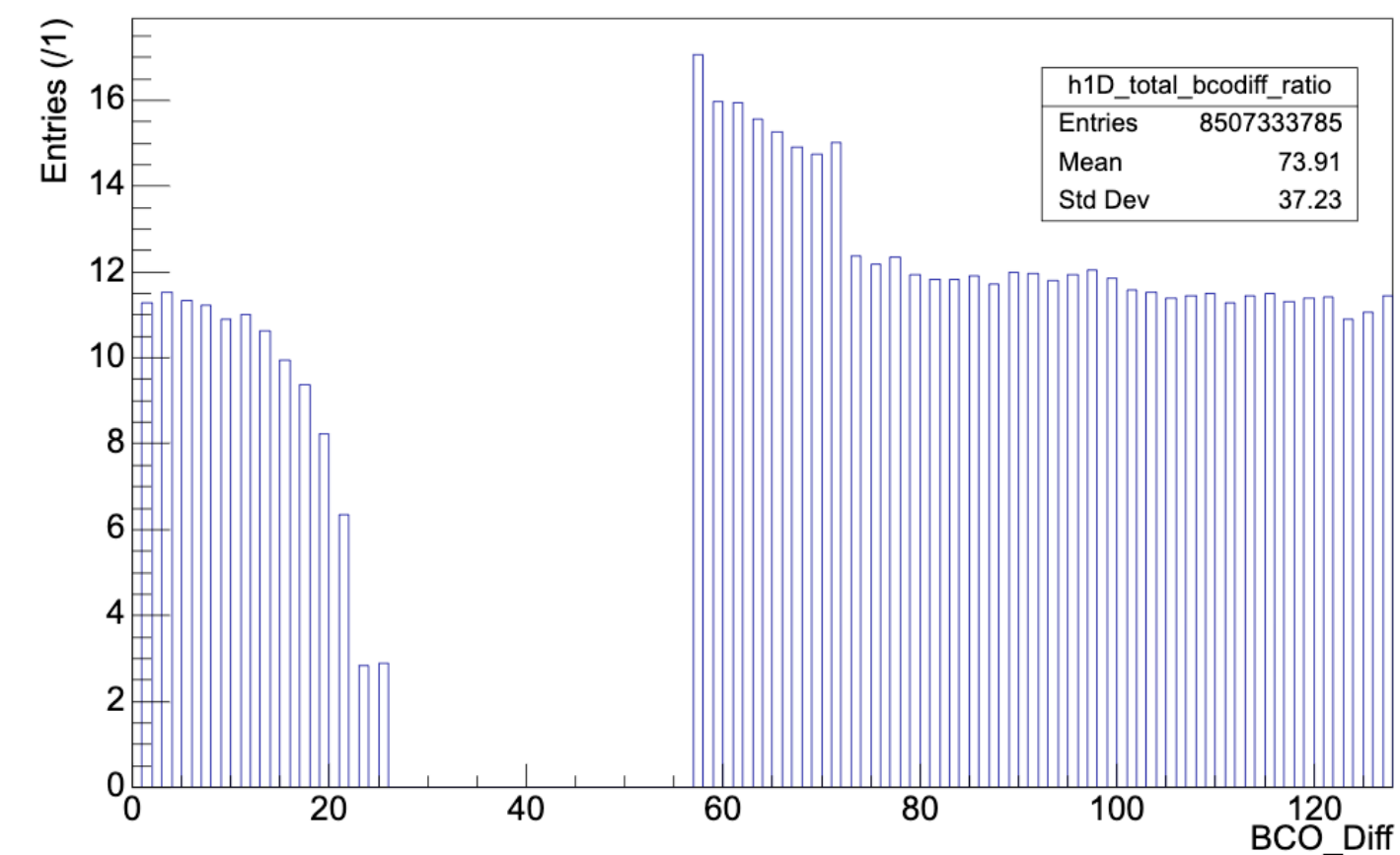
2. Remove the collision bins, trigger region_and abort gap



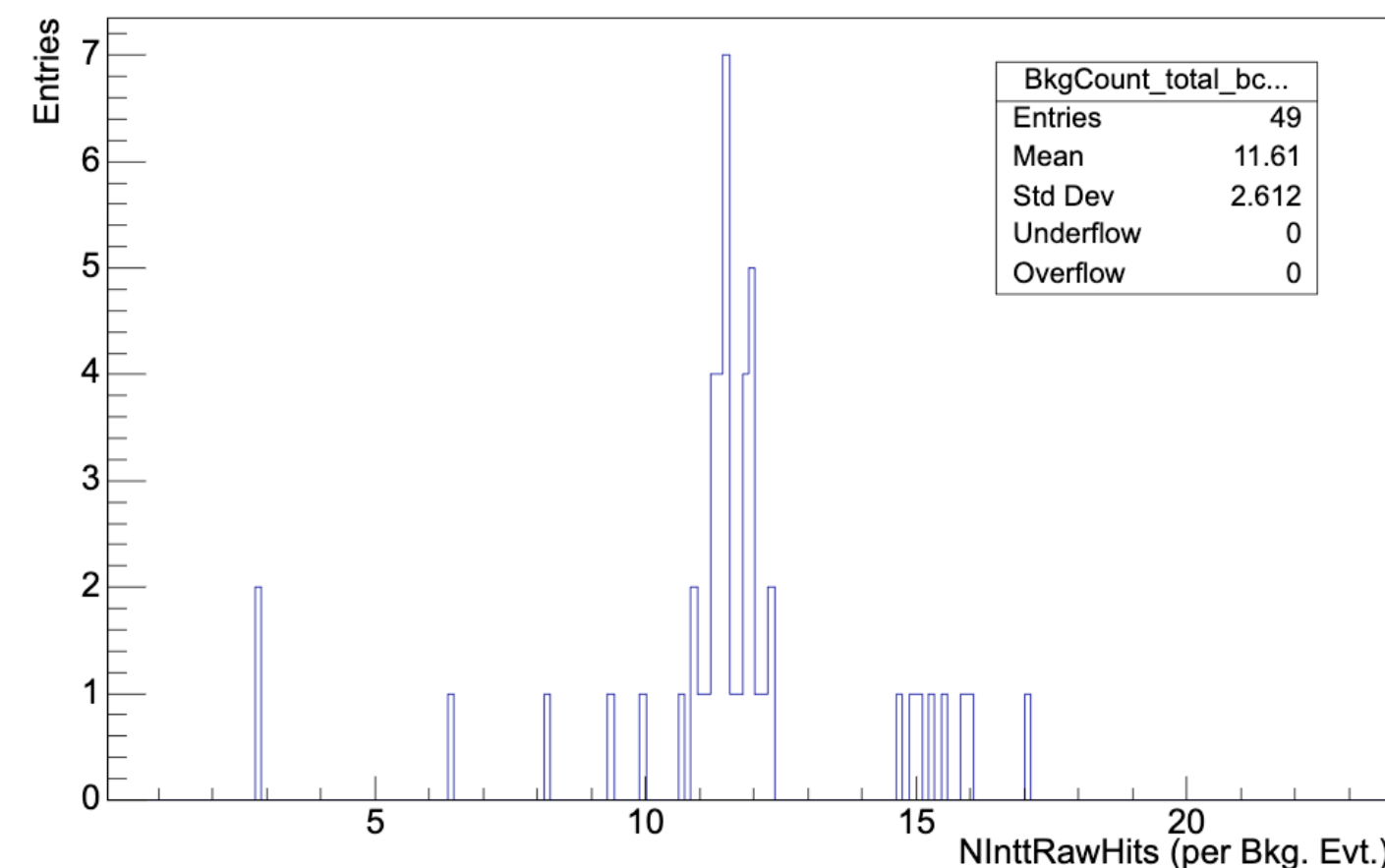
3. Stack all eight distributions



4. Scale down by number of selected events



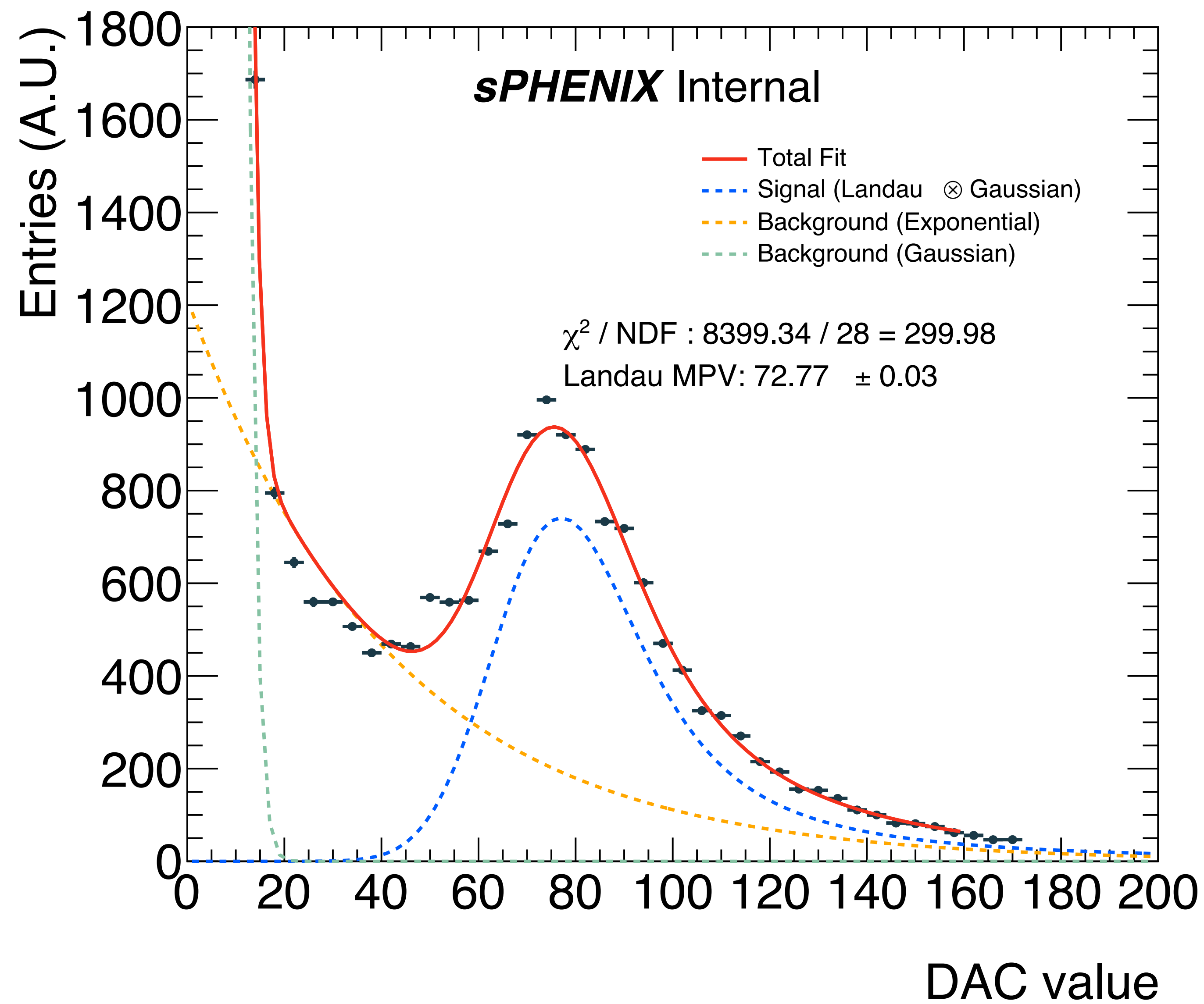
5. Fill all the bin contents



- 56 x 56 crossings: half of the bunch crossing slots are with no collision. The hits in those empty slots are considered as noise hits
- Hot channels masked applied, clone hits removed
 - Same condition as the cluster data
- Results: 11.61 (w/ StdDev 2.61) noise hits per event per bco
- Average # of hits in triggered bin: 7339261187/1683940. = 4358.39
- Ratio: 11.61 / 4358.39 = 0.26% (w/ threshold 35 ADC)

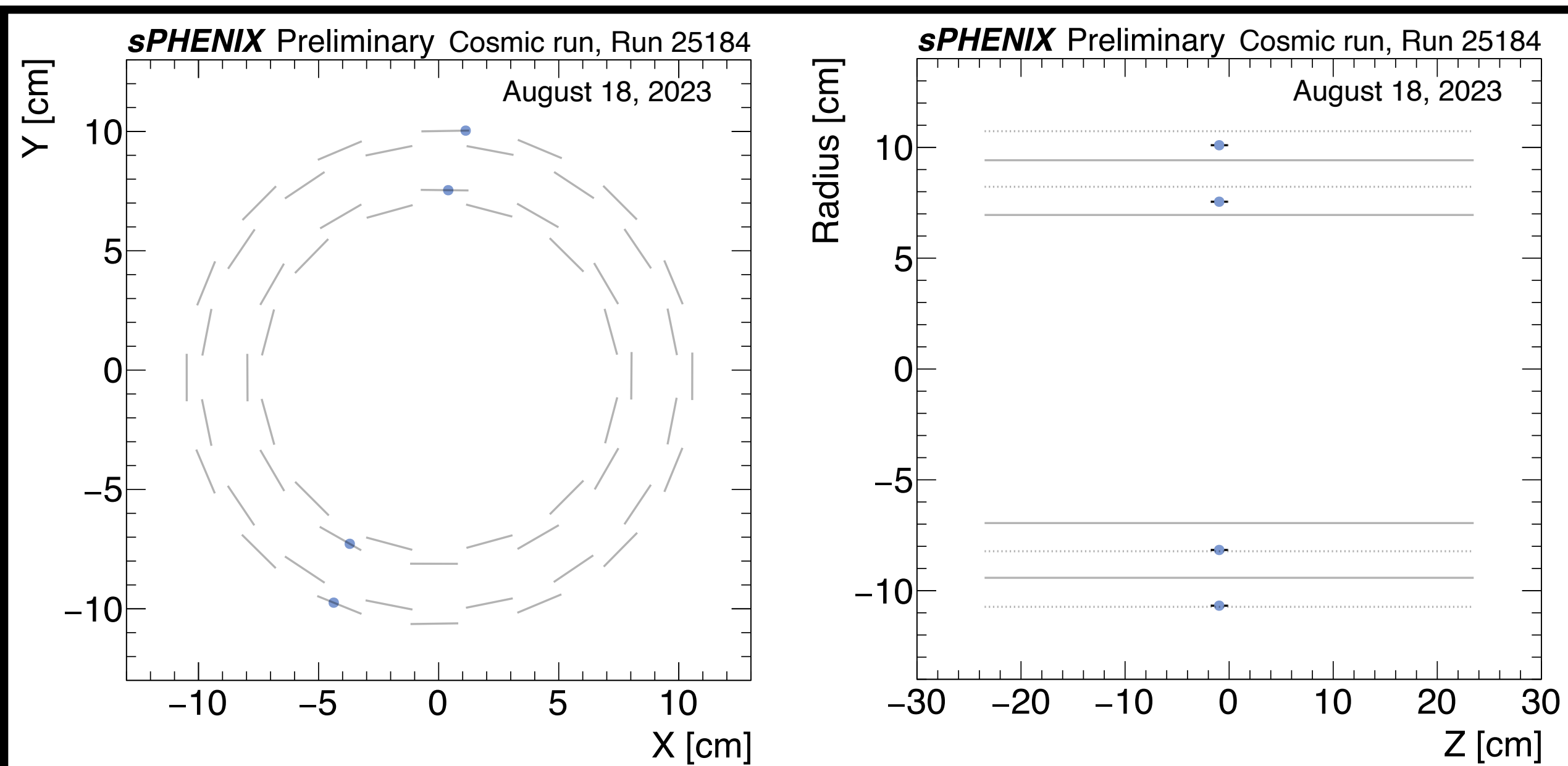
Run24 Au+Au data

Field-on
Au+Au collisions
Local mode
100 V bias
“control” sample

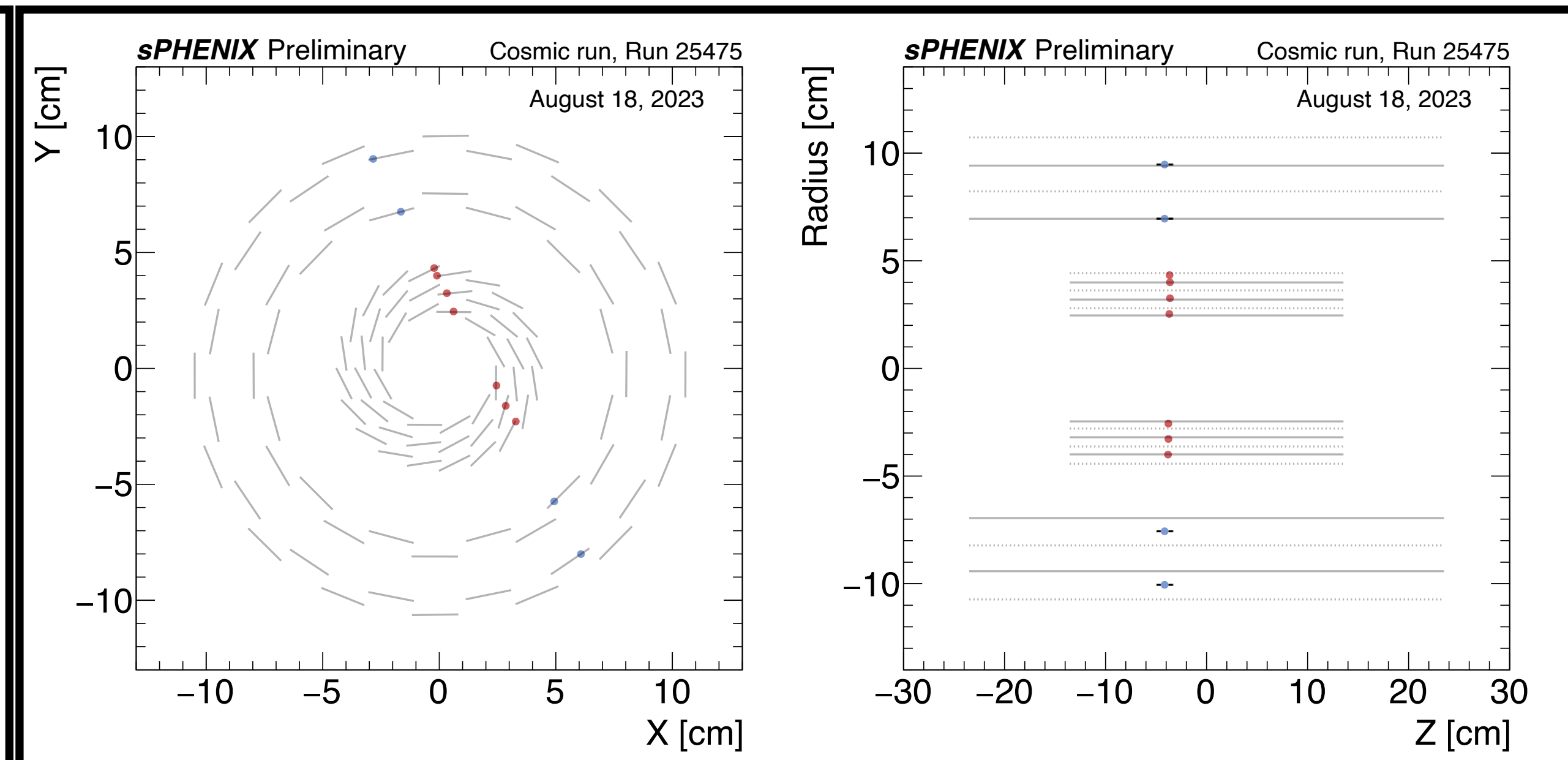


Cosmic ray event display

INTT standalone



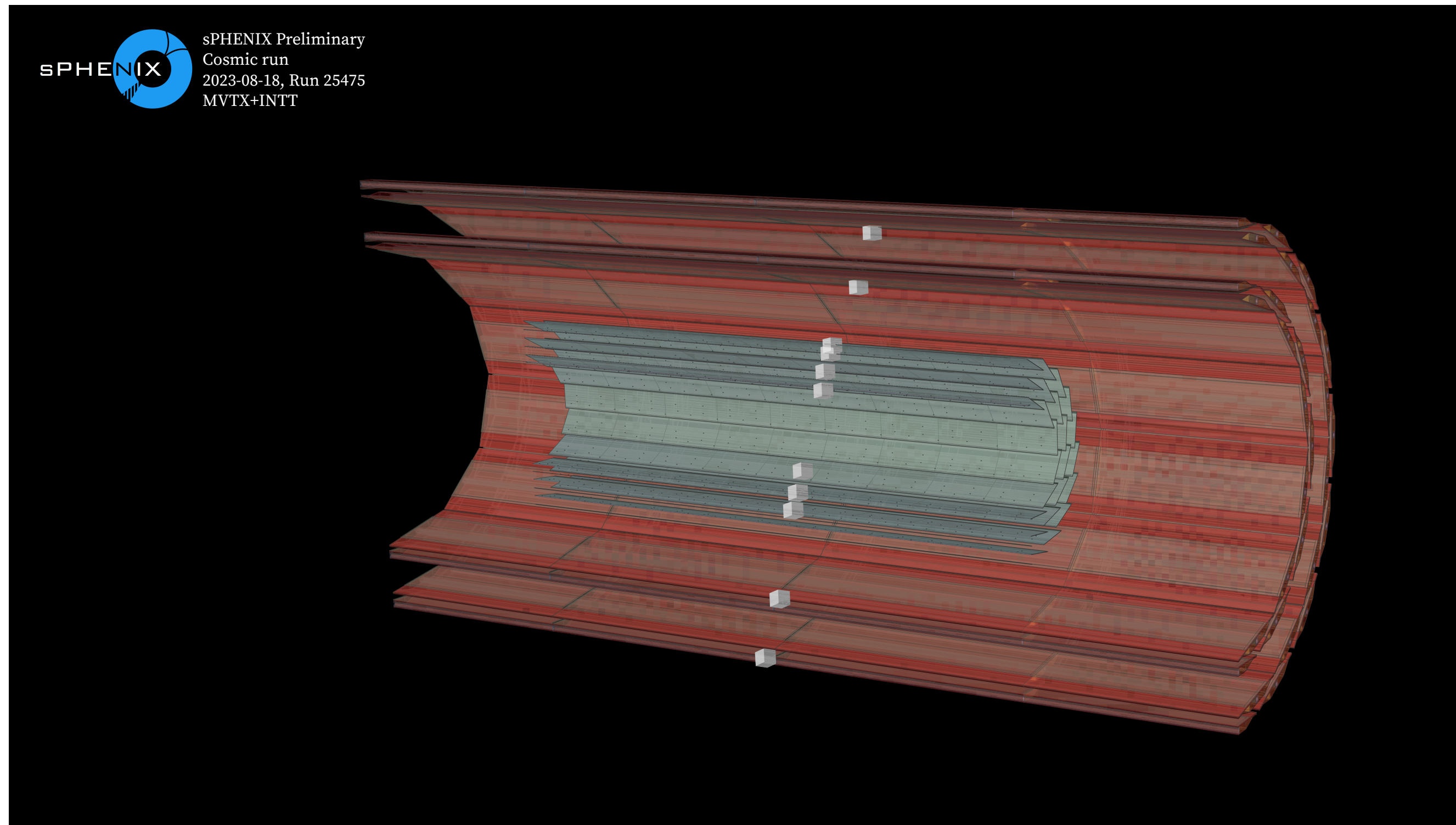
MVTX + INTT



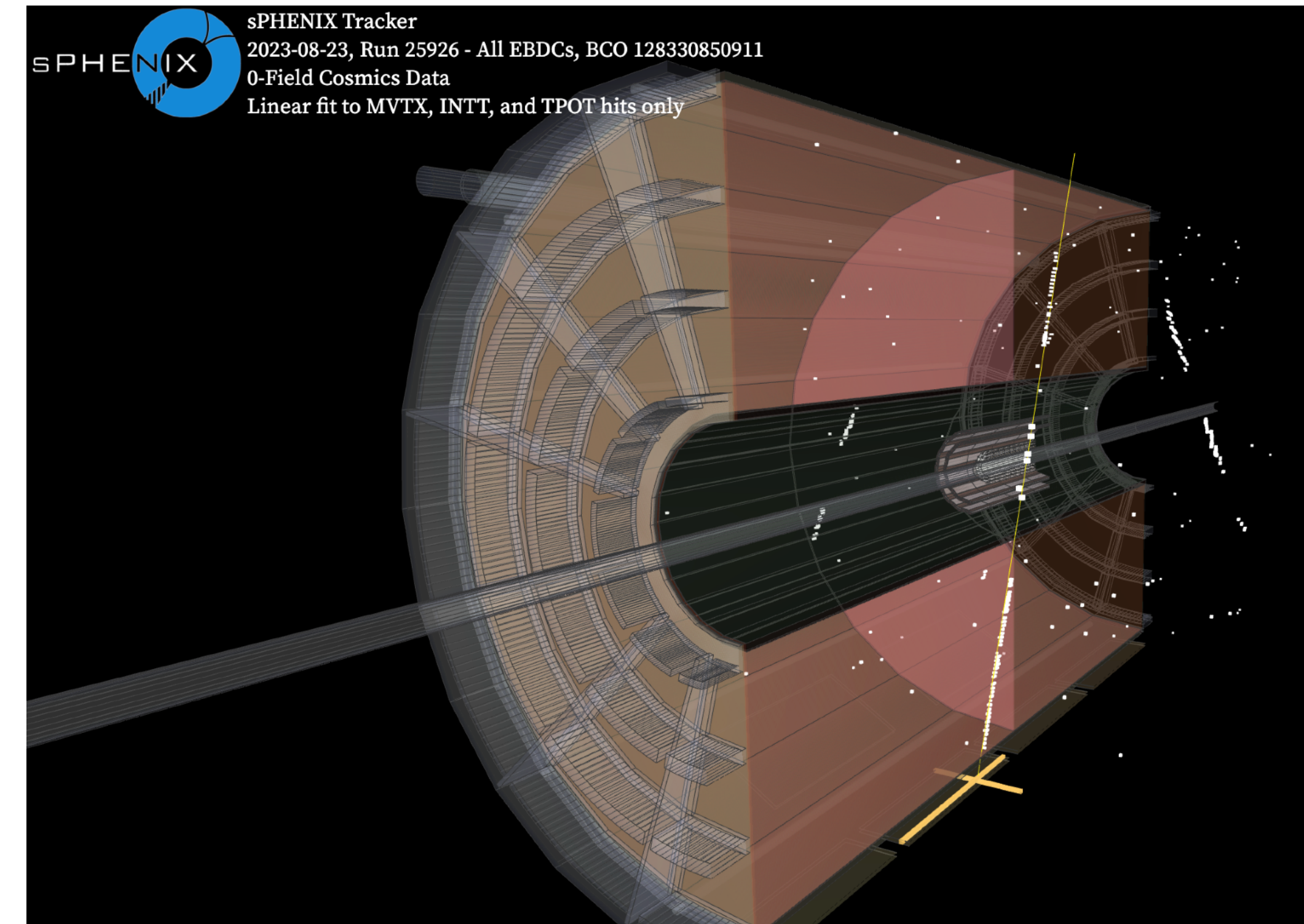
Plots from the [sPHENIX web](#)

Cosmic ray event display

MVTX + INTT



Full sPHENIX tracking system

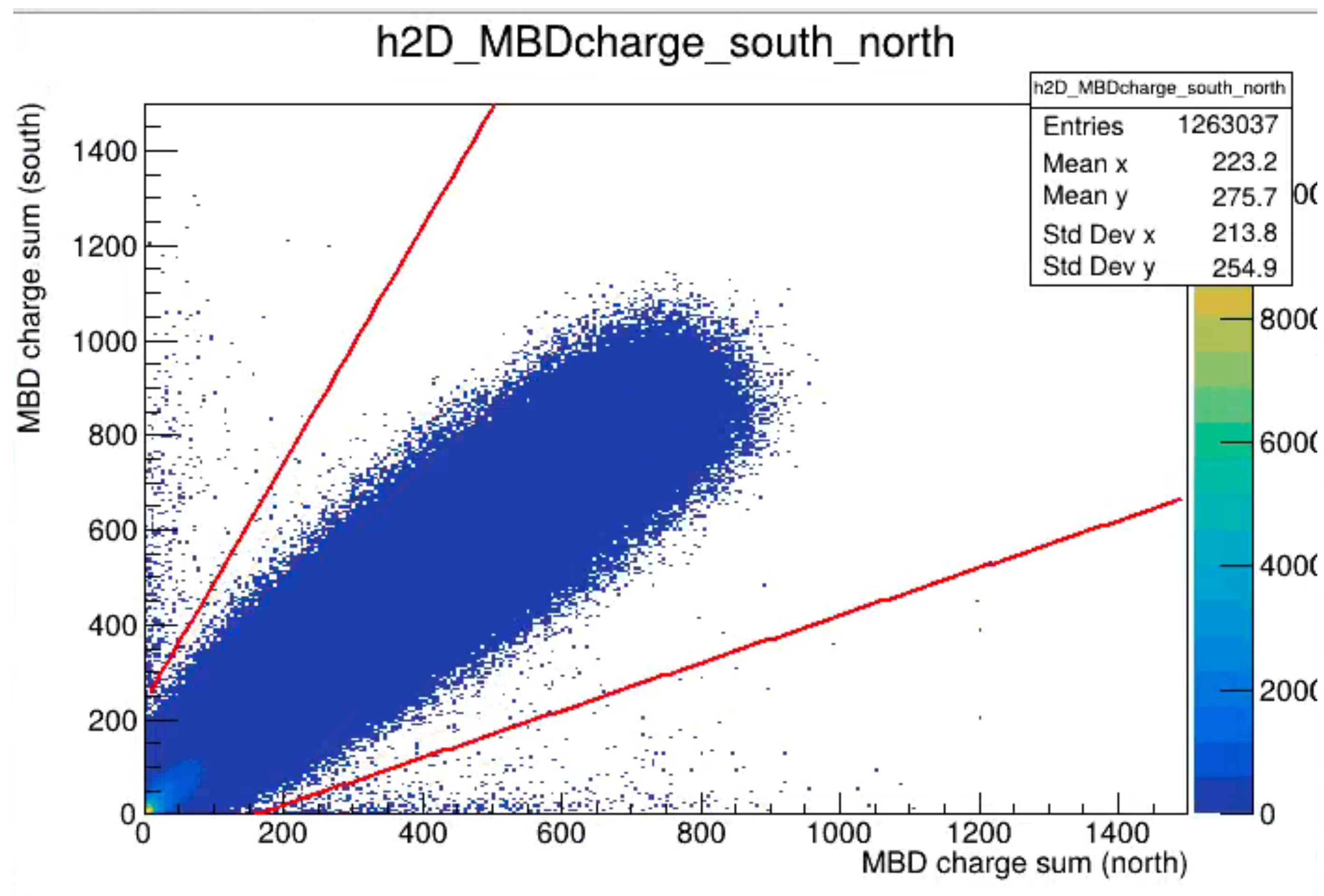


Plots from the [sPHENIX web](https://sphenix.web.cern.ch/)

- First round of showcase of available plots for the INTT barrel NIM paper
- For plots using collision data
 - INTT part: with latest alignment correction file (using ana.520)
 - MBD part: consistent with PPG02 analysis (using ana.441)
- For cosmic plots
 - Though it's old, but should be ready to go
- It's up to the committee's decision what to be included
- I can try to look into the latest zero-field Au+Au run taken this year

Back up

The MBD asymmetry cut



unit : [cm]
final average vertex XY should be used :
line filled X : $-0.00610342 \pm 0.00122848$
line filled Y : 0.189778 ± 0.000993072
quadrant X : $-0.00296484 \pm 0.00442758$
quadrant Y : 0.191328 ± 0.0026492
avg: $\{-0.00453413, 0.190553\}$ [cm]
Fit avg: $\{-0.0061016, 0.189775\}$ [cm]