sPEHNIX - INTT commissioning

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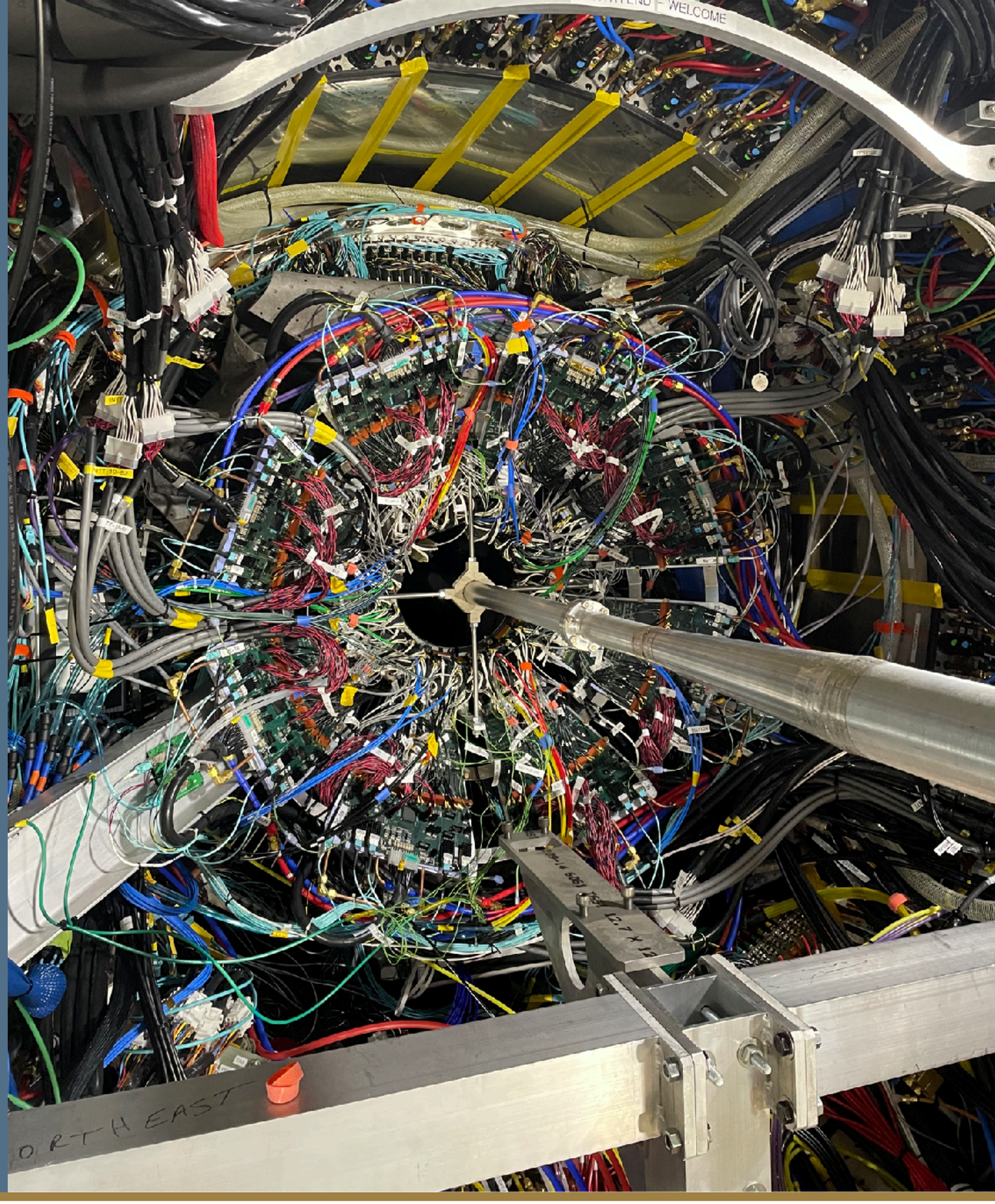
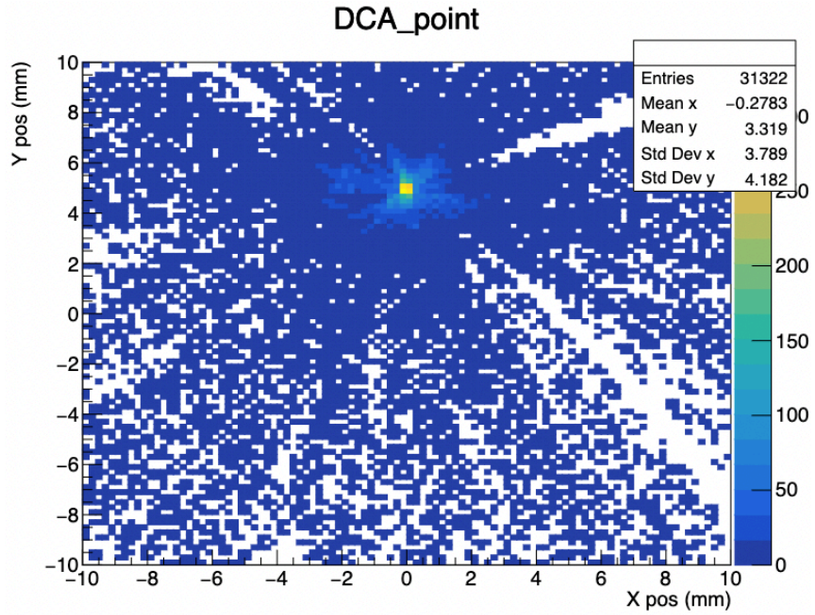


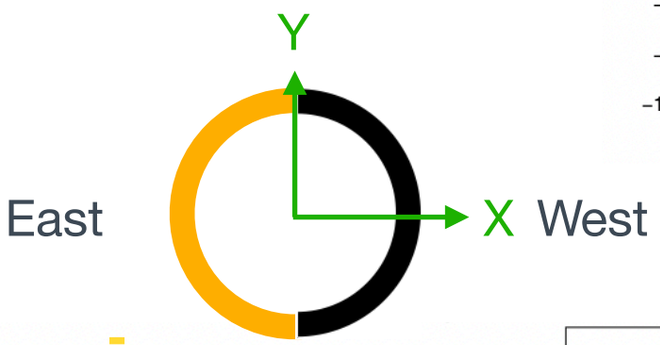
2023/08/03 Group meeting

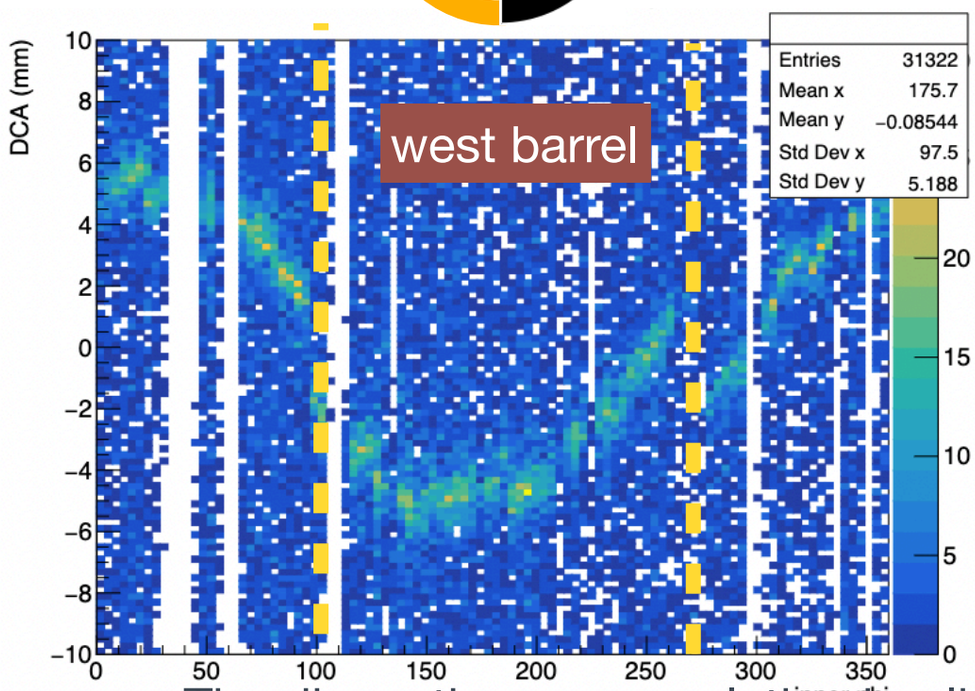
INTT geometry check

I am able to calculate the DCA in 2D, with respect to the vertex



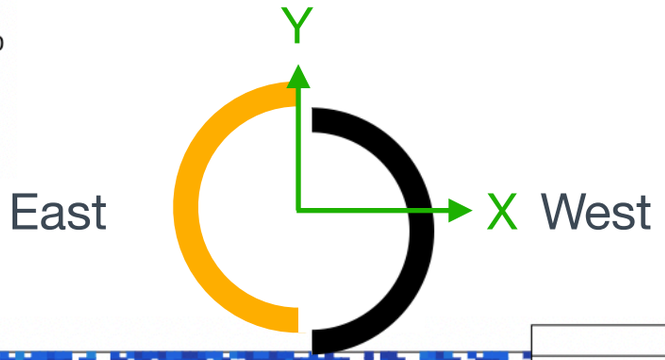
If using the nominal geometry (no correction)

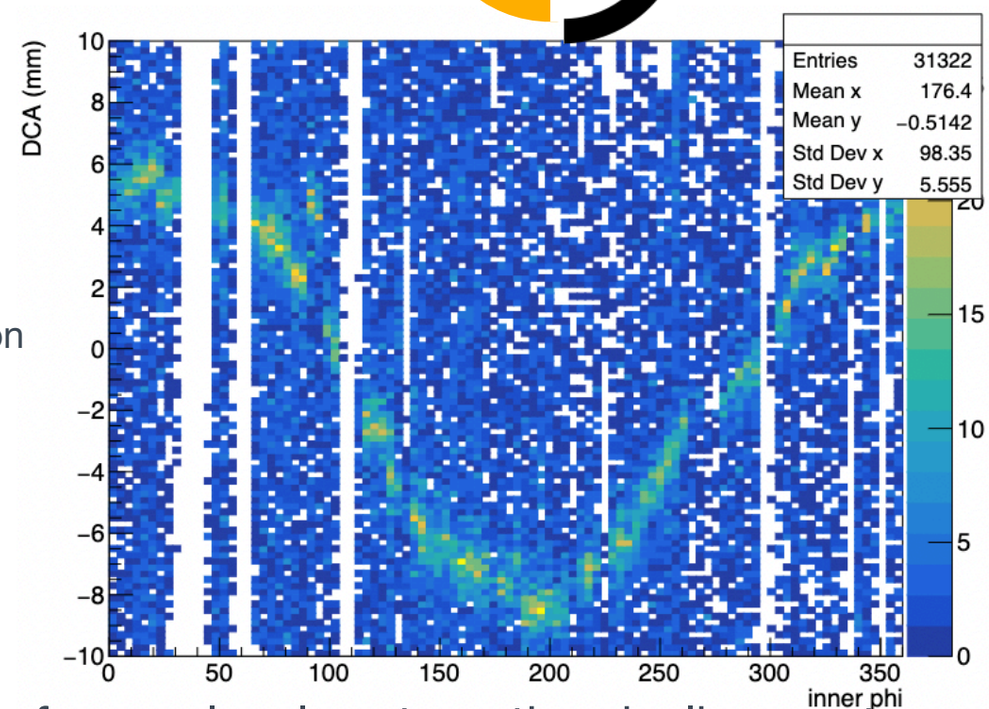




Add the correction

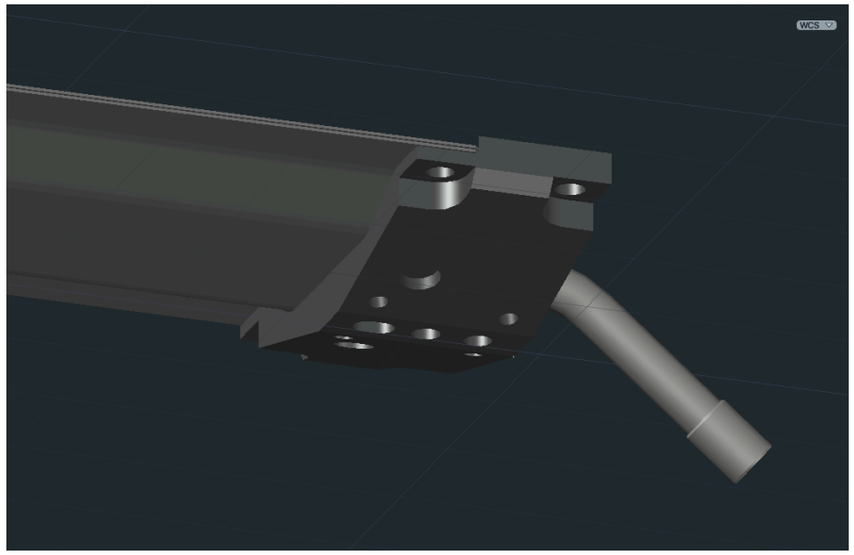
Assume West barrel with misalignment (3 mm, -3 mm)

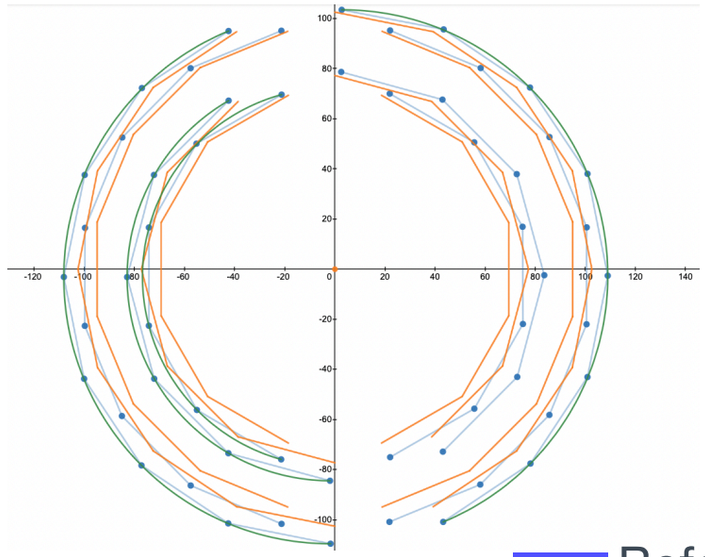


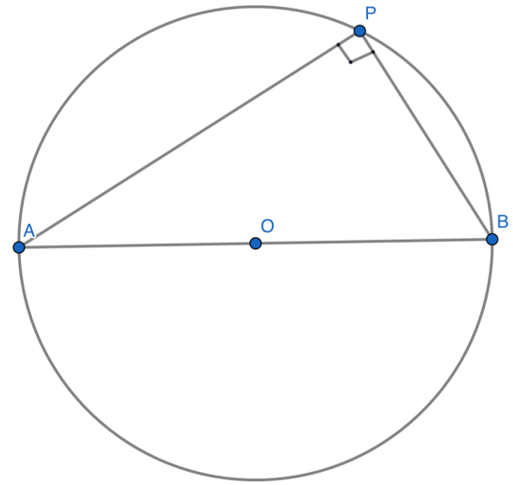


The discontinuous correlation implies the existence of ~ mm level systematic misalignment
-> The halves are not close

Survey data Peek correction (roughly !)



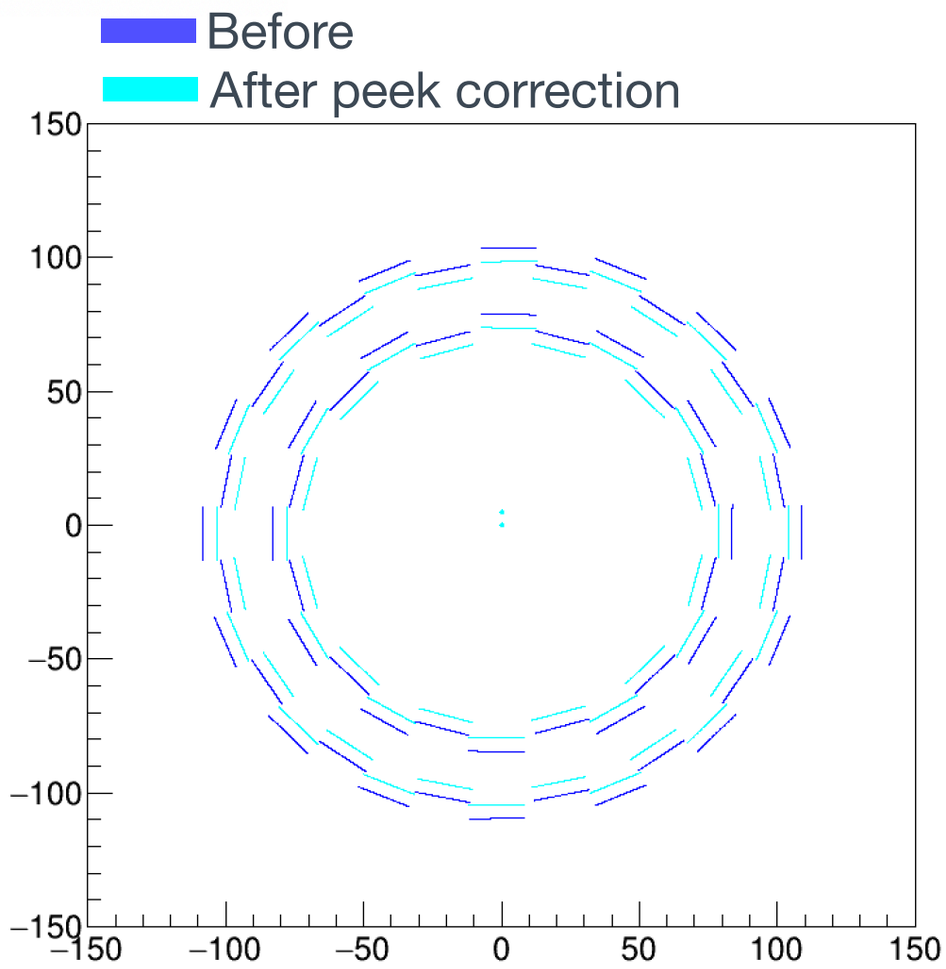




- Ideal geometry :
  - Radius of outermost layer : 102.584 mm
  - Radius of innermost layer : 71.844 mm
- Survey data :
  - Radius of east barrel outermost layer : 105.493 mm
  - Radius of west barrel outermost layer : 106.264 mm

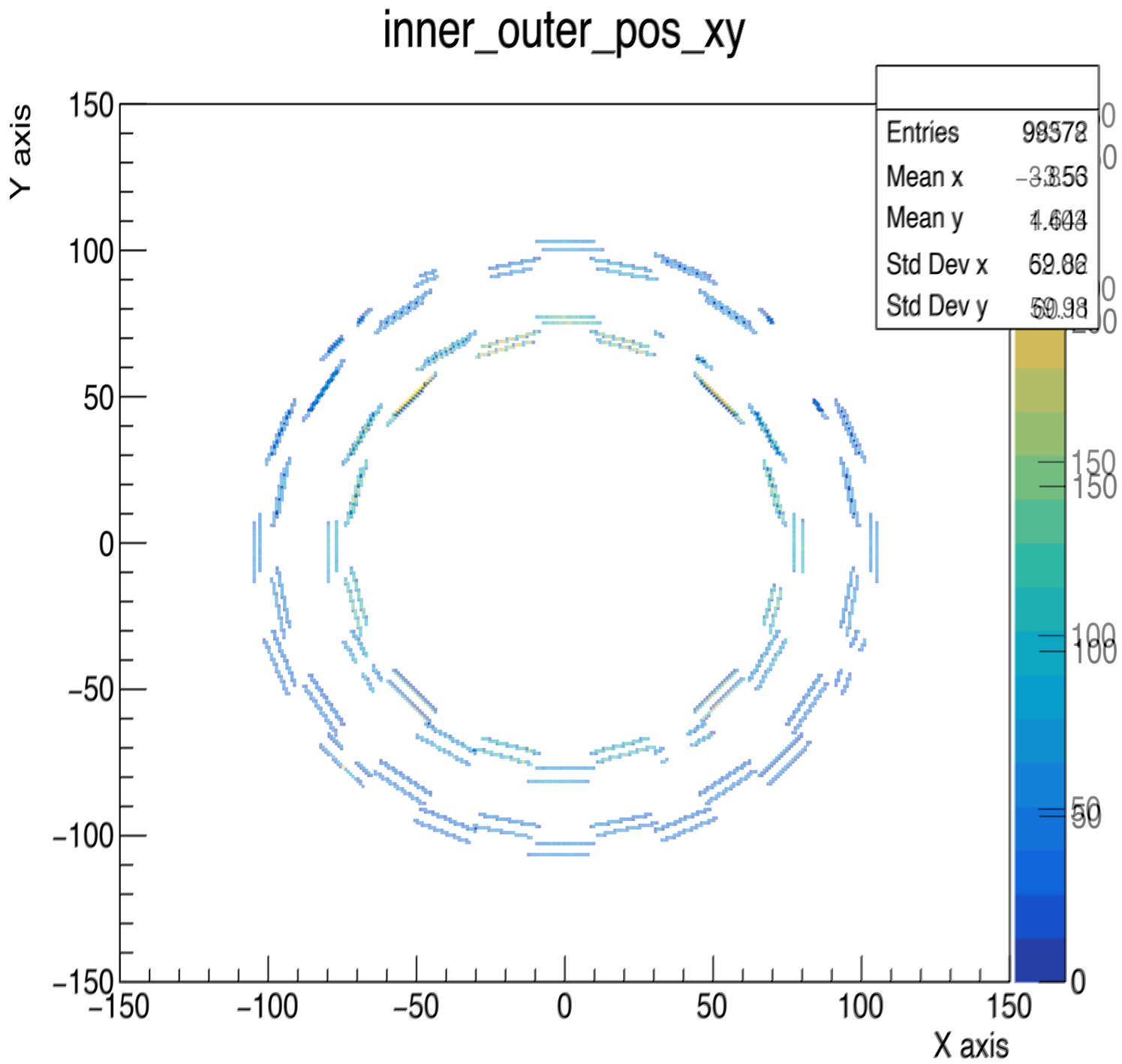
  - Radius of innermost layer : 75.1976 mm

- Difference :
  - Outermost layer : 3.2945 mm
  - Innermost layer : 3.3536 mm -> In avg : 3.32405 mm



Survey data Peek correction (roughly !)

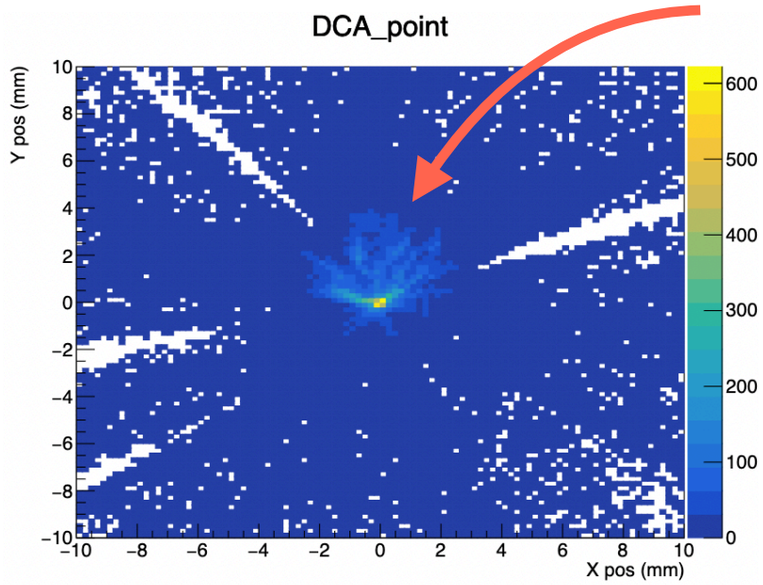
peek correction : 3.32 mm



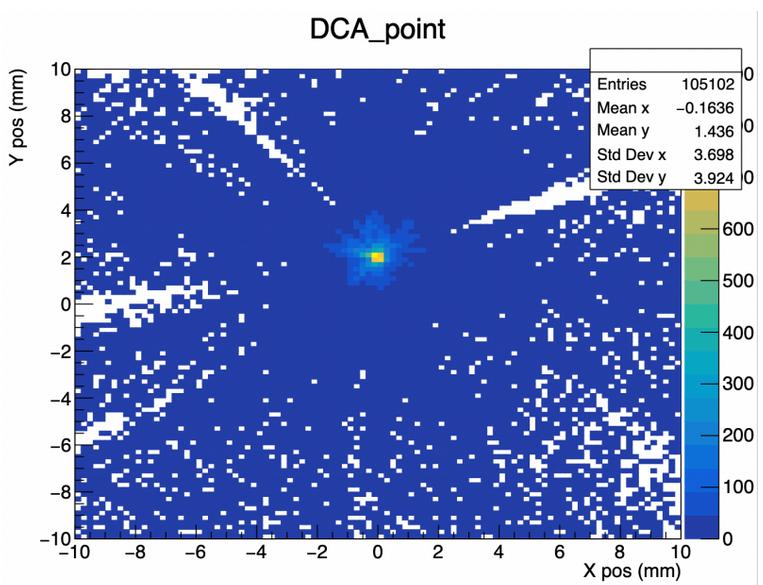
Survey data Peek correction (roughly !)

Run 20869, zero field

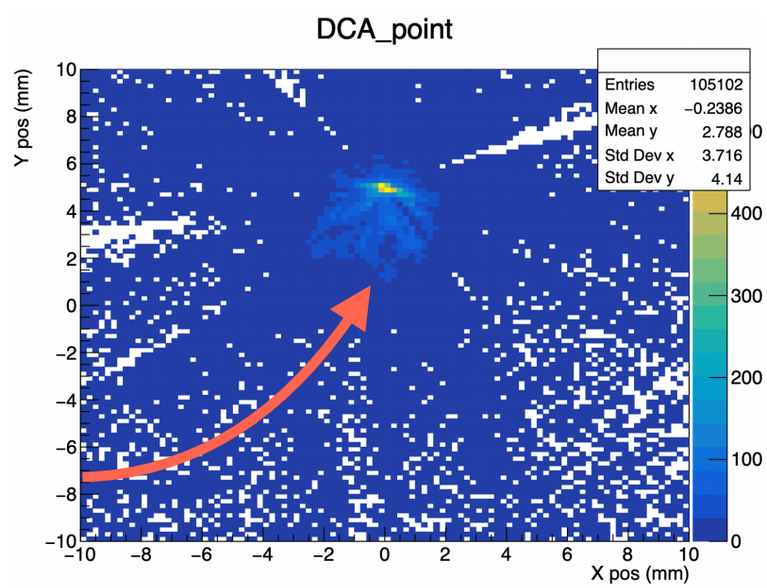
Origin : (0,0)

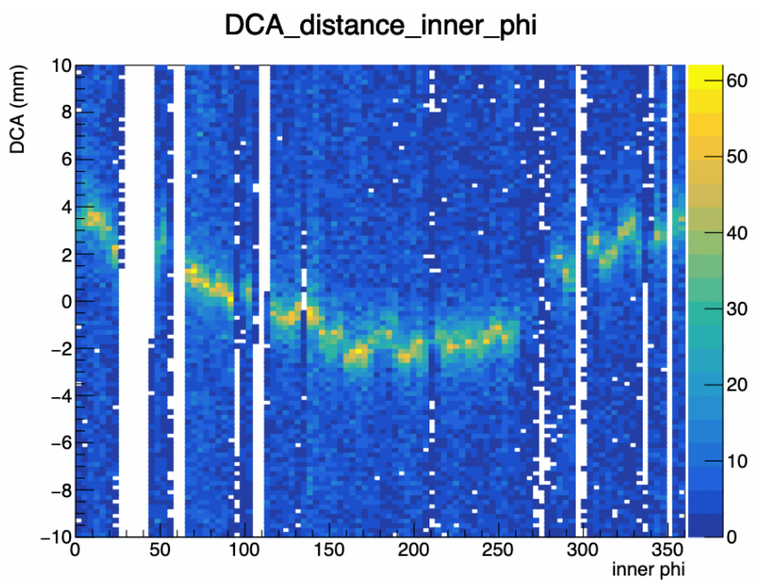


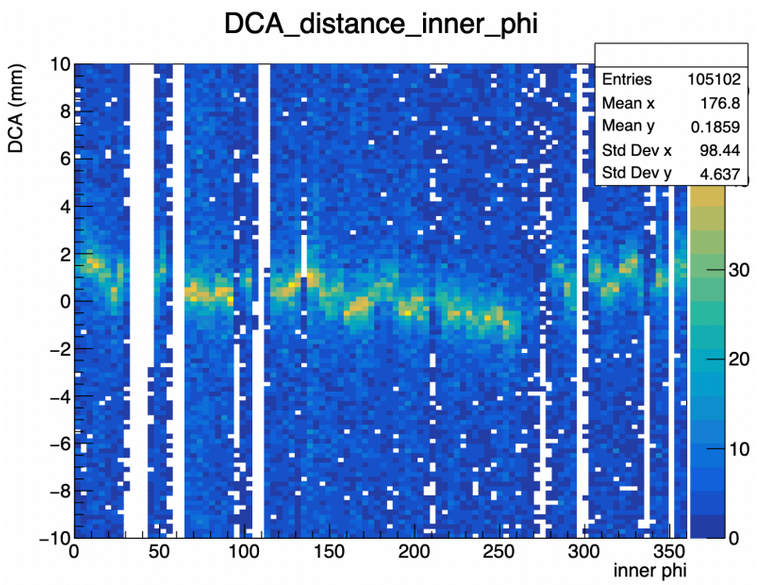
Origin : (0,2 mm)

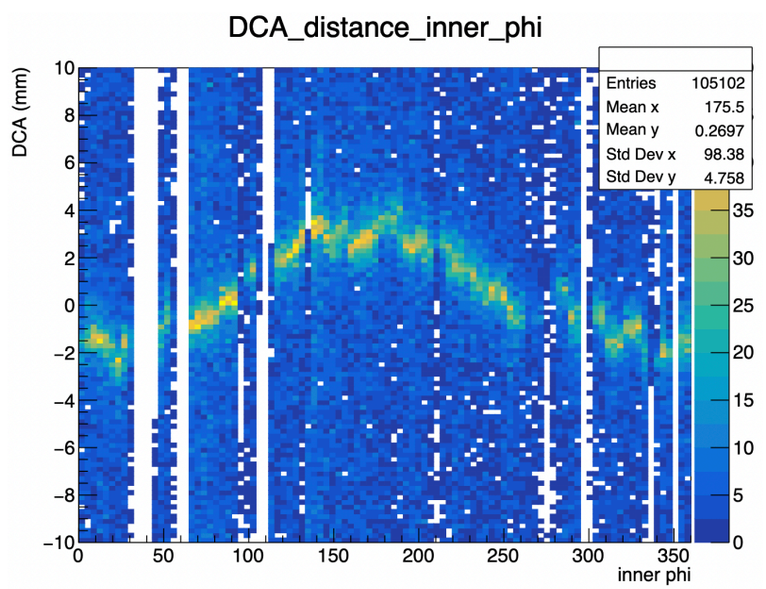


Origin : (0,5 mm)





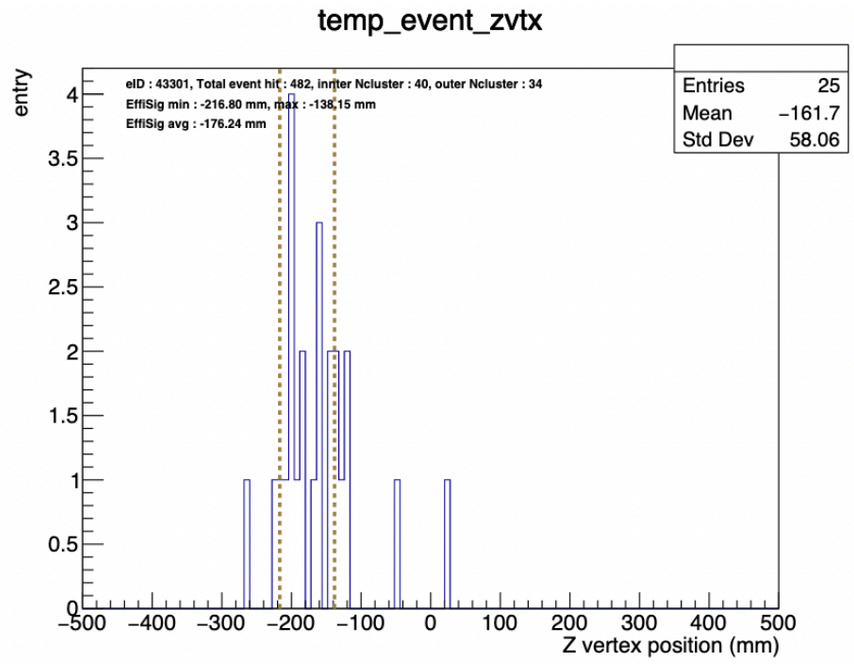




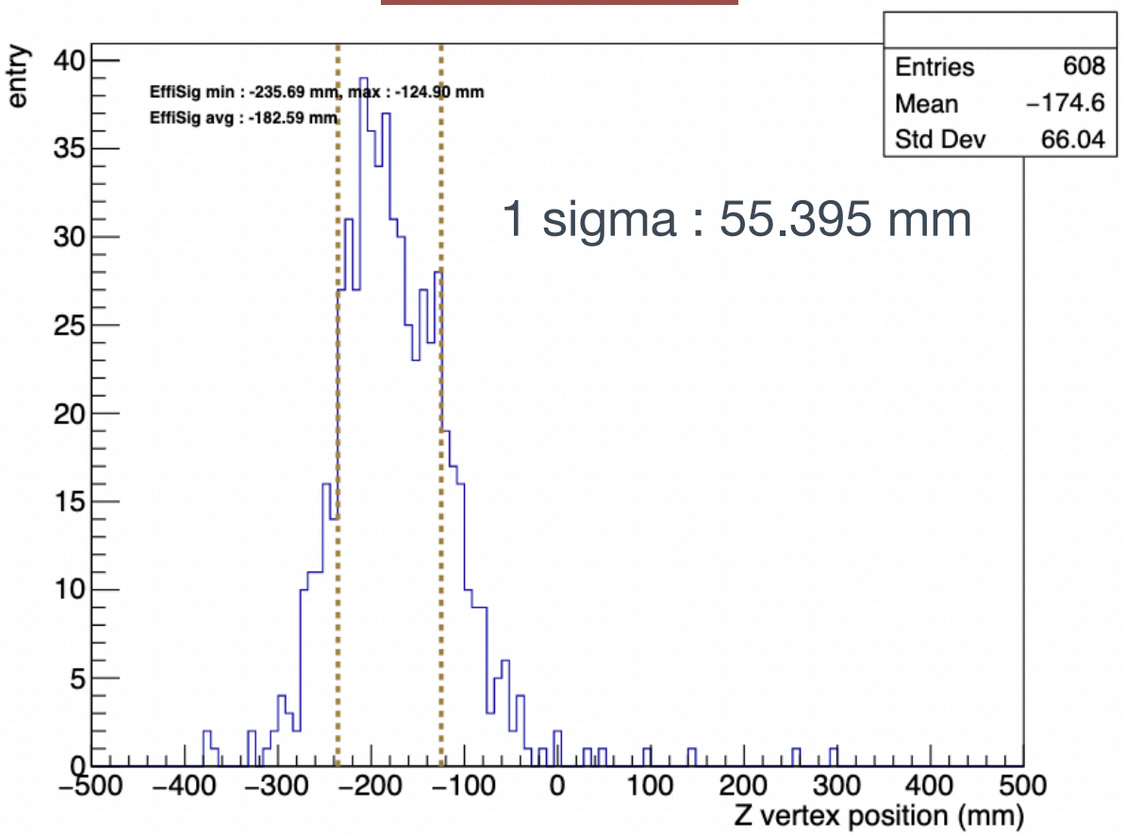
Z vertex distribution

Run 20869, zero field

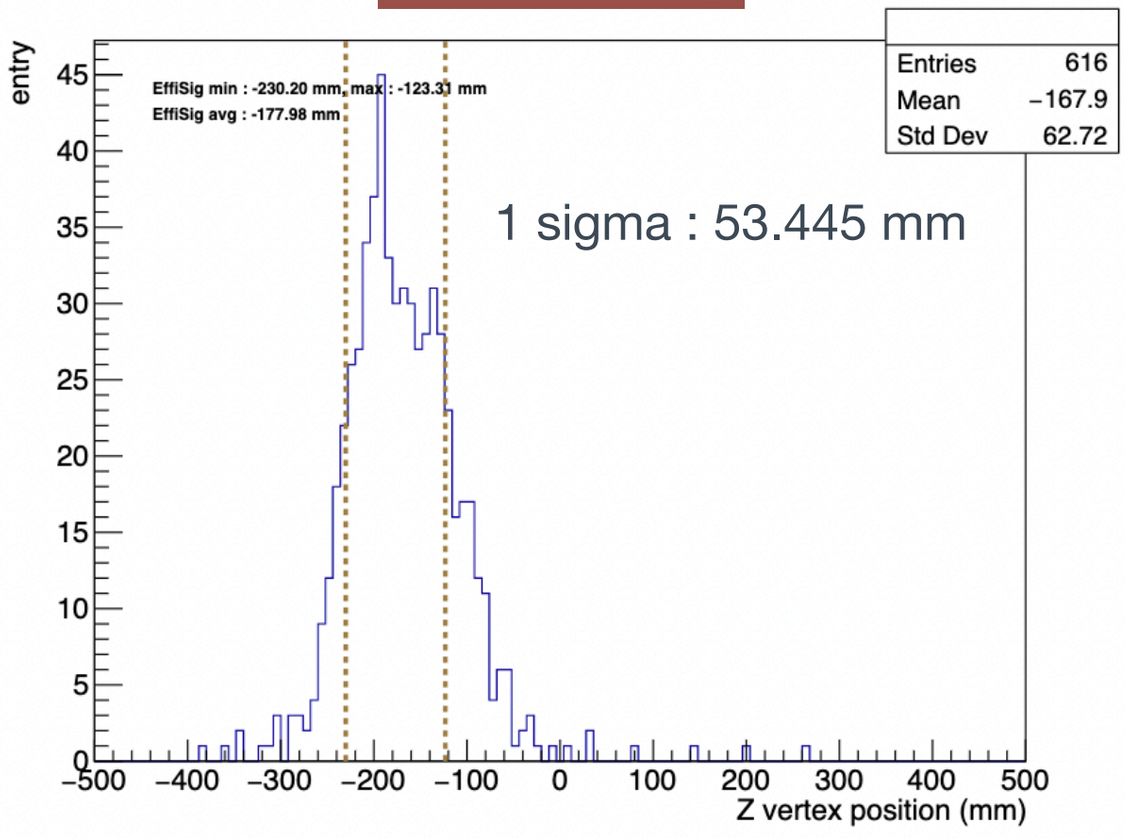
Effective sigma method is used to obtain the peak pos
(Find the shortest range that contains 68% of entries, and calculate the average of the entries in the range)



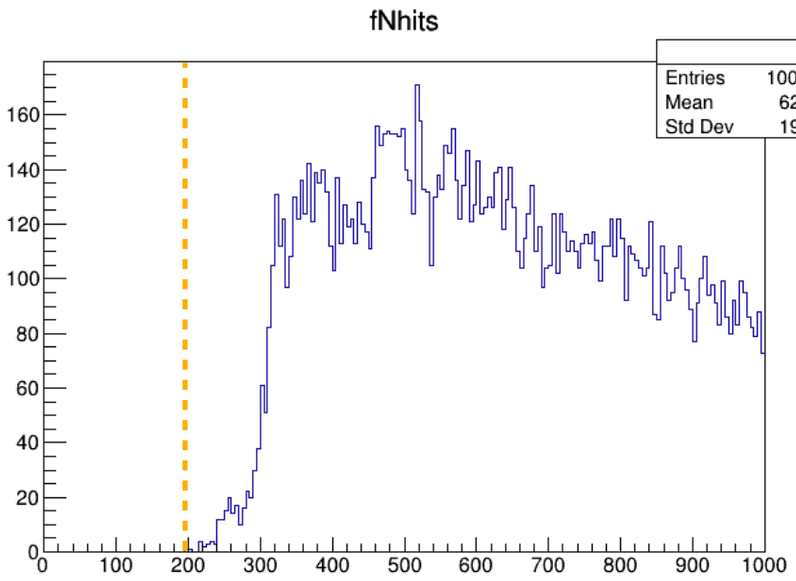
Geo correction



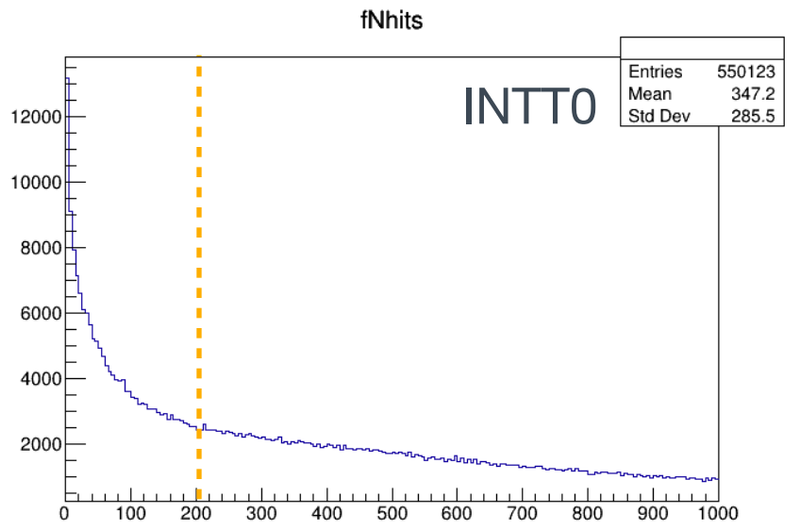
Ideal Geometry

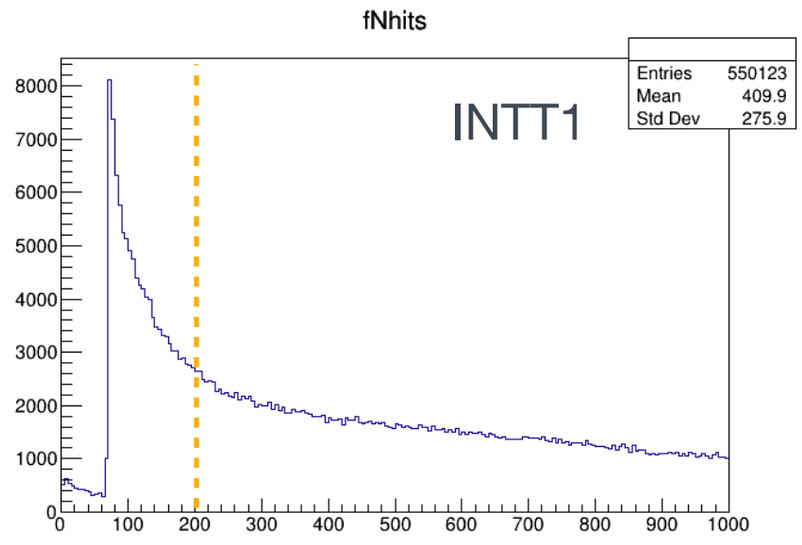


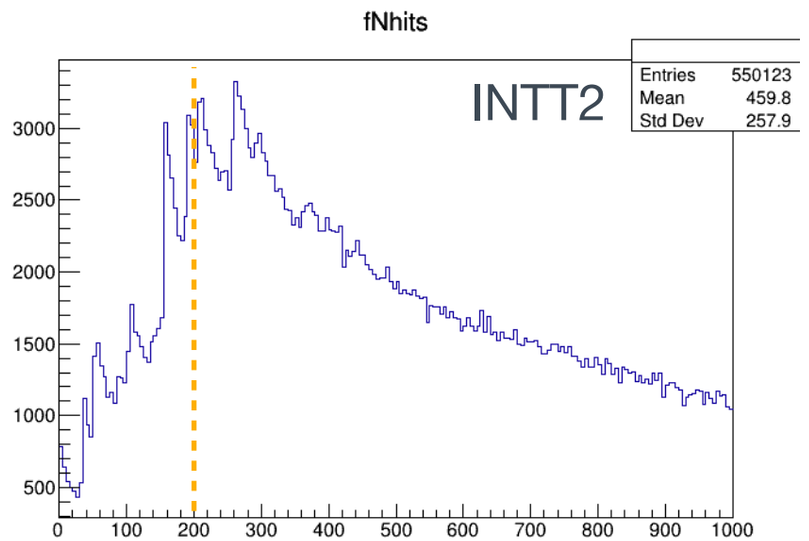
Run 20869, zero field. n_collision 127

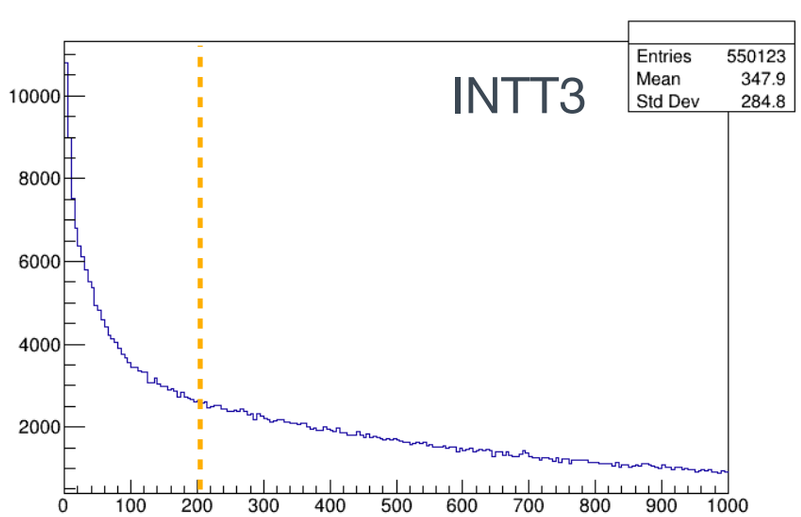


8 FELIX combined



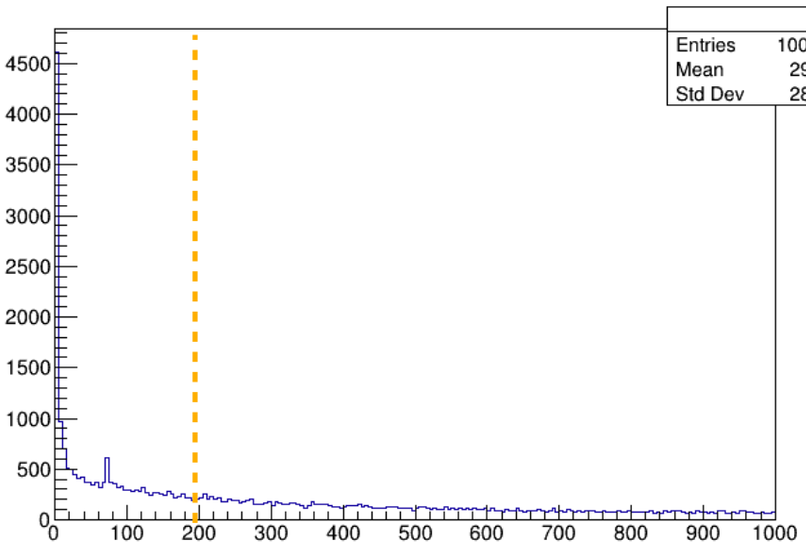




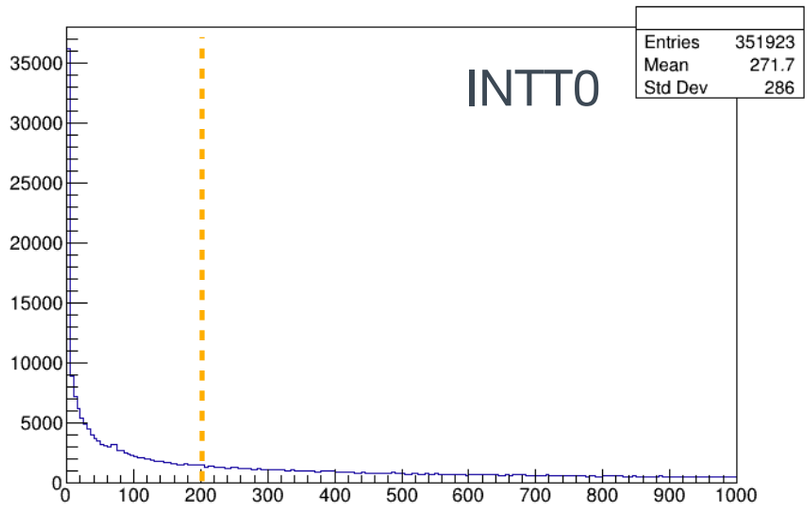


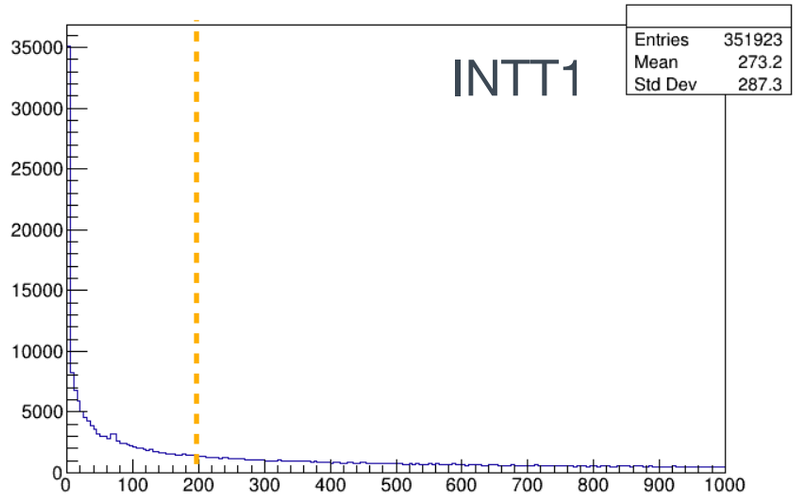
Some cuts are applied when doing the server combined ?

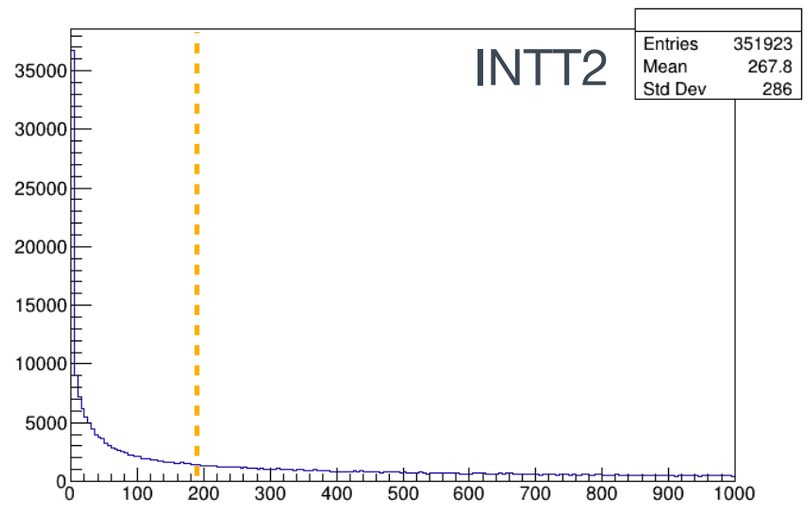
Run 23767, magnet ON, n_collisions 4

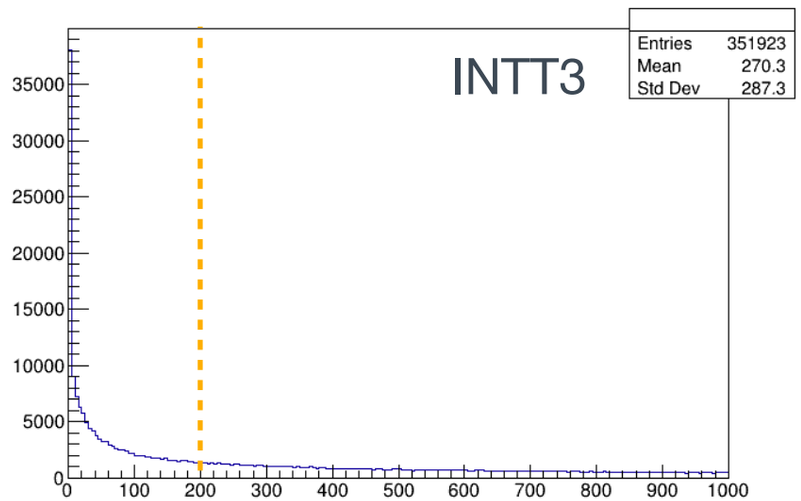


8 FELIX combined







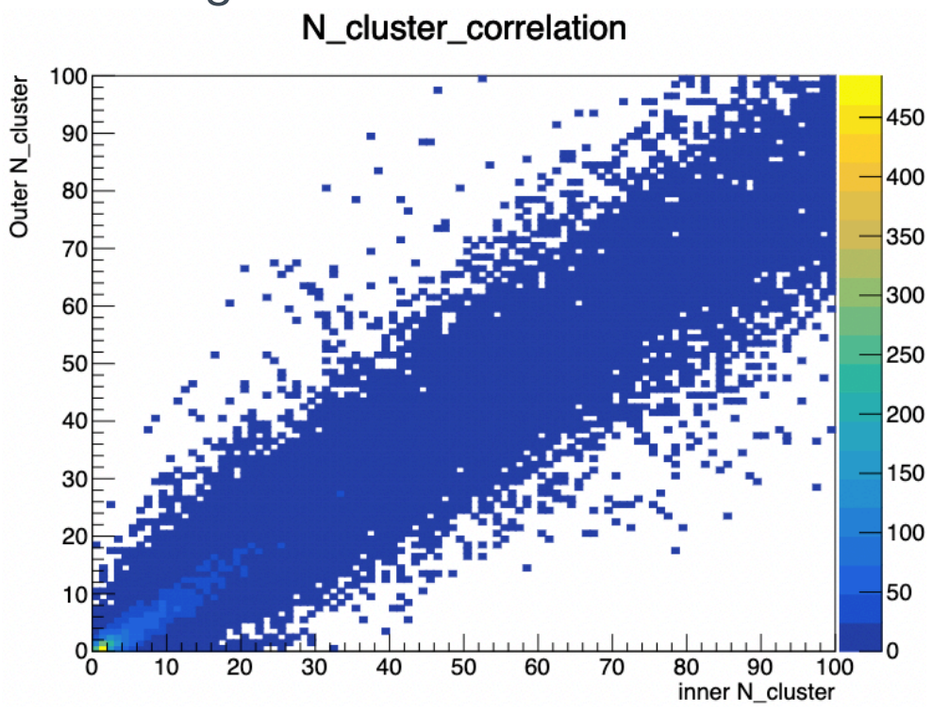


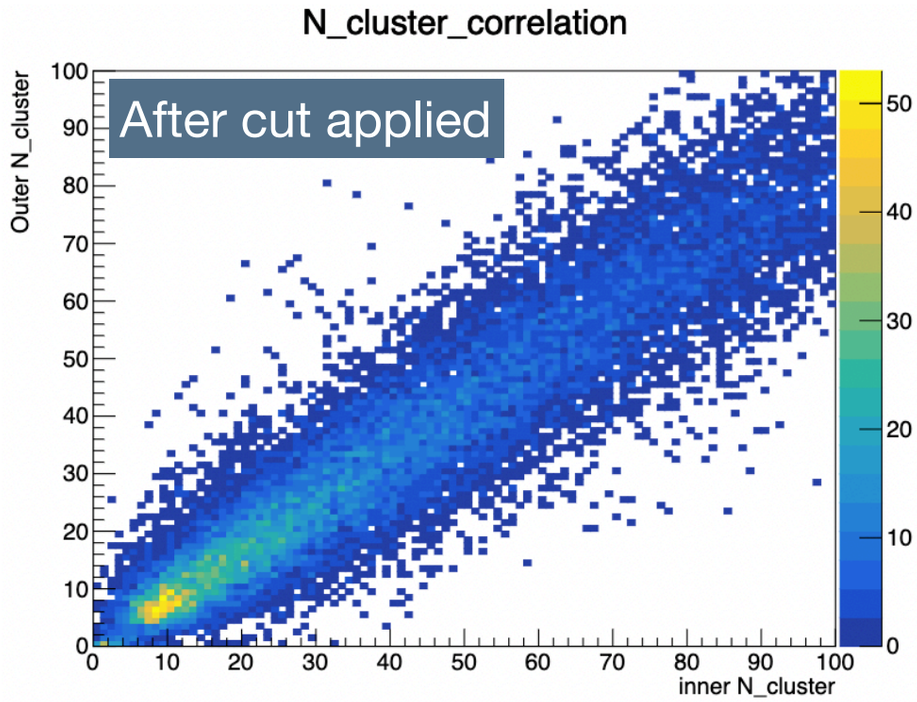
Some cuts are applied when doing the server combined ?

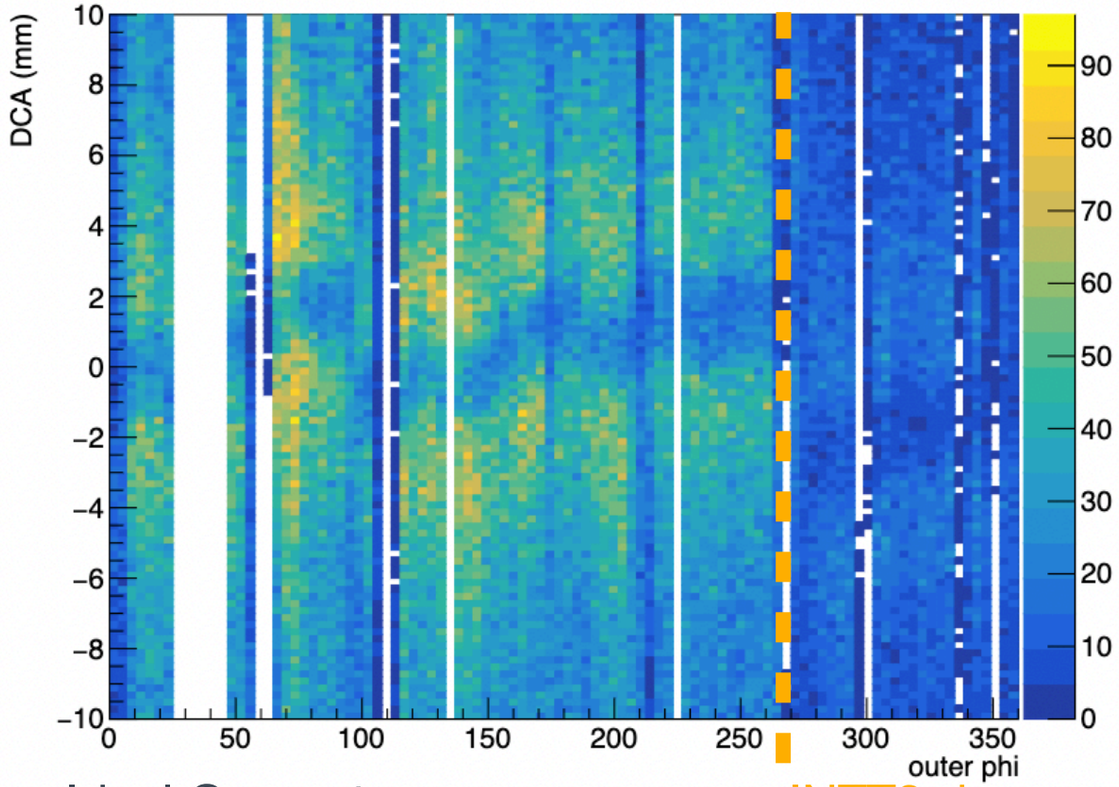
Run 23767, magnet ON, n_collisions 4

Data taken on Aug 1st, 2023, ADC setting 15 to 210

Lots of events with total Nclu ~ 10



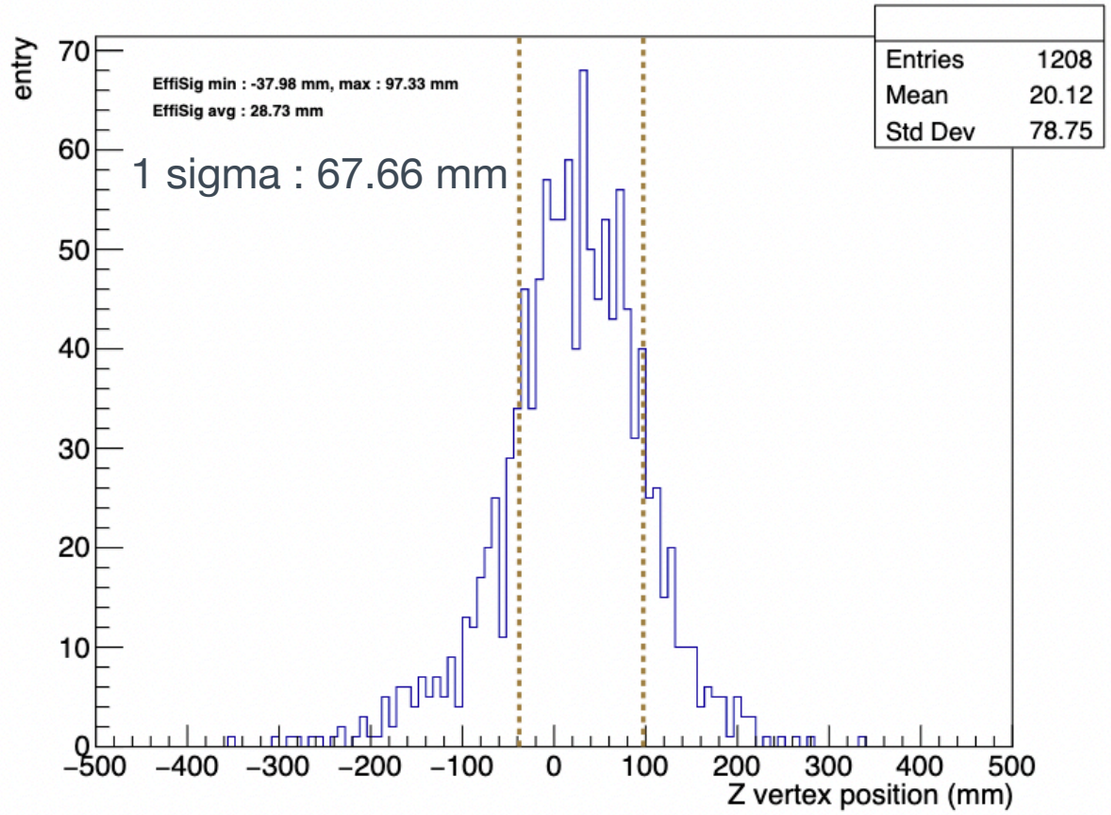




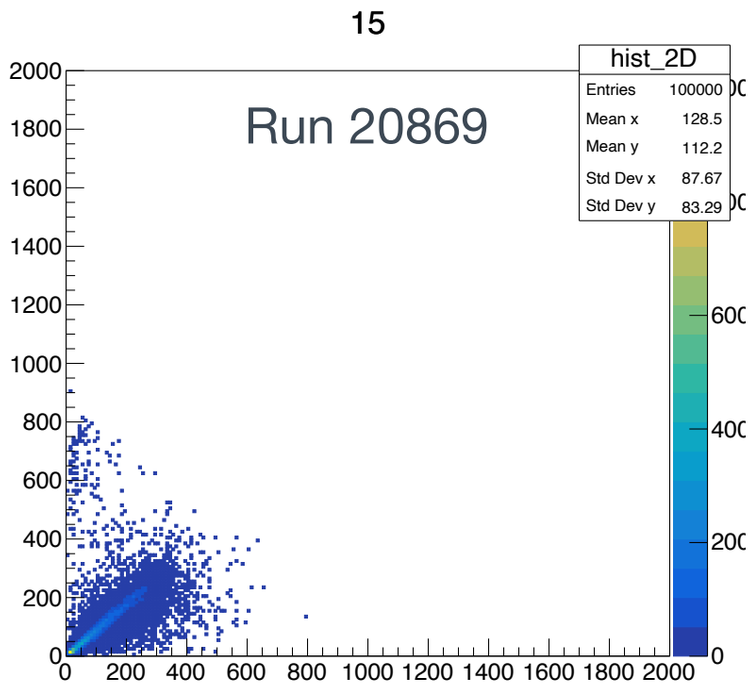
Ideal Geometry

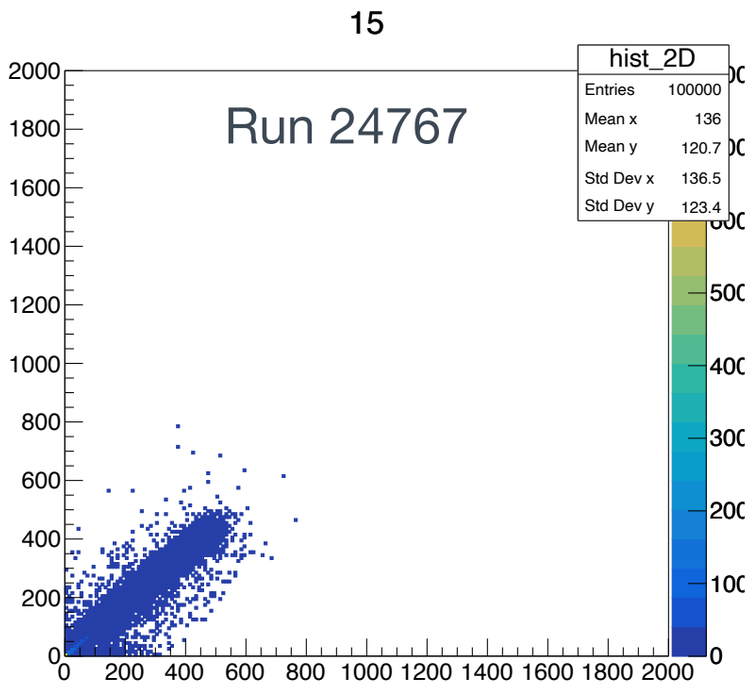
Beam origin (0,5)

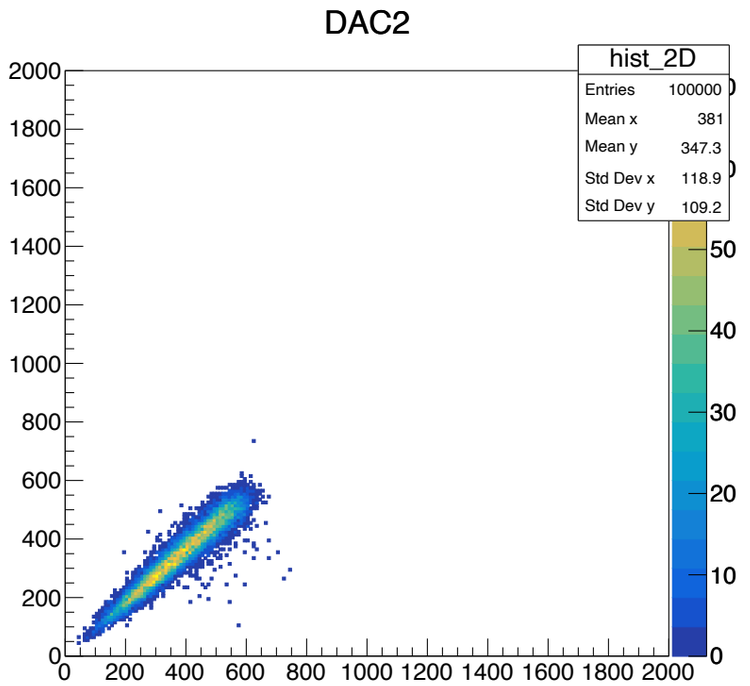
INTT3 down

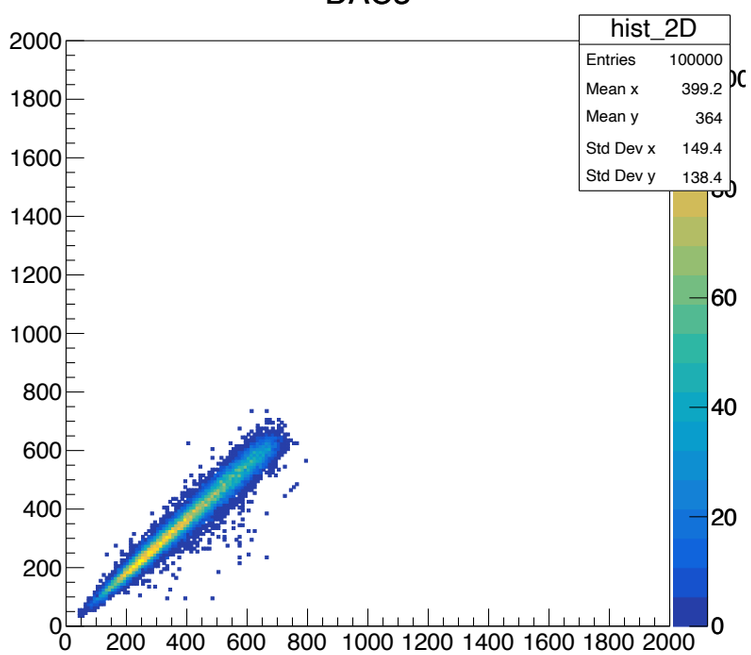


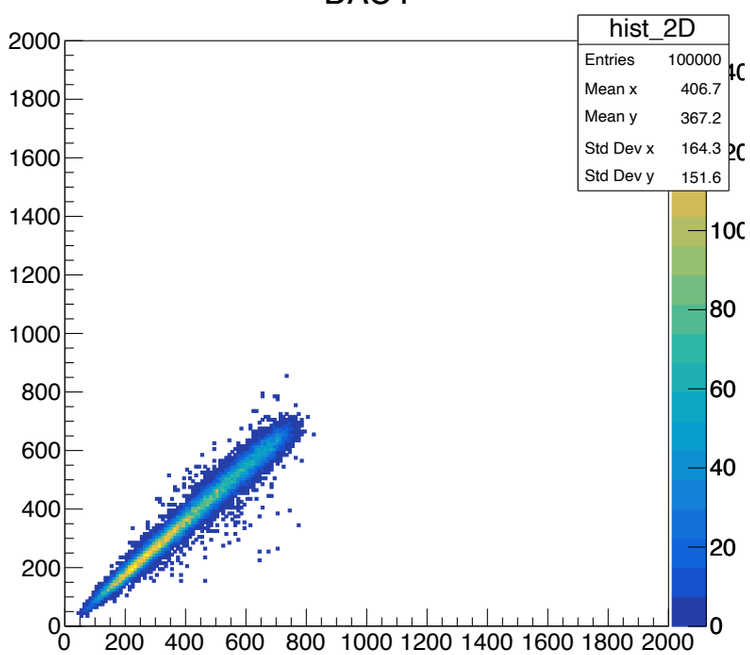
Towards to high multiplicity event

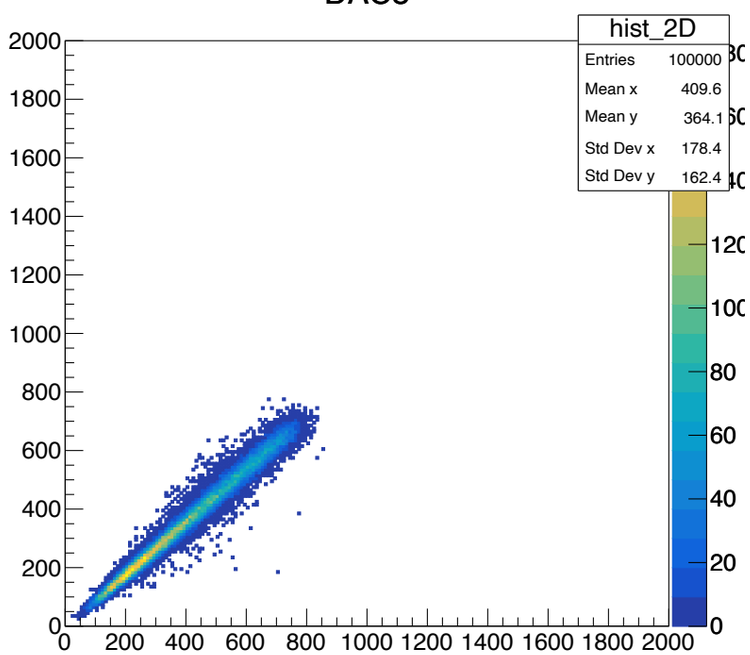








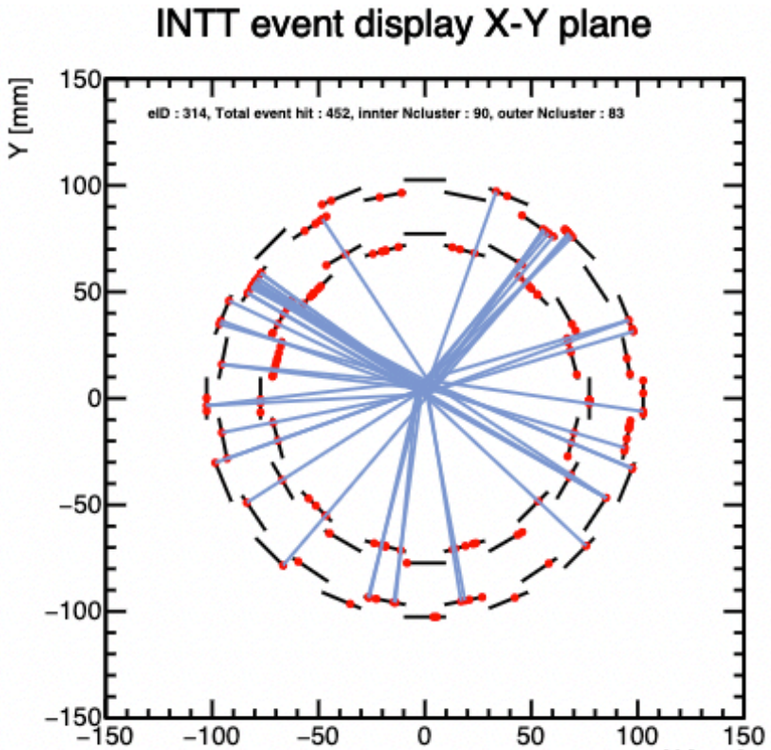


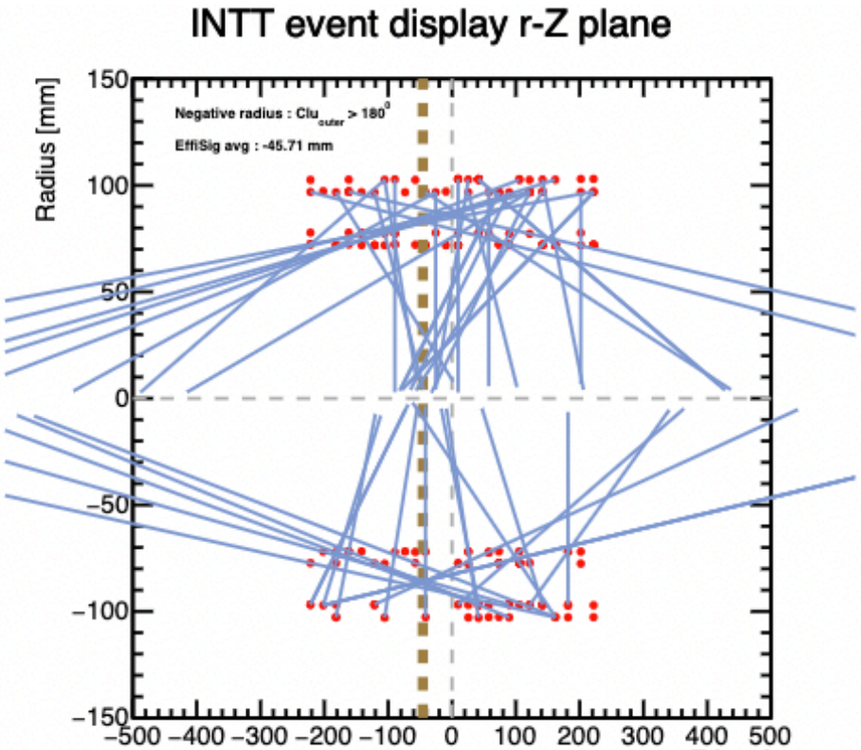


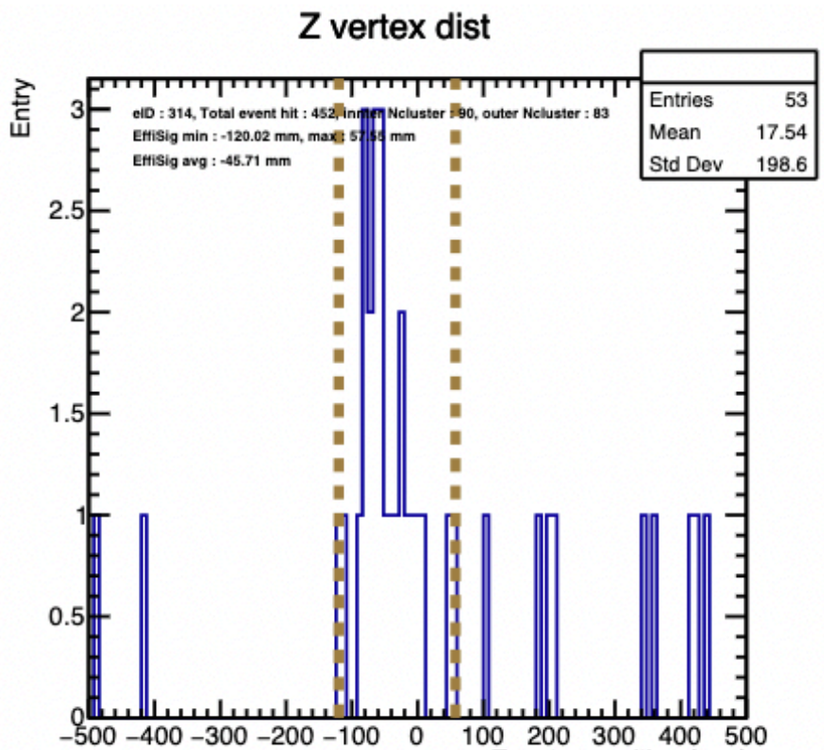
Number of clusters varies with DAC config

Towards to high multiplicity event - DAC2

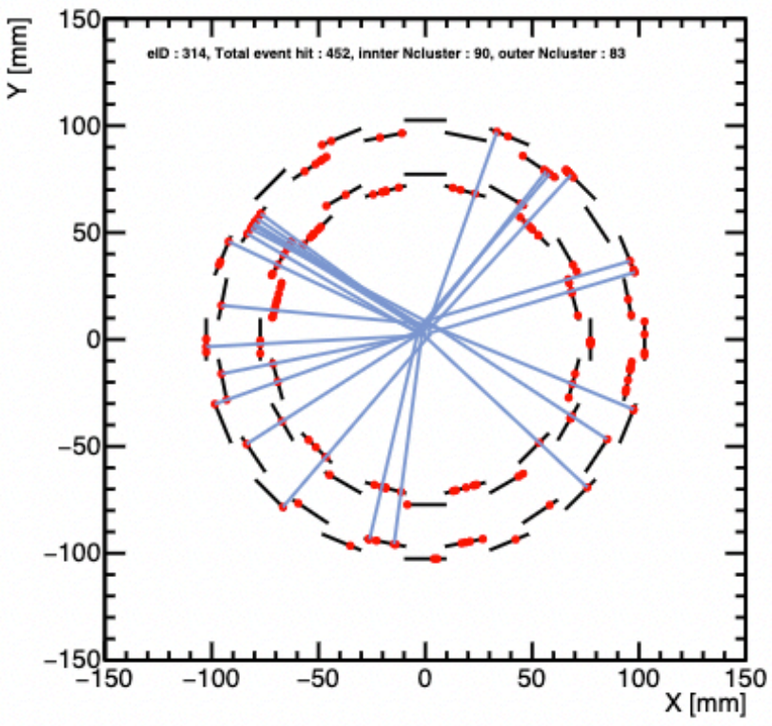
Inner outer loop and apply cuts (20 Clu_inner, 20 Clu_outer = 400)

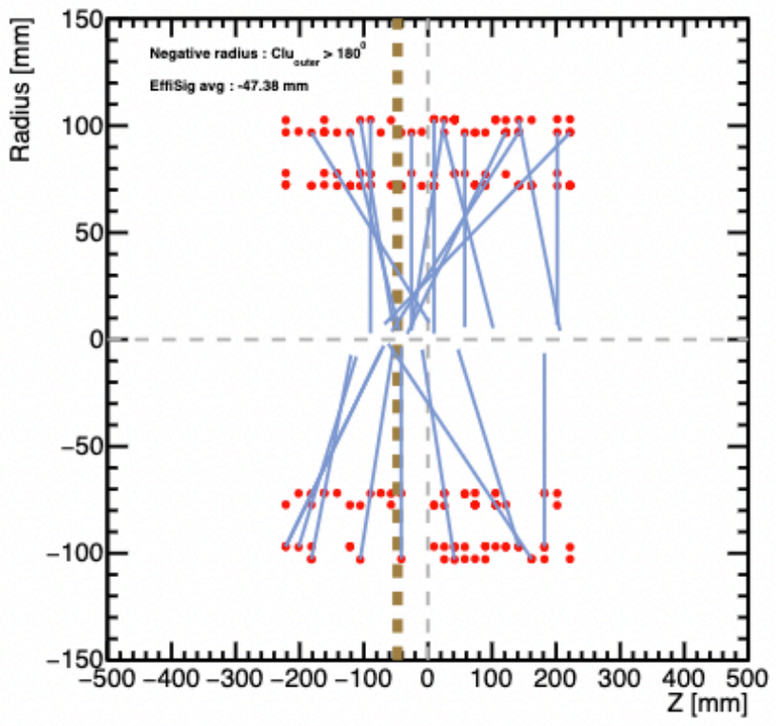


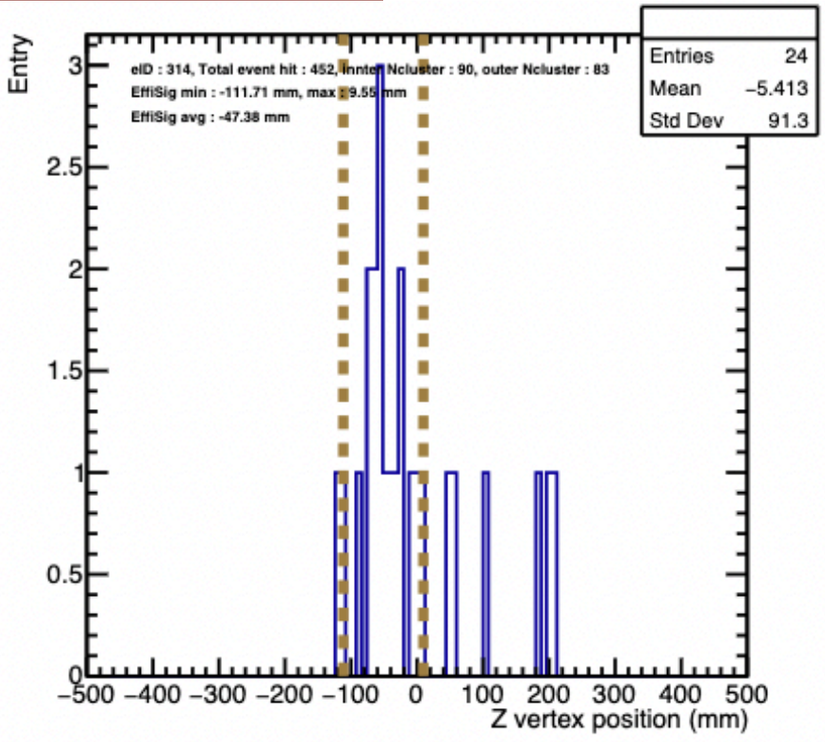




Once a good combination is found, remove from the list. (|zvtx| < 24 cm)

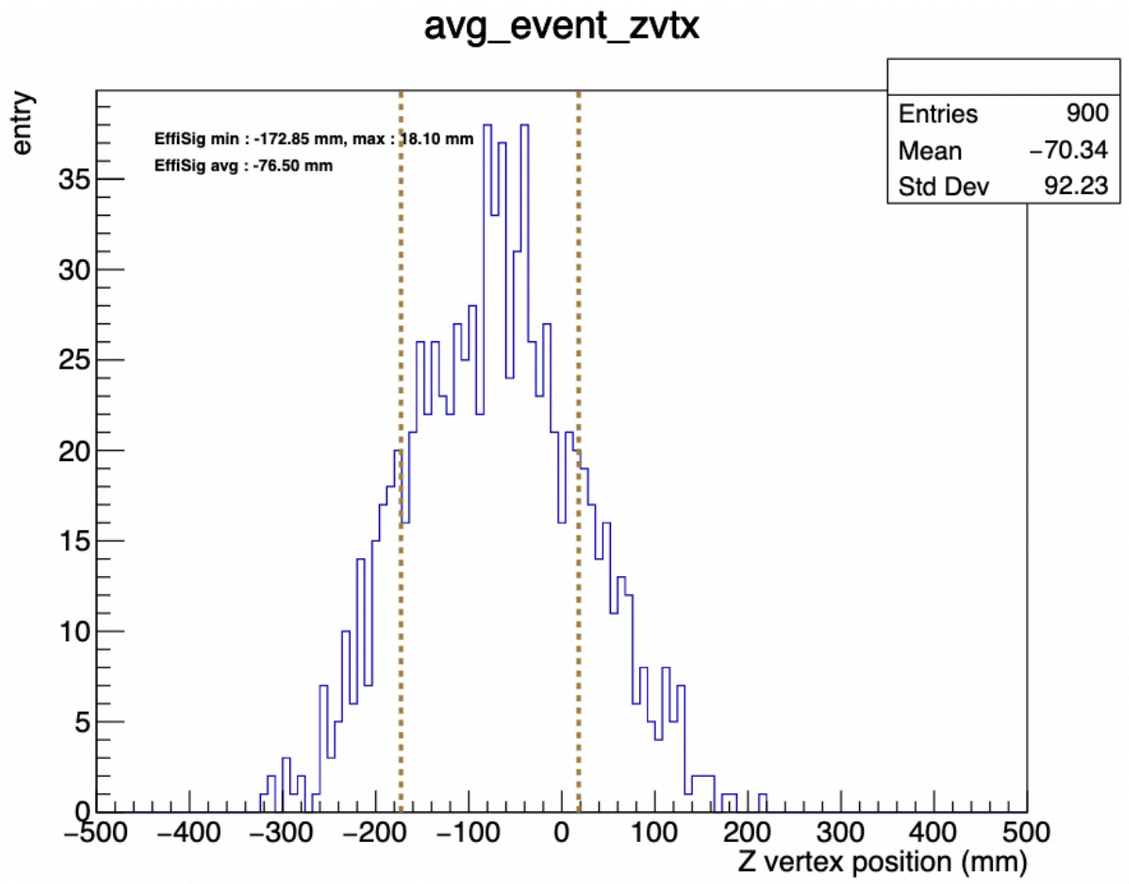




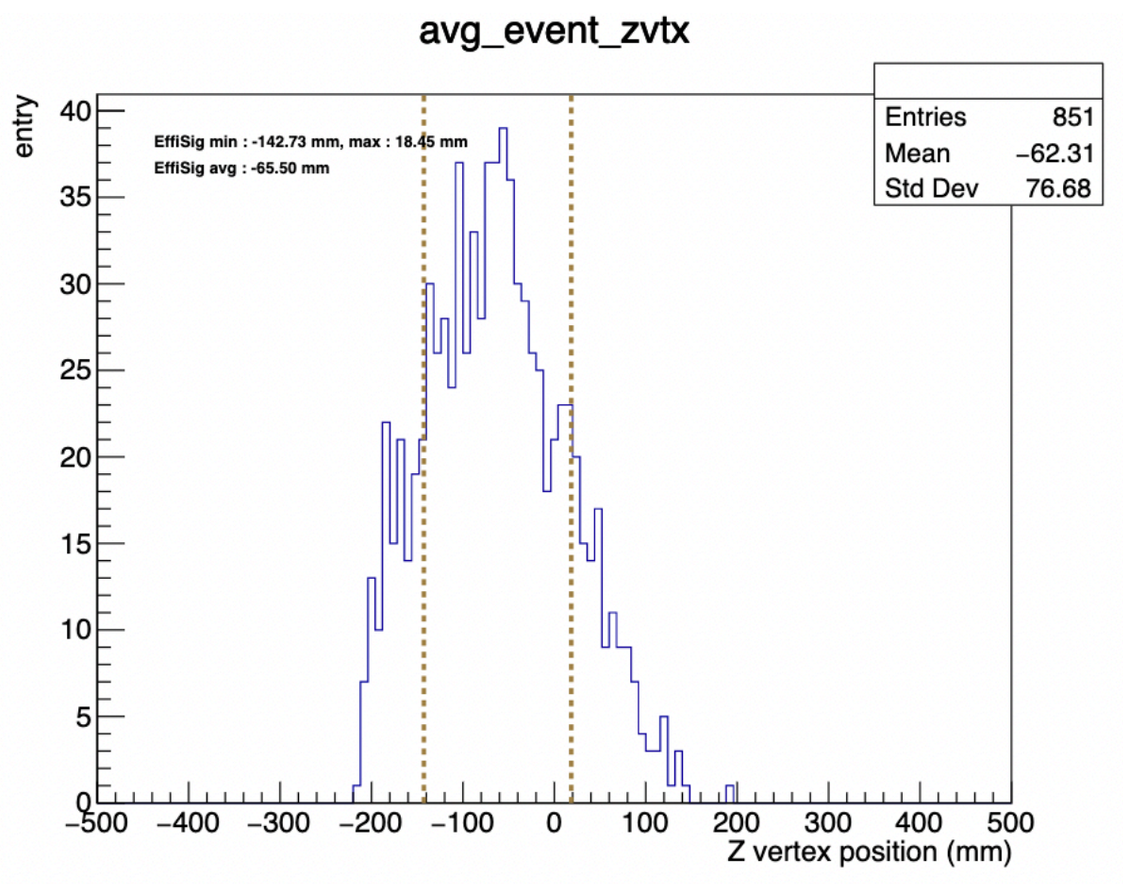


Towards to high multiplicity event - DAC2

Original method



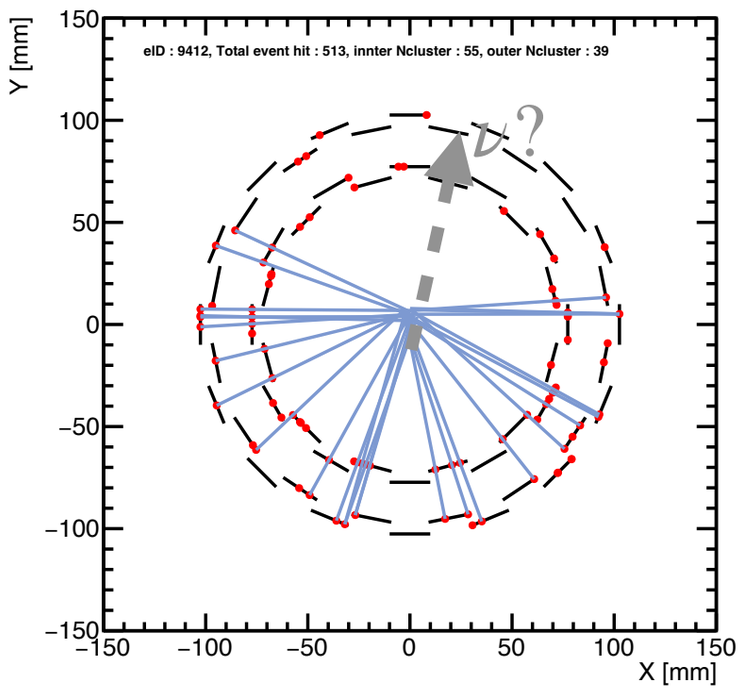
New method

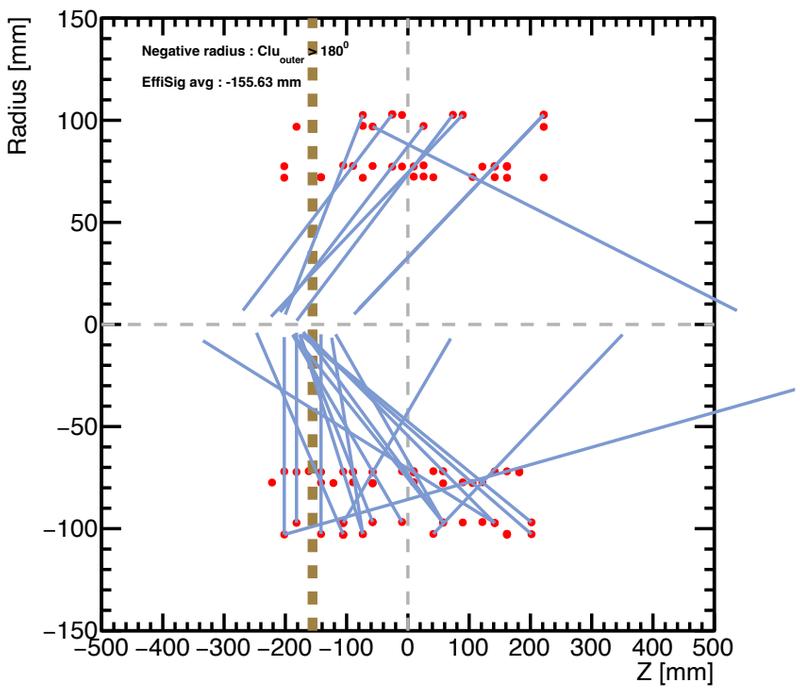


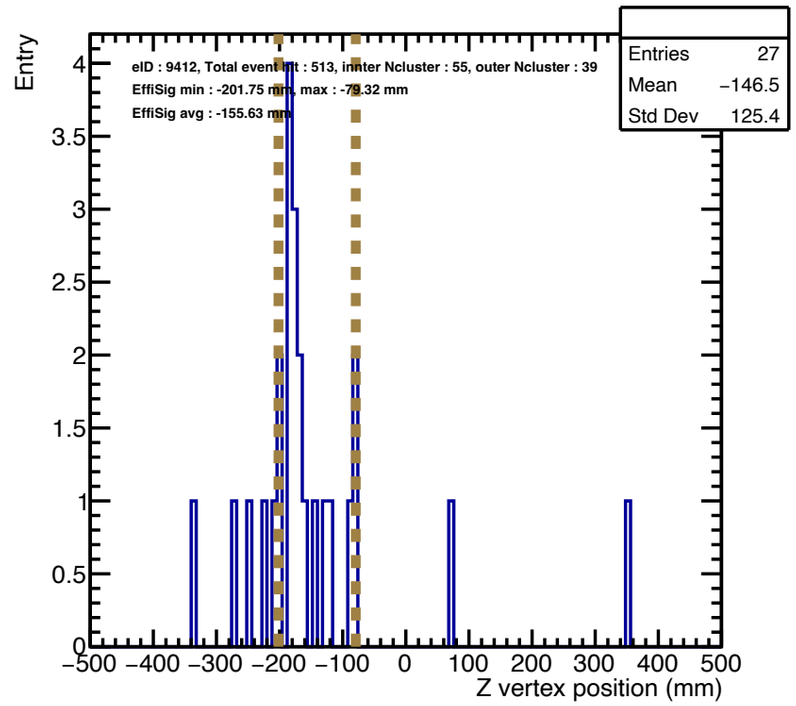
Interesting events

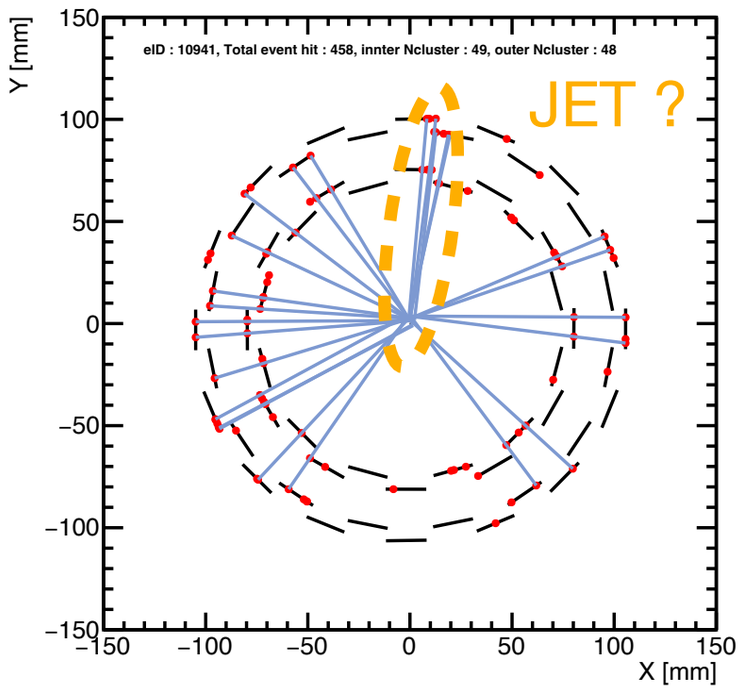
Run 20869 Zero field

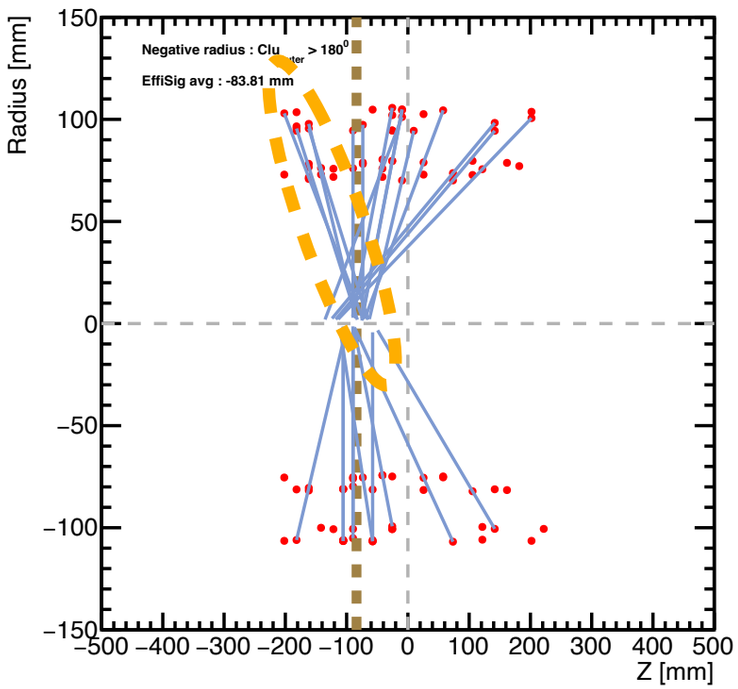
Disclaimer : more check has to be done

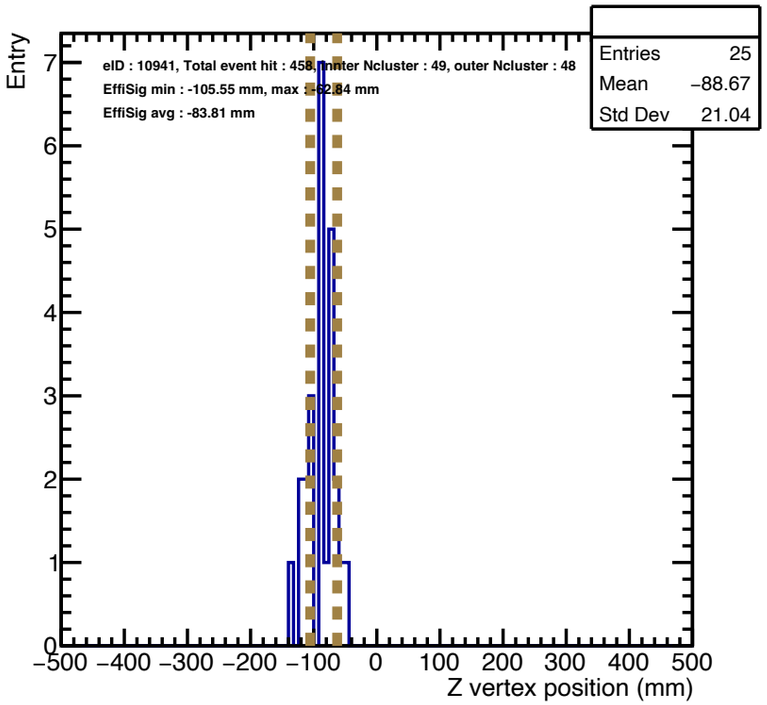












Summary

- It seems that the current survey data mis-consider the peek thickness
  - Difference in radius : 3.32 mm

- With the consideration of the survey data, the beam pos becomes (0, 2 mm)

- The effective sigma method is used for the z vertex determination
  - Width : ~ 5.5 cm

- If wish to use the INTT standalone tracking method, new algorithm is necessary to handle high multiplicity

Backup

DAC Scan config

DAC Scan

Extend to max range

Scan	1	2	3	4	5	6	7	8	9	10	11	12
DAC0	8	28	48	68	88	108	128	148	168	188	212	236
1	12	32	52	72	92	112	132	152	172	192	216	240
2	16	36	56	76	96	116	136	156	176	196	220	244
3	20	40	60	80	100	120	140	160	180	200	224	248
4	24	44	64	84	104	124	144	164	184	204	228	252
5	28	48	68	88	108	128	148	168	188	208	232	255
6	32	52	72	92	112	132	152	172	192	212	236	255
7	36	56	76	96	116	136	156	176	196	216	240	255

- BigPartition together with MBD (Must) no need to be a dedicated run
- Can be done with n_collision=127 (w/o waiting for asynchronous timing issue btwn intt servers.
- 12 settings
- > 1M events at ~400Hz
- ~ 12 hours total
- If the series of data are interrupted by the beam dump, repeat the same setting as the last run at the last store.

3

The selections for the Z vertex

- fNhits cut
- cluster size > 4 continue
- sum_adc_conv < 31 continue
- hot region cut

- N cluster cut (inner + outer)

- inner_phi - outer_phi cut
- DCA distance cut

- N good track in one event cut
  - For Z vtx calculation

Z position correction

- The z pos of origin-closest column (column 13) :
  - 0.1 mm / 2 (gap b/w two HDIs) +
    0.5 mm (gap in HDI) +
    1 mm (gap in sensor) +
    16 / 2 mm (half width of typeA strip) = 9.55 mm, vice versa

- The z pos of column 5 (last typeB column) :
  - 121.55 mm (Z pos of column 6) +
    8 mm (half cell of type A sensor) +
    1 mm (gap between active area & sensor edge) +
    0.2 mm (gap between two sensors) +
    1 mm (gap between active area & sensor edge) +
    10 mm (half cell of type B sensor) = 141.75, vice versa