The first look at INTT Run24 AuAu collision data

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sPHENIX INTT sPHENIX 國立中央大學 National Central University RIKEN

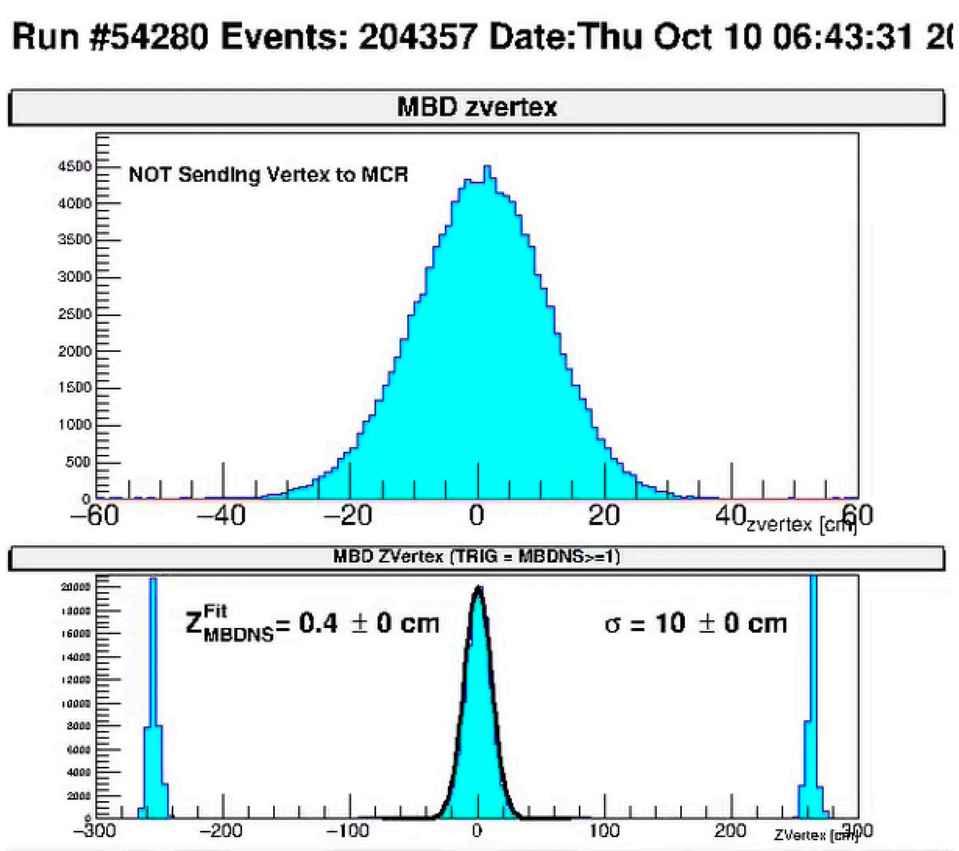
Run description - 54280

- Au+Au collisions at $\sqrt{s} = 200\ GeV$ in zero field
- Data taking time: 1 hour (2024-10-10 05:43:52 → 2024-10-10 06:44:03)
- Number of events: 10,610,255
- Official DST production was not available* → Private production with F4A
  - .evt files → INTTRawHit DST → TrkrHitSet → TrkrCluster
  - Analysis build: ana.439
- 1M production is still ongoing, the first 10k events are analyzed
- Still working on combining the MBD and INTT data

*Now we have 10k INTTRawHit available in the official production directory

Run description - 54280

- Spike appears at each end of MBD
- The mini-bias definition is not yet available (as far as I know)
- Live trigger available to constraint the MBD vertex Z



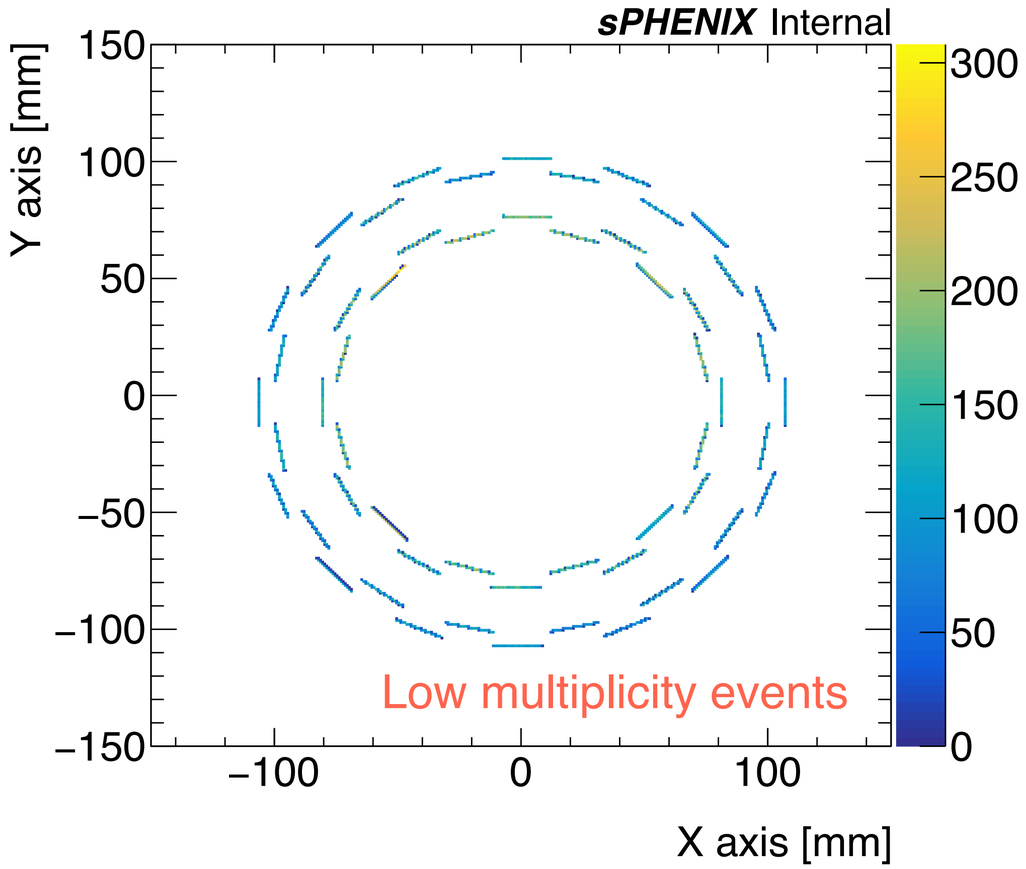
Trigger input channel	Name	enabled	Scaledown	Raw	Live <\div>	Scaled	Live (%)
0	Clock	yes	93810	33836274325	33663041357	358838	99.5
1	ZDC South	yes	off	102829214	102308816	0	99.5
2	ZDC North	yes	off	98430768	95872319	0	97.4
3	ZDC Coincidence	yes	60	9417100	9370209	153672	99.5
4	HCAL Singles/Coincidence	yes	off	30282609	30125423	0	99.5
5		yes	off	33836274325	33663041357	0	99.5
6		yes	off	0	0	0	0
7		yes	off	0	0	0	0
8	MBD S >= 2	yes	off	86958423	86380777	0	99.3
9	MBD N >= 2	yes	off	85797943	85195687	0	99.3
10	MBD N&S >= 2	yes	0	10242665	10187457	10187457	99.5
11	MBD N&S >= 1	yes	off	18093659	17967450	0	99.3
12	MBD N&S >= 2, vtx < 10 cm	yes	off	4021509	4000602	0	99.5
13	MBD N&S >= 2, vtx < 30 cm	yes	off	5799143	5768655	0	99.5

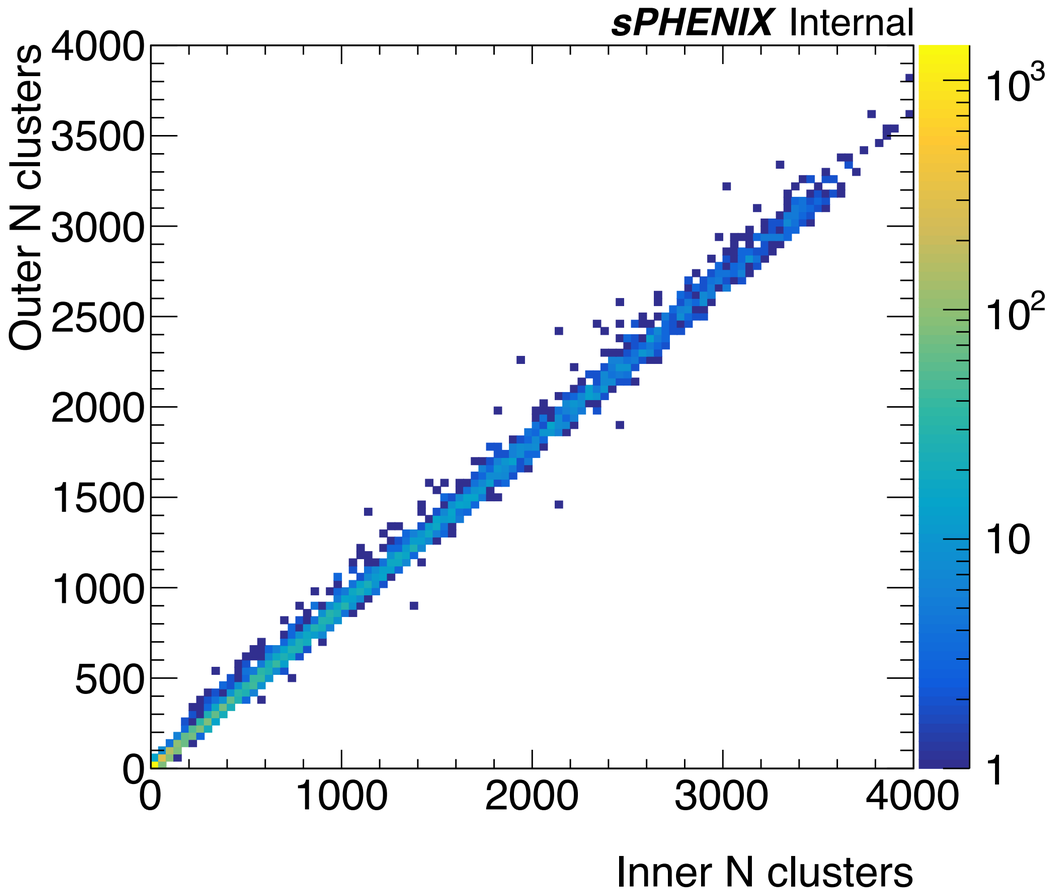
Sanity check

First 10k events

- Require the events firing the trigger of “MBD N&S >= 2,vtx < 30 cm”
- Hot channel mask & BCO_diff cut applied (maps produced by Jaein)

Survey geometry in offline reconstruction



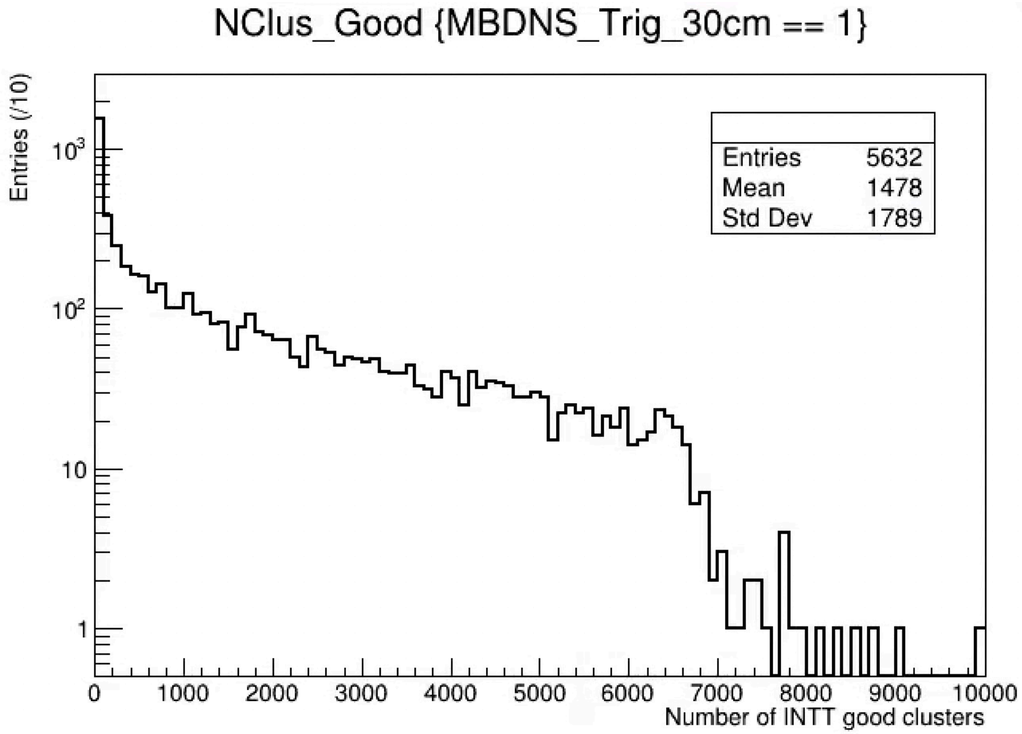


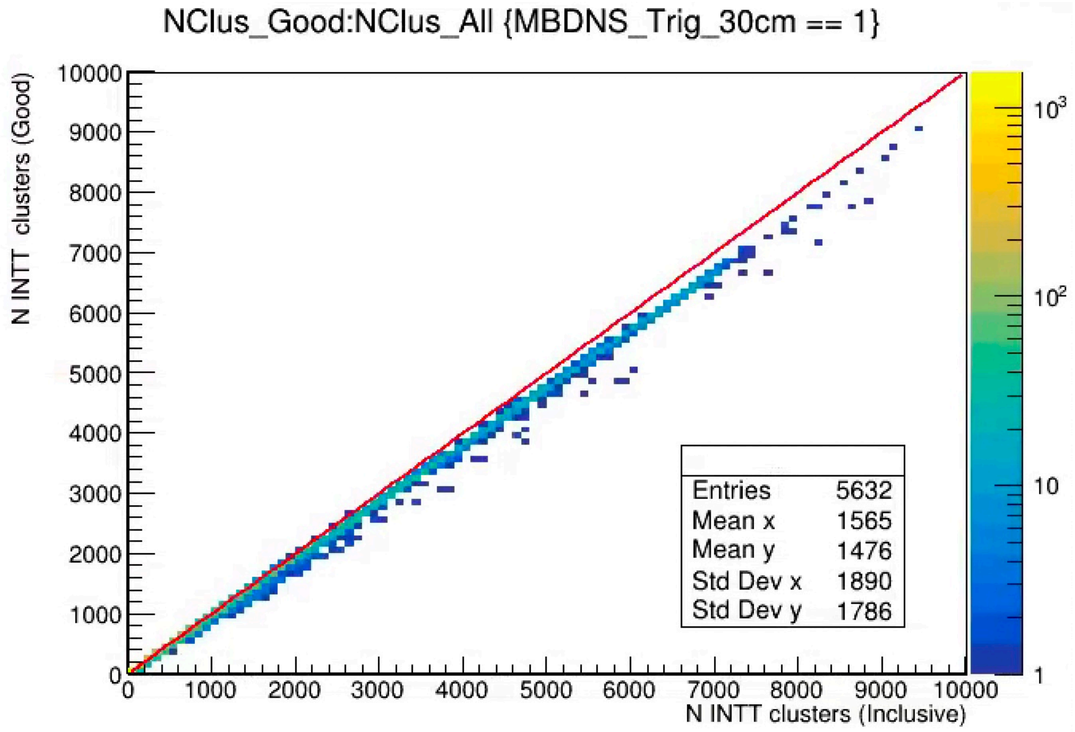
So far so good

Sanity check

First 10k events

- Require the events firing the trigger of “MBD N&S >= 2,vtx < 30 cm”
- Hot channel mask & BCO_diff cut applied (maps produced by Jaein)





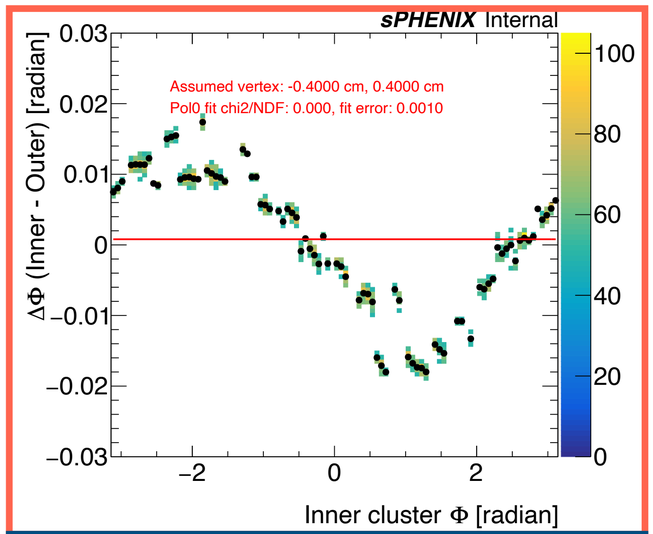
*Good cluster: cluster ϕ size < 6 && cluster adc > 35

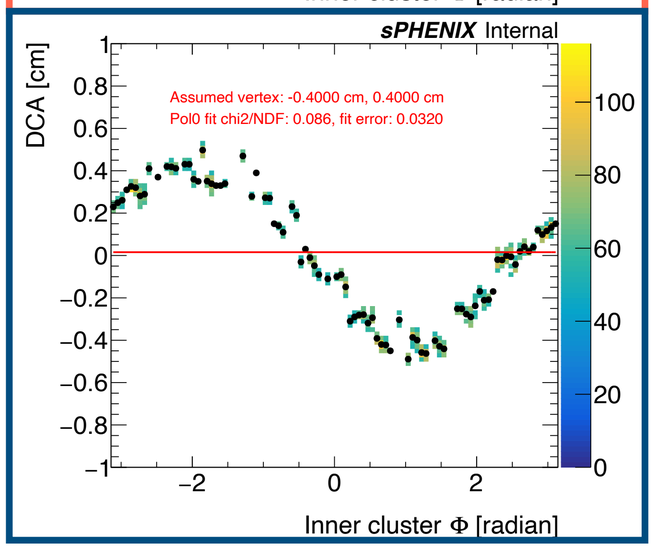
So far so good

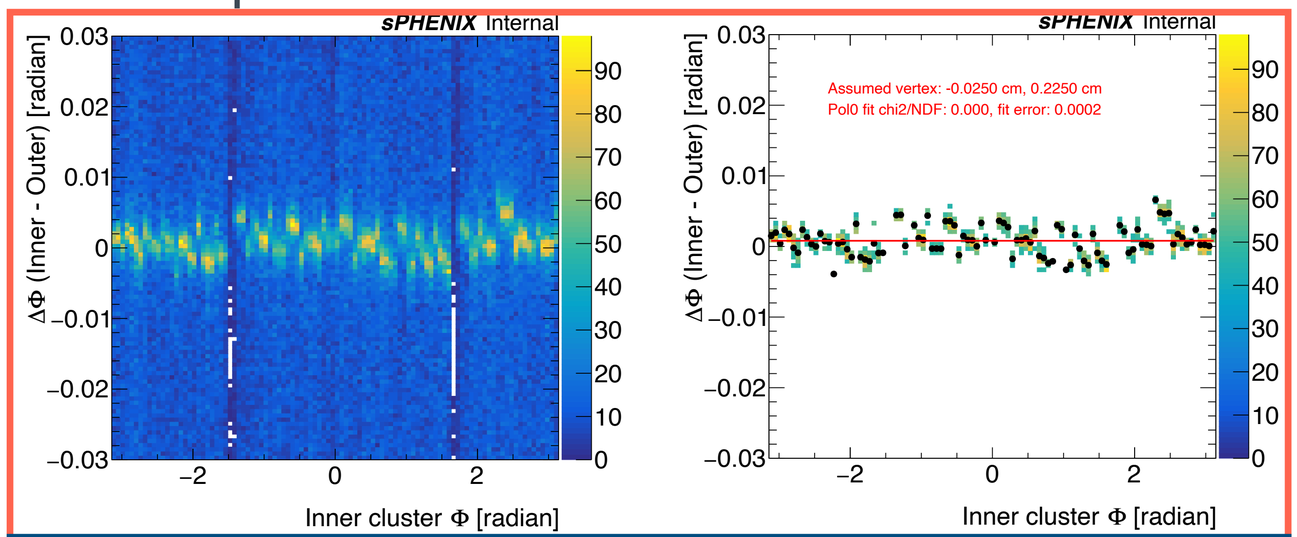
Average vertex XY - quadrant method

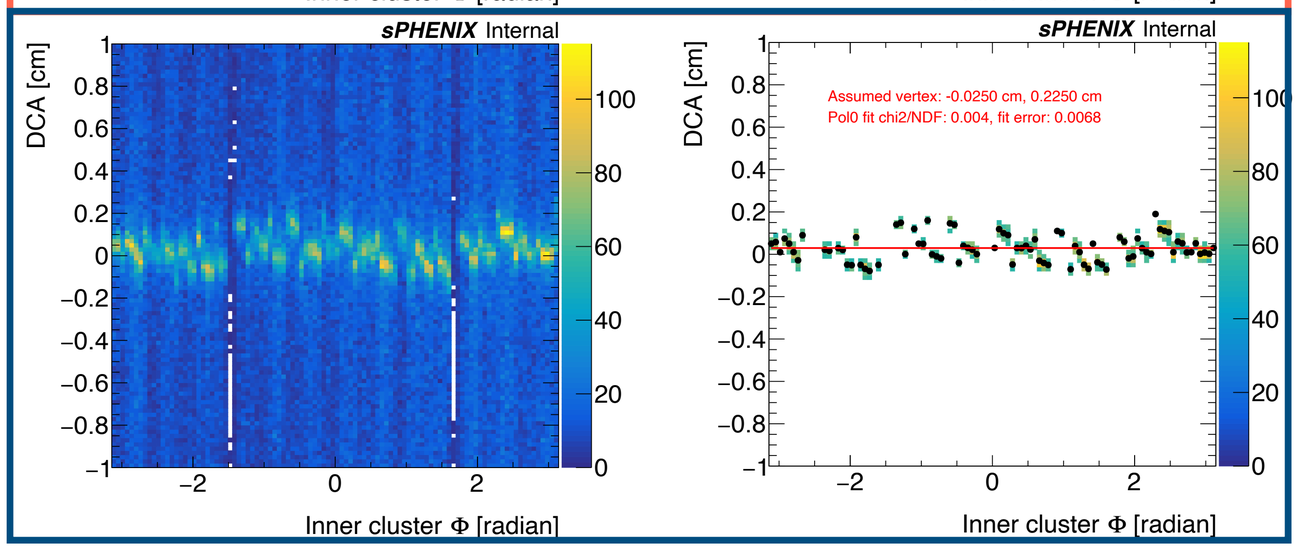
First 10k events

- Low multiplicity && “MBD N&S >= 2,vtx < 30 cm” events selected
- Try w/ four corners and move to the better quadrant





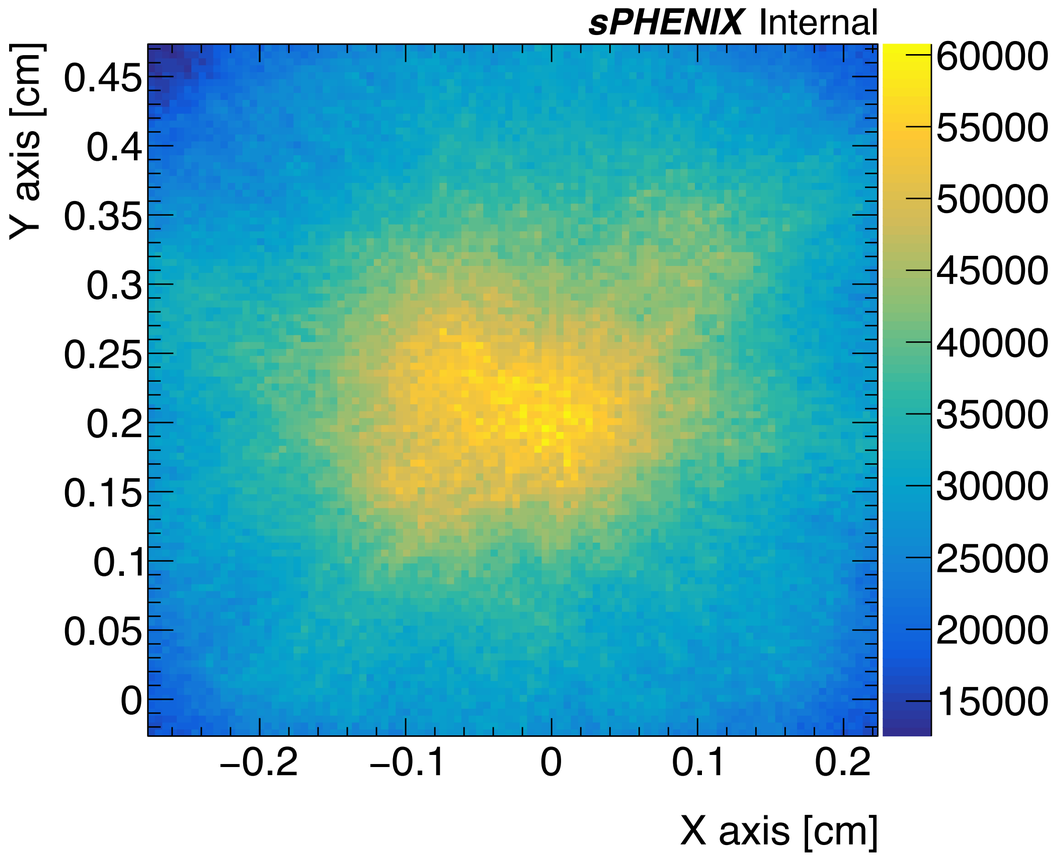


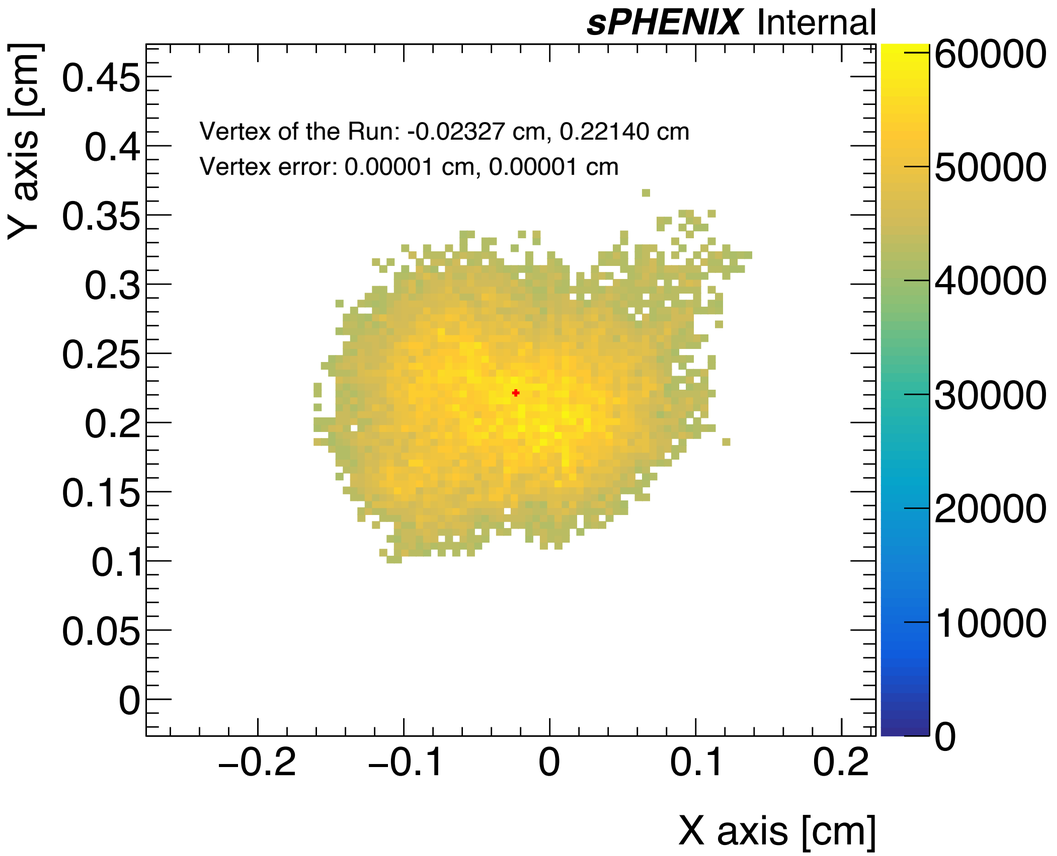


Average vertex XY - line filled method

First 10k events

- Low multiplicity && “MBD N&S >= 2,vtx < 30 cm” events selected
- Populating the proto-tracklets in the fine-segmented 2D histogram, and remove the background

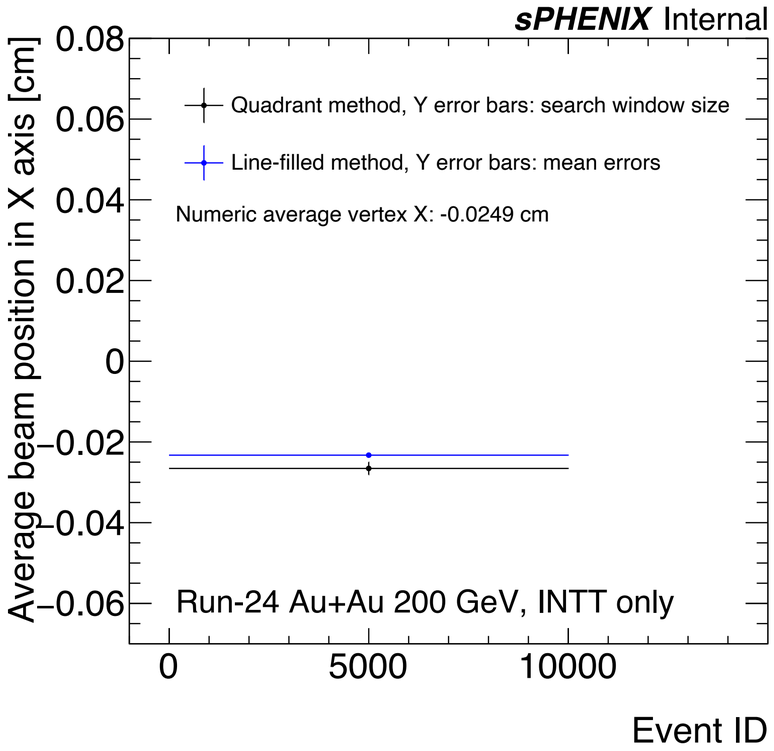


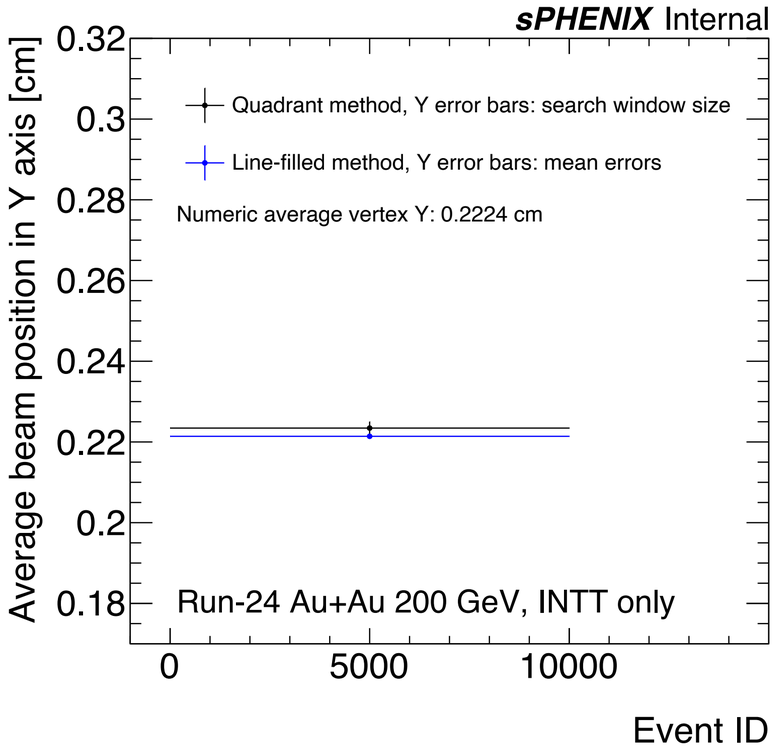


Average vertex XY - combined

First 10k events

- Require the events firing the trigger of “MBD N&S >= 2,vtx < 30 cm”
- Hot channel mask & BCO_diff cut applied (maps produced by Jaein)
- Low multiplicity selected (20 < N good clusters* < 350)





line filled X : -0.0232 cm

line filled Y : 0.2213 cm

quadrant X : -0.0265 cm

quadrant Y : 0.2234 cm

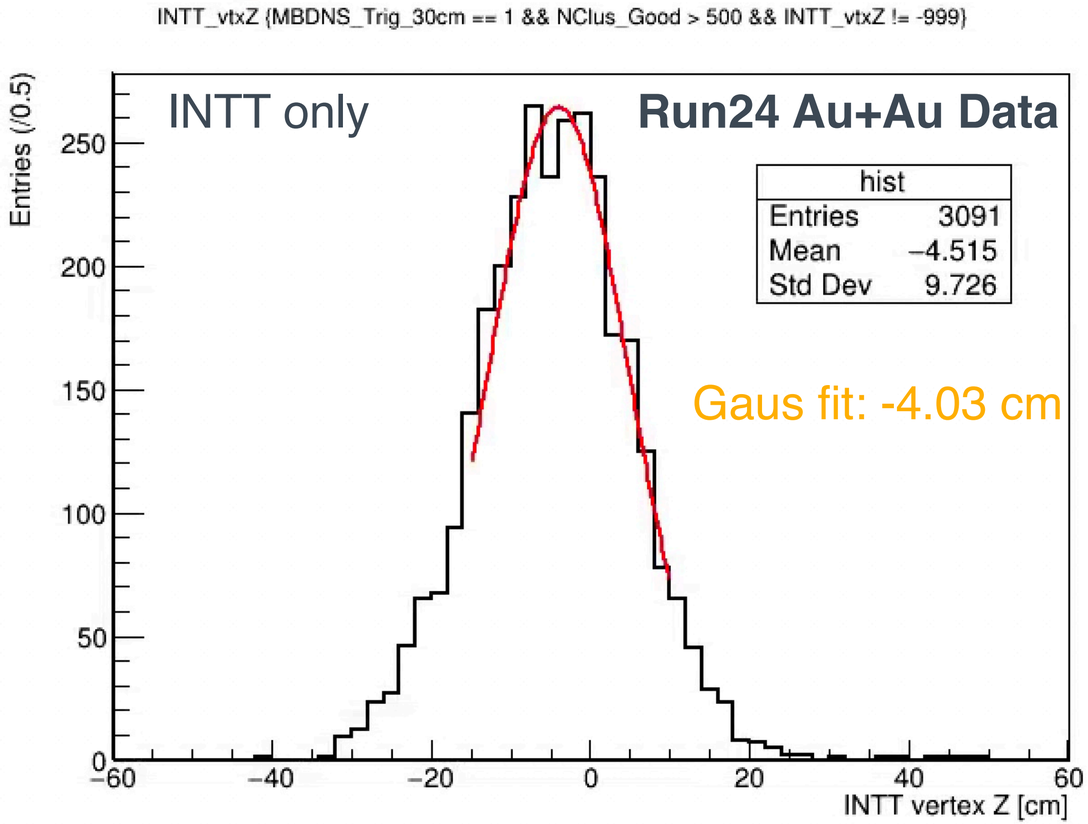
avg: {-0.0249 * cm, 0.2224 * cm}

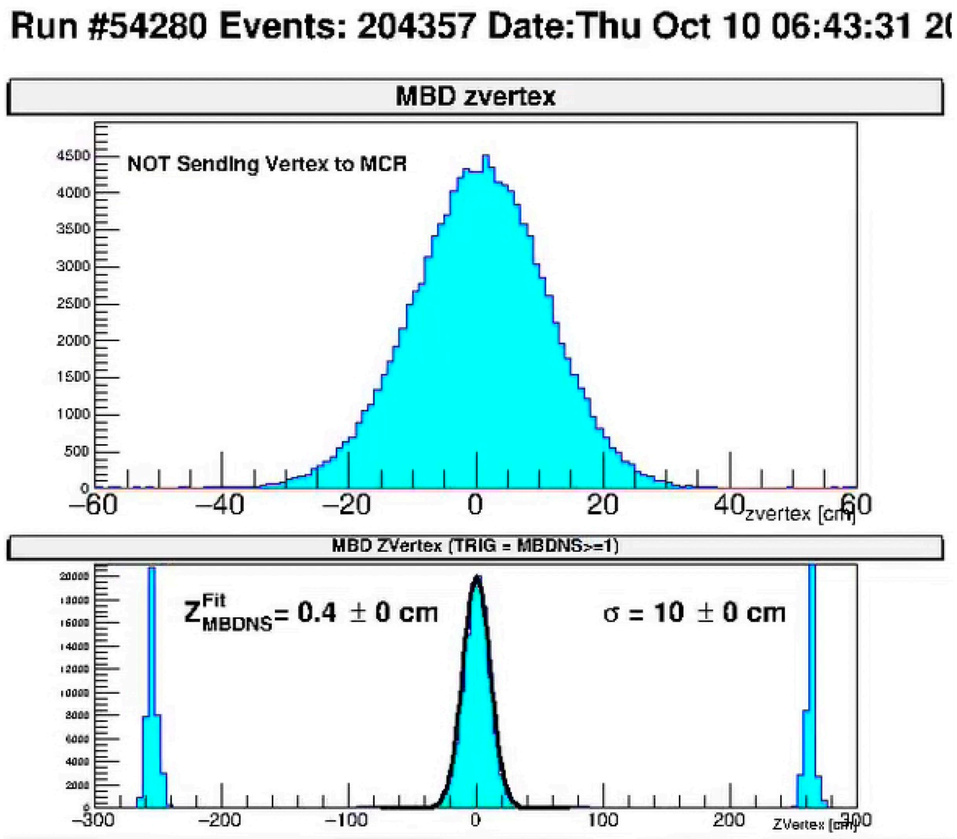
*Good cluster: cluster size < 6 && cluster adc > 35

Per-event vertex Z

First 10k events

- Require the events firing the trigger of “MBD N&S >= 2,vtx < 30 cm”
- Hot channel mask & BCO_diff cut applied (maps produced by Jaein)
- N good clusters* > 500





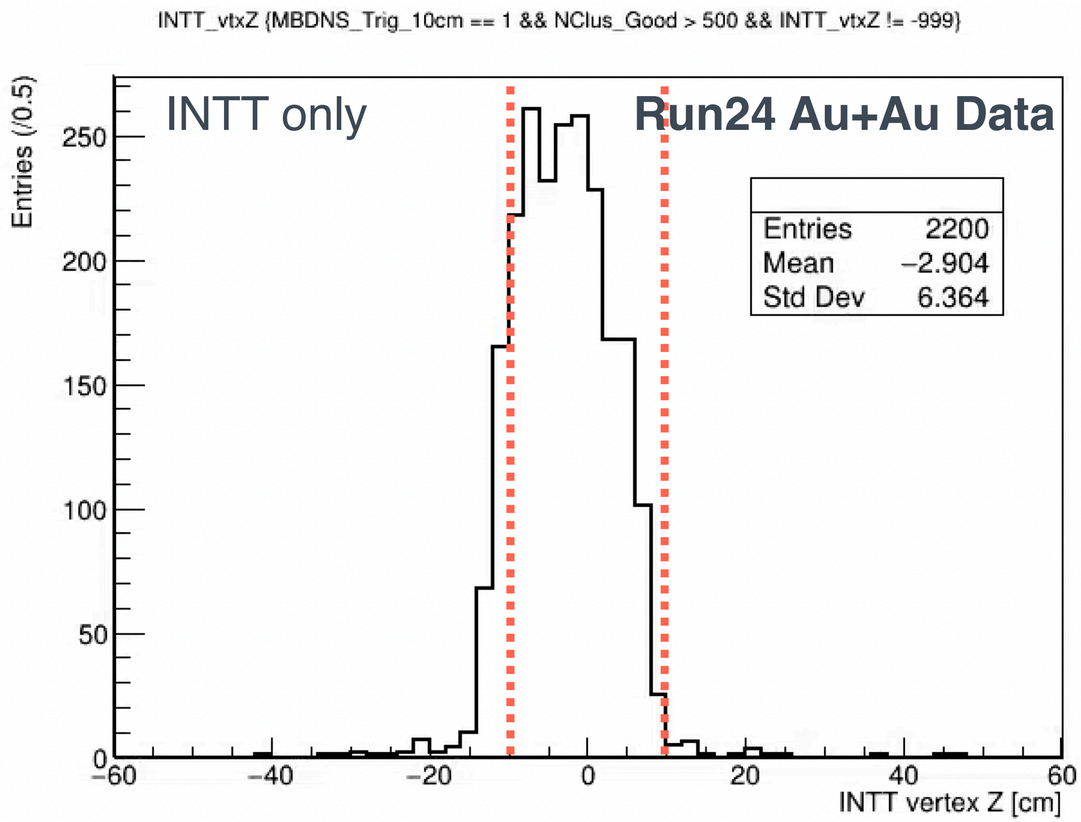
~4 cm discrepancy in the vertex Z measured by two detectors is seen

*Good cluster: cluster size < 6 && cluster adc > 35

Per-event vertex Z

First 10k events

- Require the events firing the trigger of “**MBD N&S >= 2,vtx < 10 cm**”
- Hot channel mask & BCO_diff cut applied (maps produced by Jaein)
- N good clusters* > 500



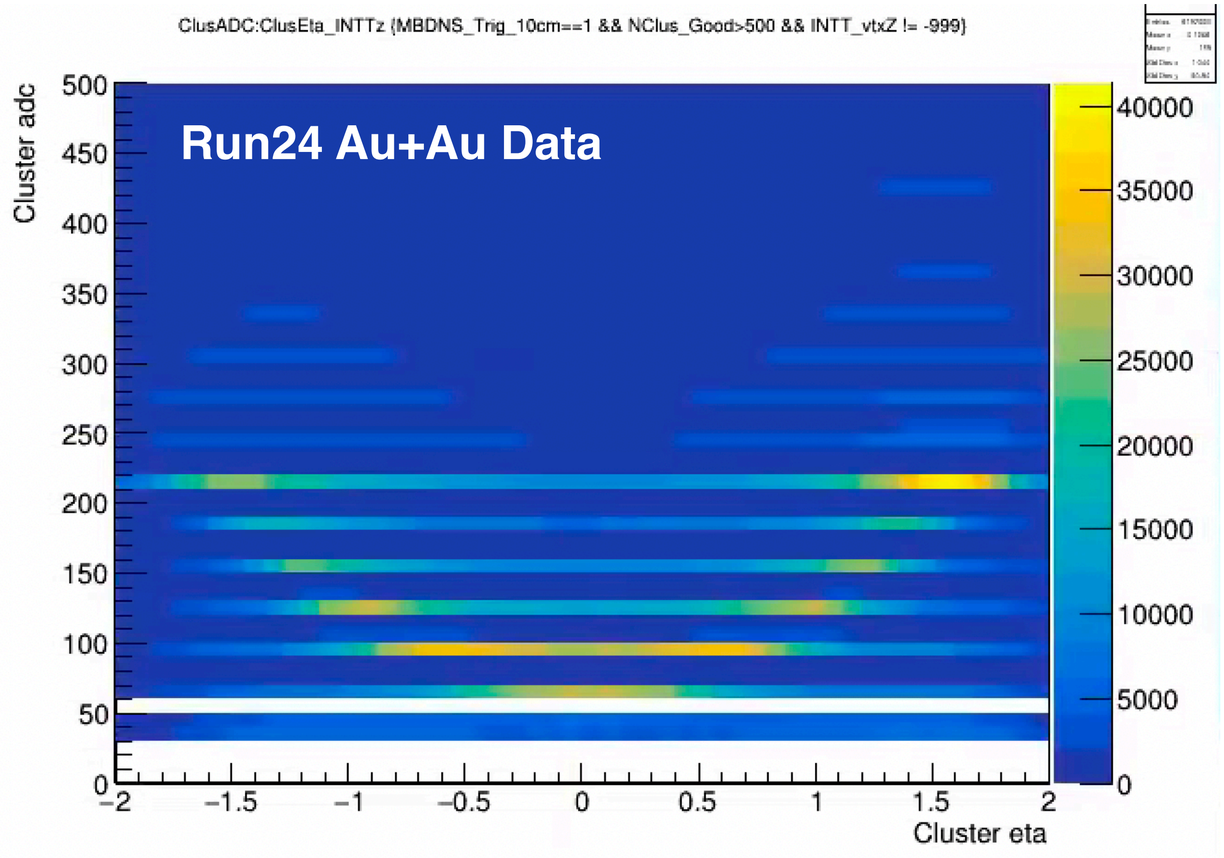
The vertex Z reconstructed by INTT does be able to reflect the trigger requirement

*Good cluster: cluster size < 6 && cluster adc > 35

Cluster ADC - η correlation

First 10k events

- Require the events firing the trigger of "**MBD N&S >= 2,vtx < 10 cm**"
- Hot channel mask & BCO_diff cut applied (maps produced by Jaein)
- N good clusters* > 500

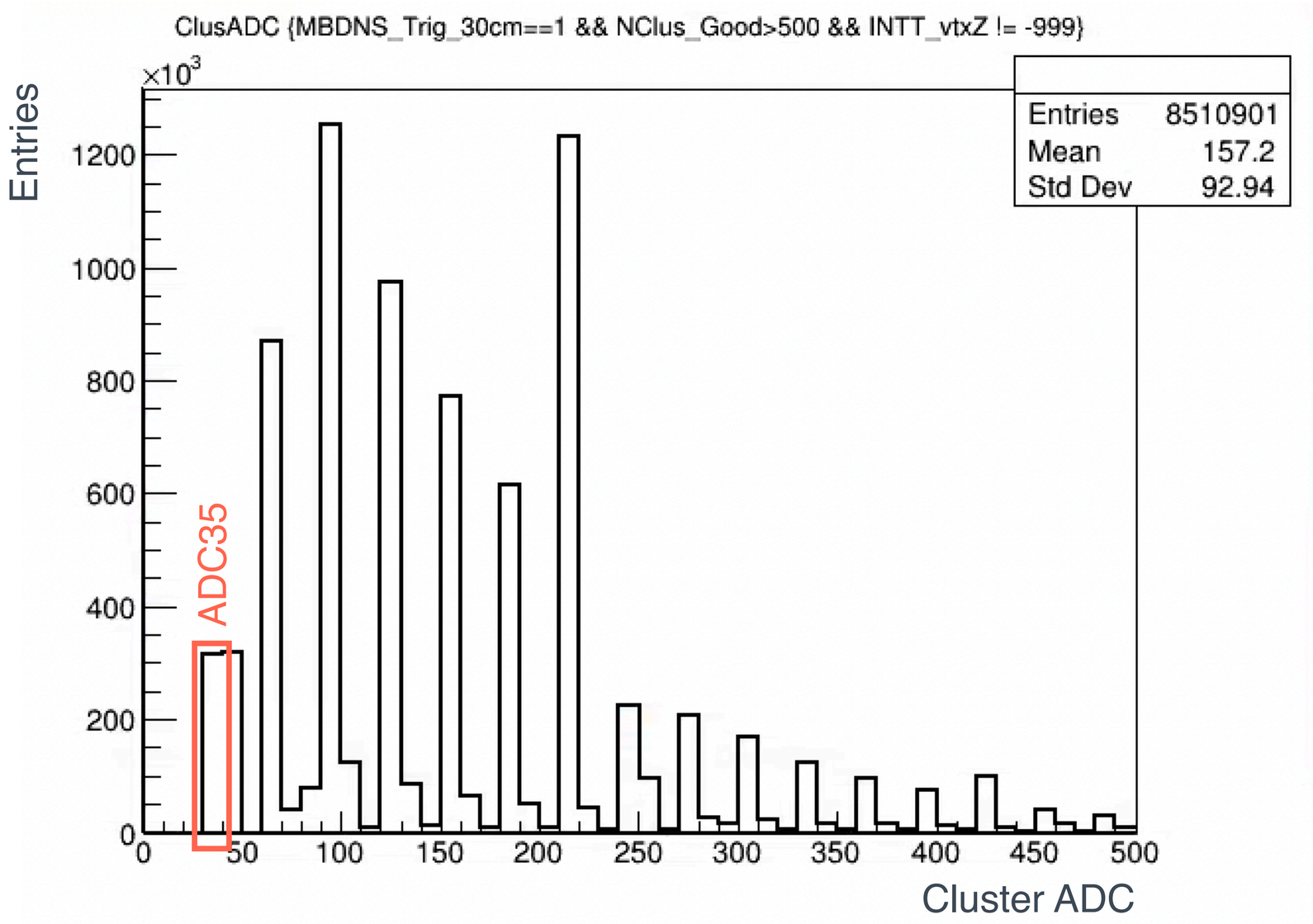


😊

The correlation supports the reconstructed vertex Z

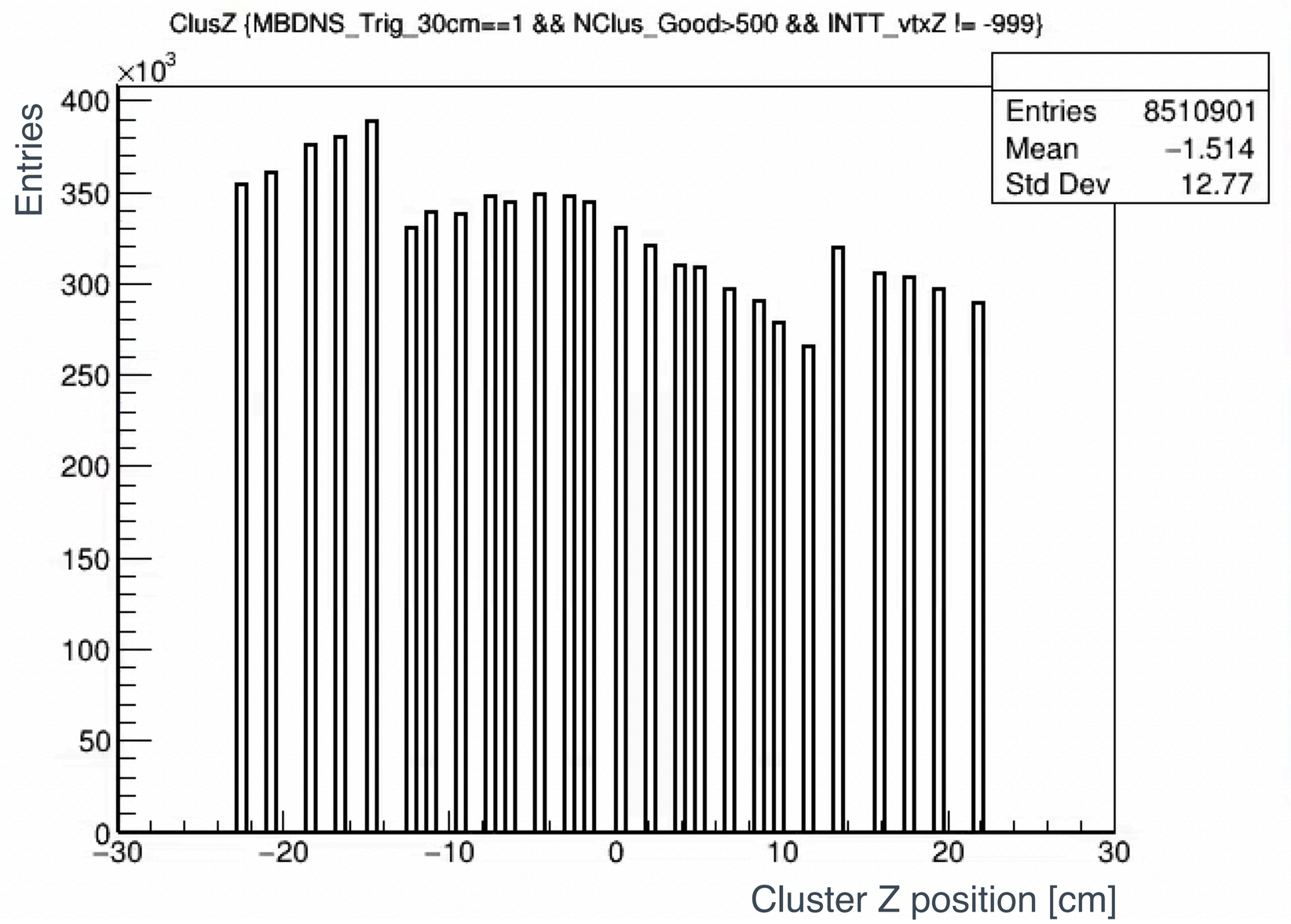
Cluster adc distribution

First 10k events



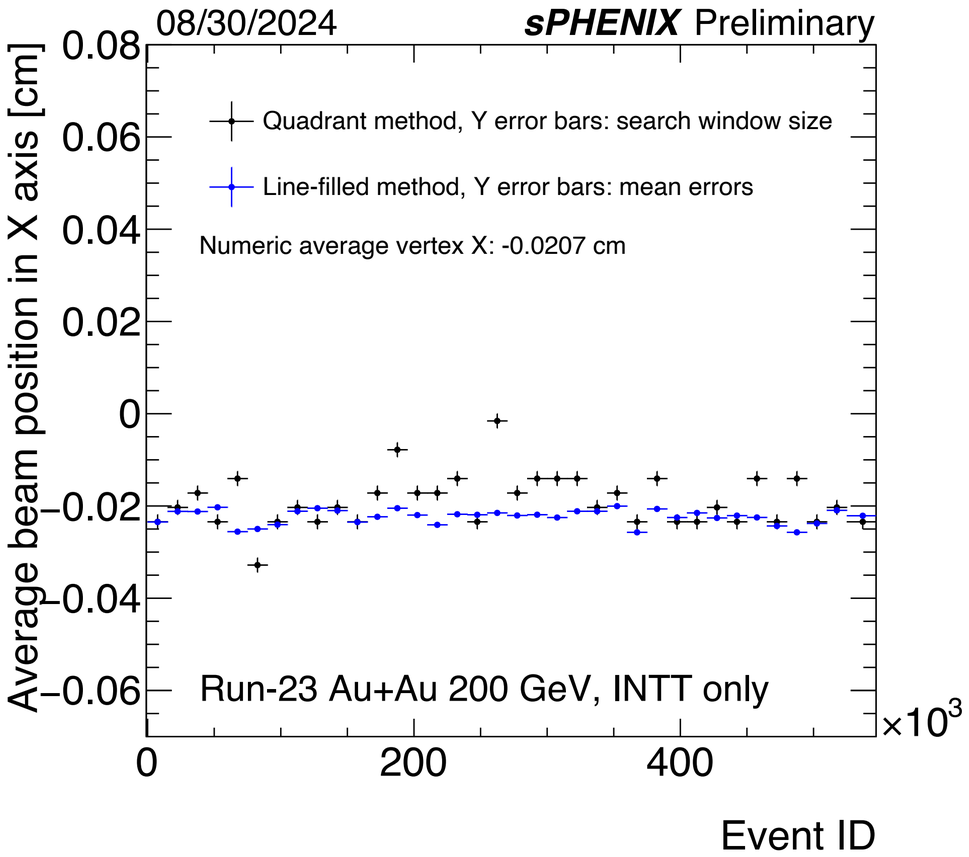
Cluster Z position distribution

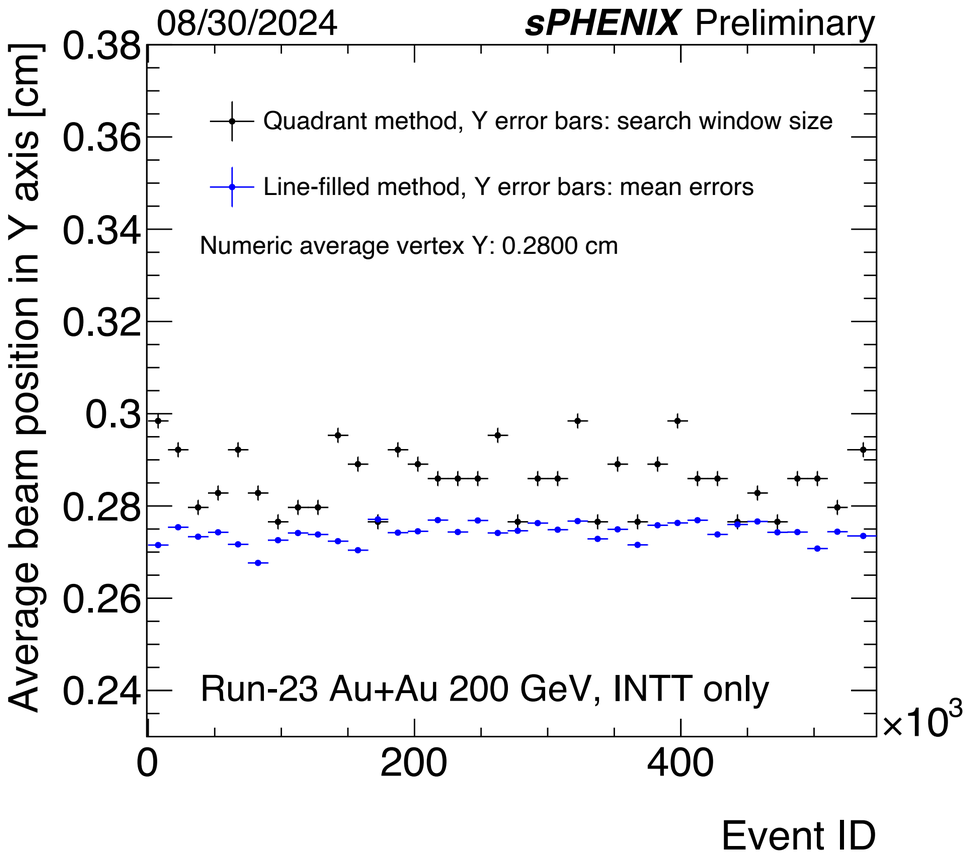
First 10k events



Recap - run 20869 taken in 2023

Average vertex XY

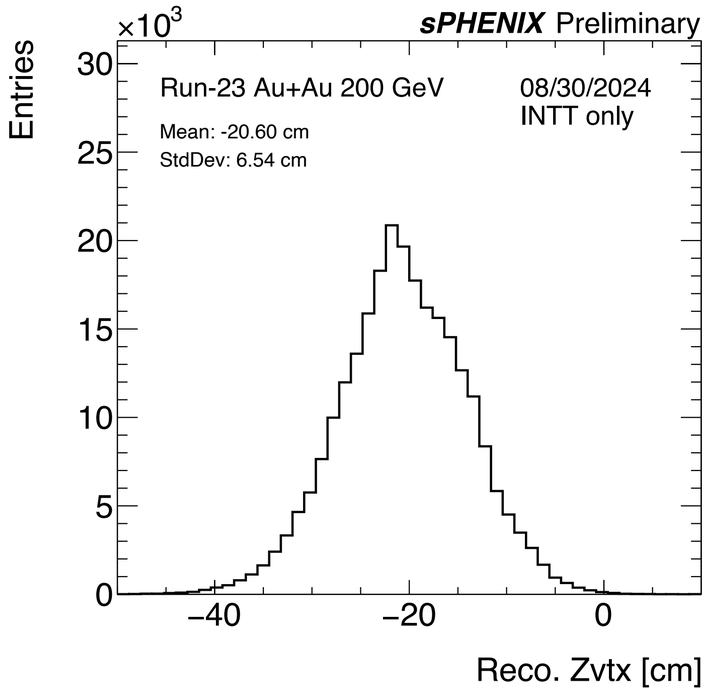


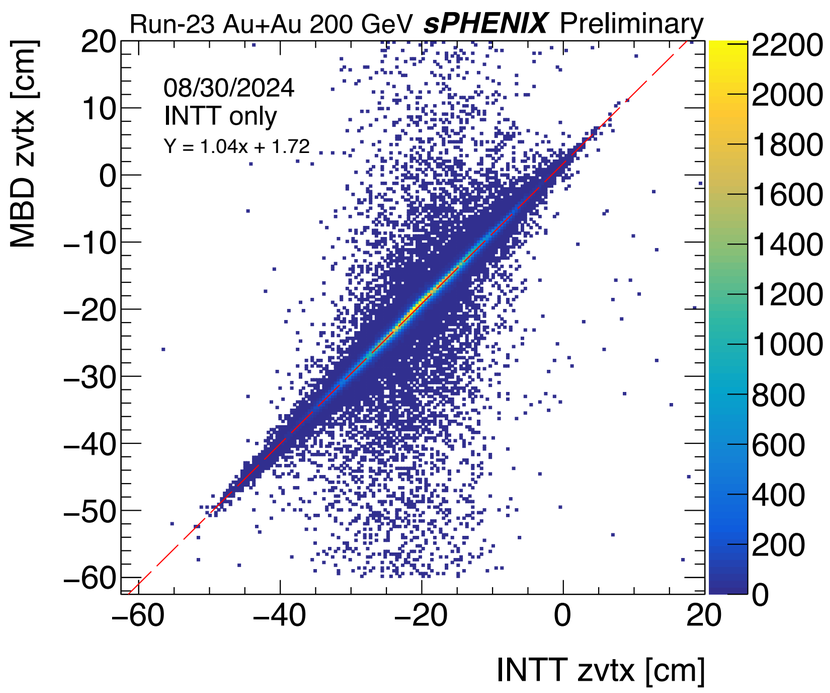


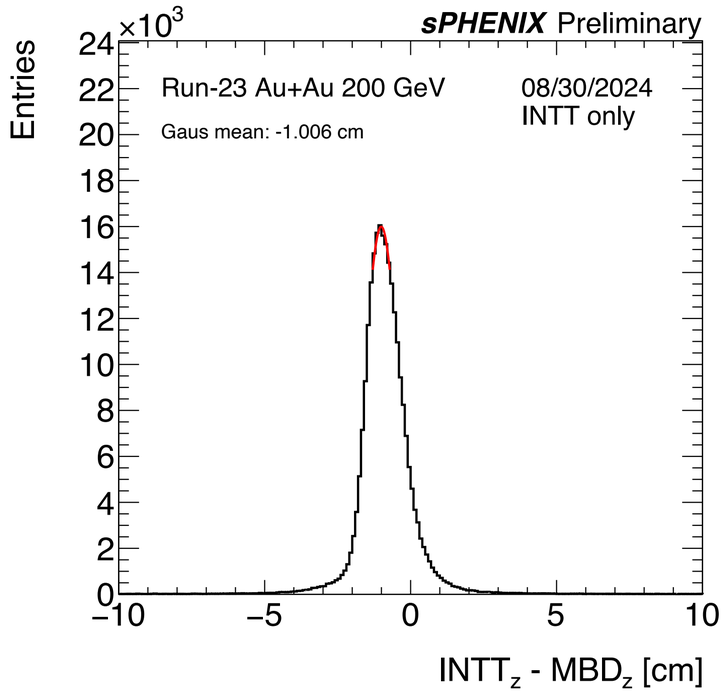
Avg: {-0.0206744 * cm, 0.279965 * cm}

Recap - run 20869 taken in 2023

Per-event vertex Z







Some how only 1 cm difference seen in run23 data, need more investigations

Summary

- INTT has some Run 24 Au+Au data taken in zero-field. The first glance at data is performed

- Official DST production was not available
  - Alternative: produce the INTT cluster data from .evt files in F4A framework privately
  - Production is ongoing, first 10k is available
  - Still working on combing the MBD events

- Average vertex XY: {-0.0249 * cm, 0.2224 * cm}

- Much large discrepancy seen in vertex Z measured by two detectors in Run24. More investigations needed
  - Will for sure check the correlation between INTTz and MBDz

- The data looks good generally speaking

Back up

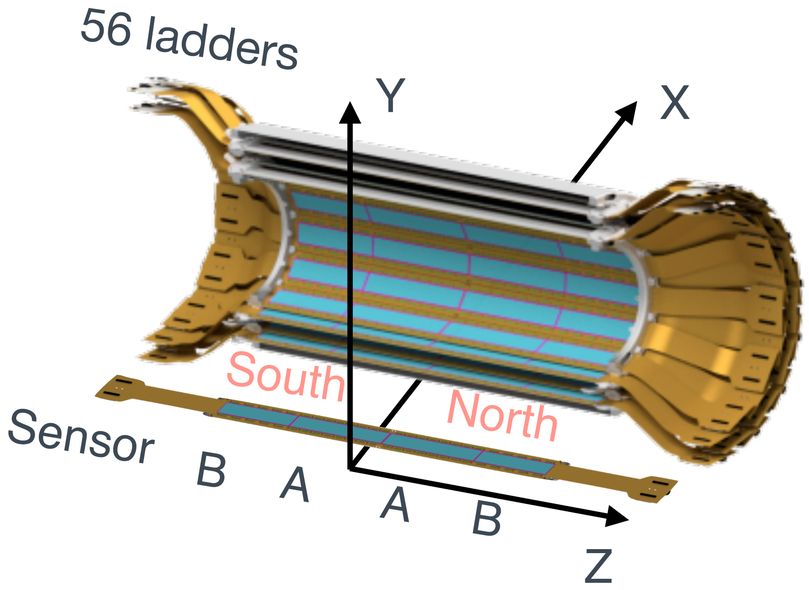
Useful directory

- The INTT DST data: /sphenix/lustre01/sphnxpro/physics/slurp/streaming/physics/new_2024p007/run_00054200_00054300

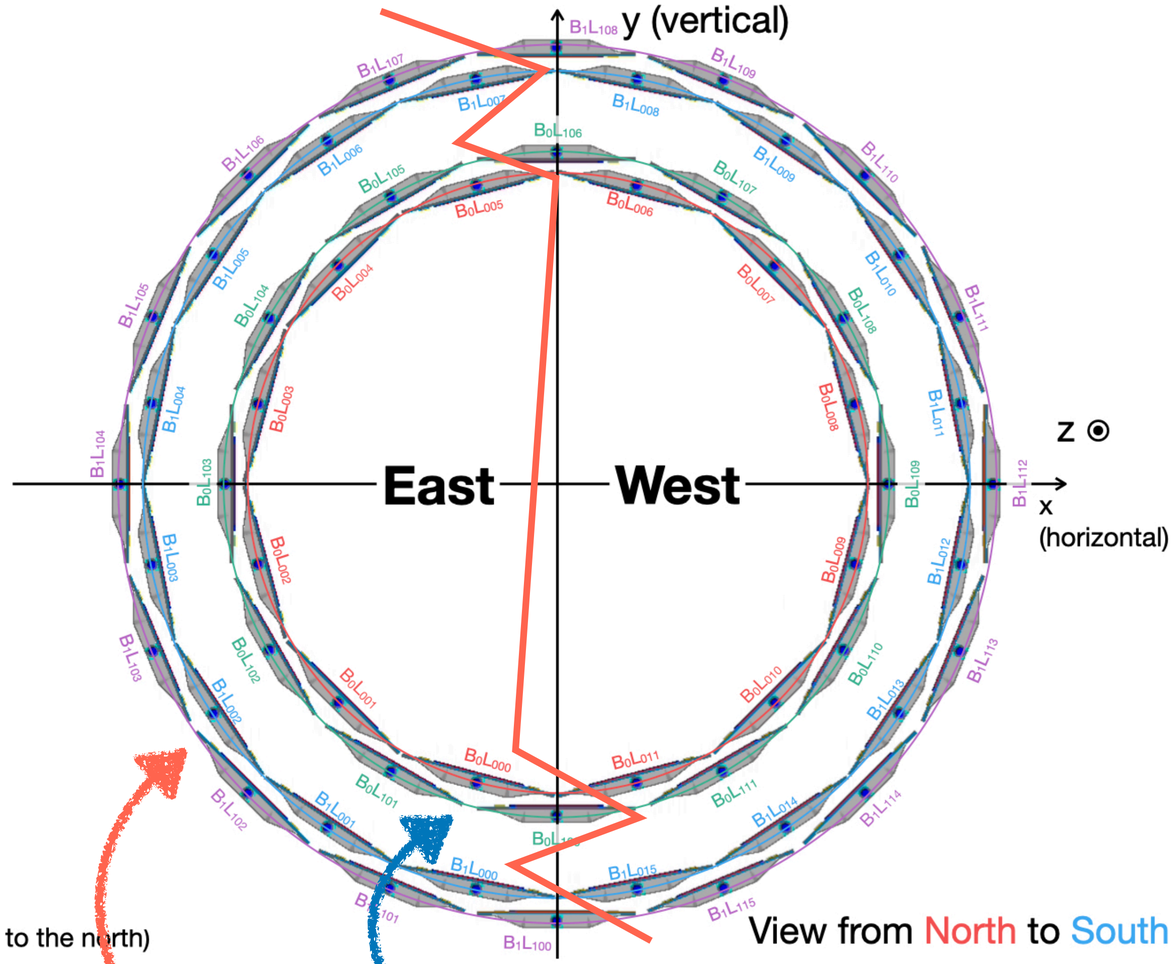
- The INTT .evt files:

INTT geometry

INTT: 2 sensors X 2 sides of half-ladders X 56 ladders = 224 sensors



Notation: B_xL_{yzz}
- x: Barrel ID (0 for inner or 1 for outer)
- y: Layer ID (0 for inner or 1 for outer)
- zz: Ladder ID (from 0 to 15)



Axis (Right-haded coordinate)
- x-axis: $\vec{y} \times \vec{z}$
- y-axis: Vertically upward direction
- z-axis: The blue beam direction (pointing to the north)