sPEHNIX - INTT commissioning

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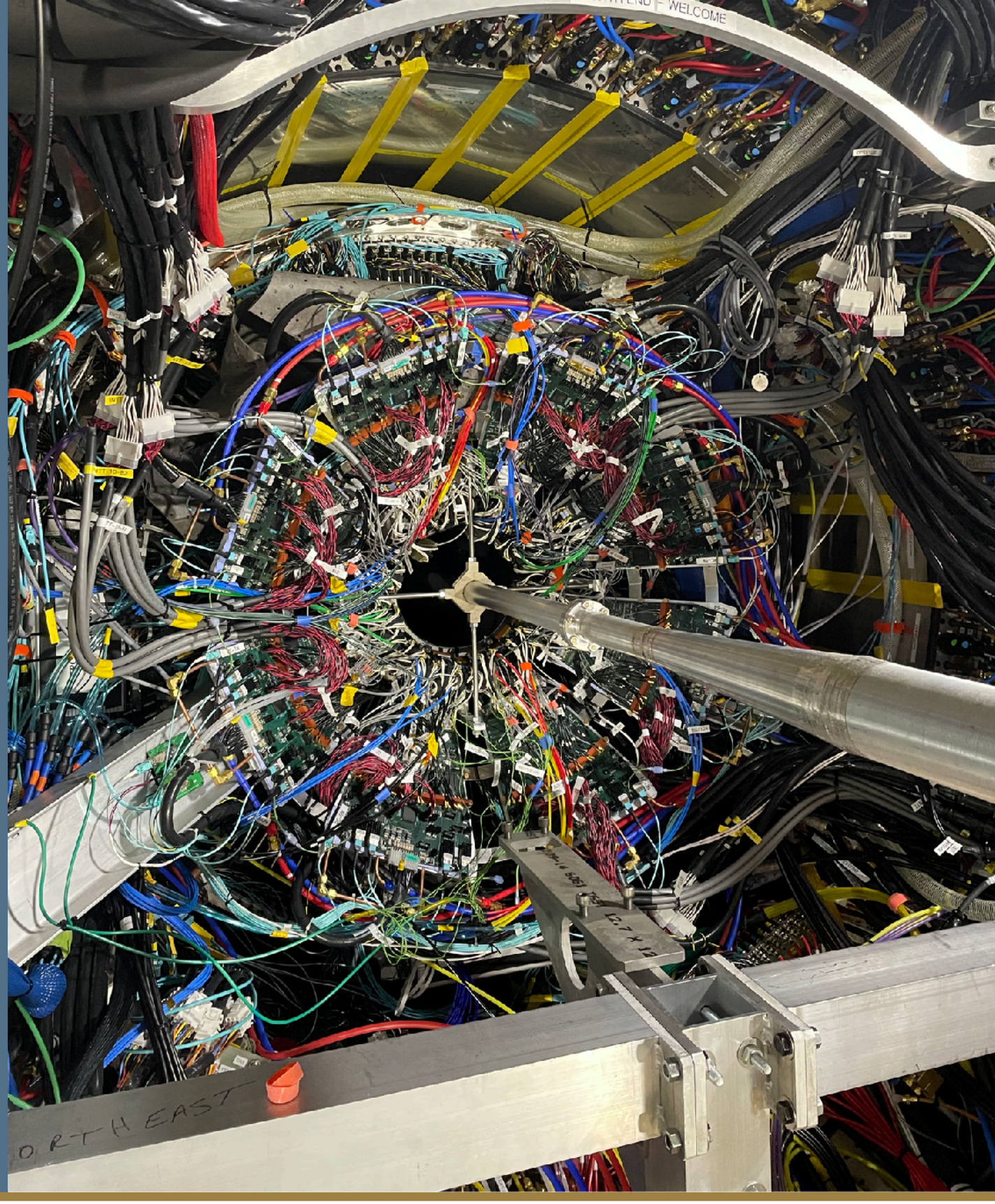
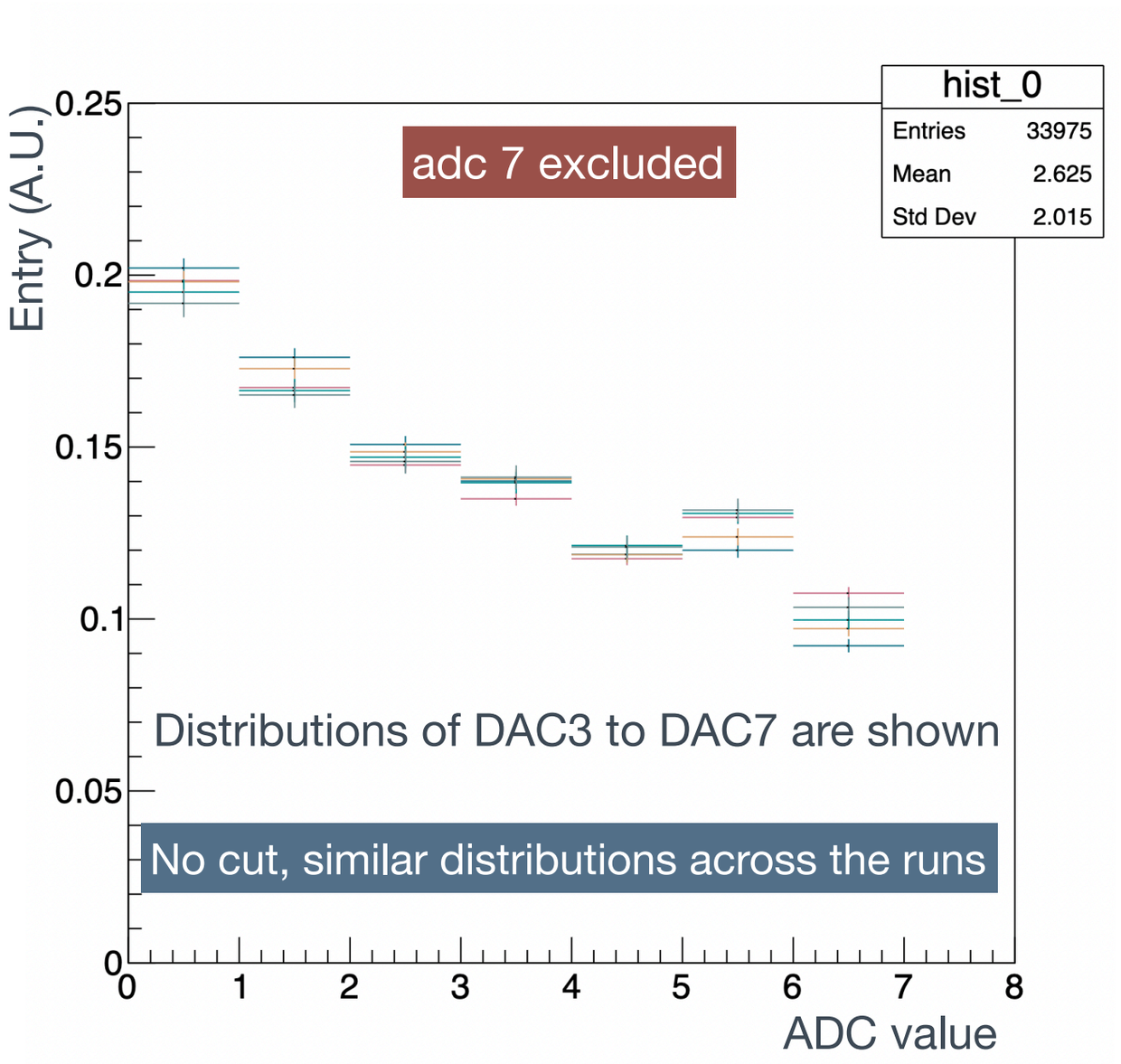
National Central University



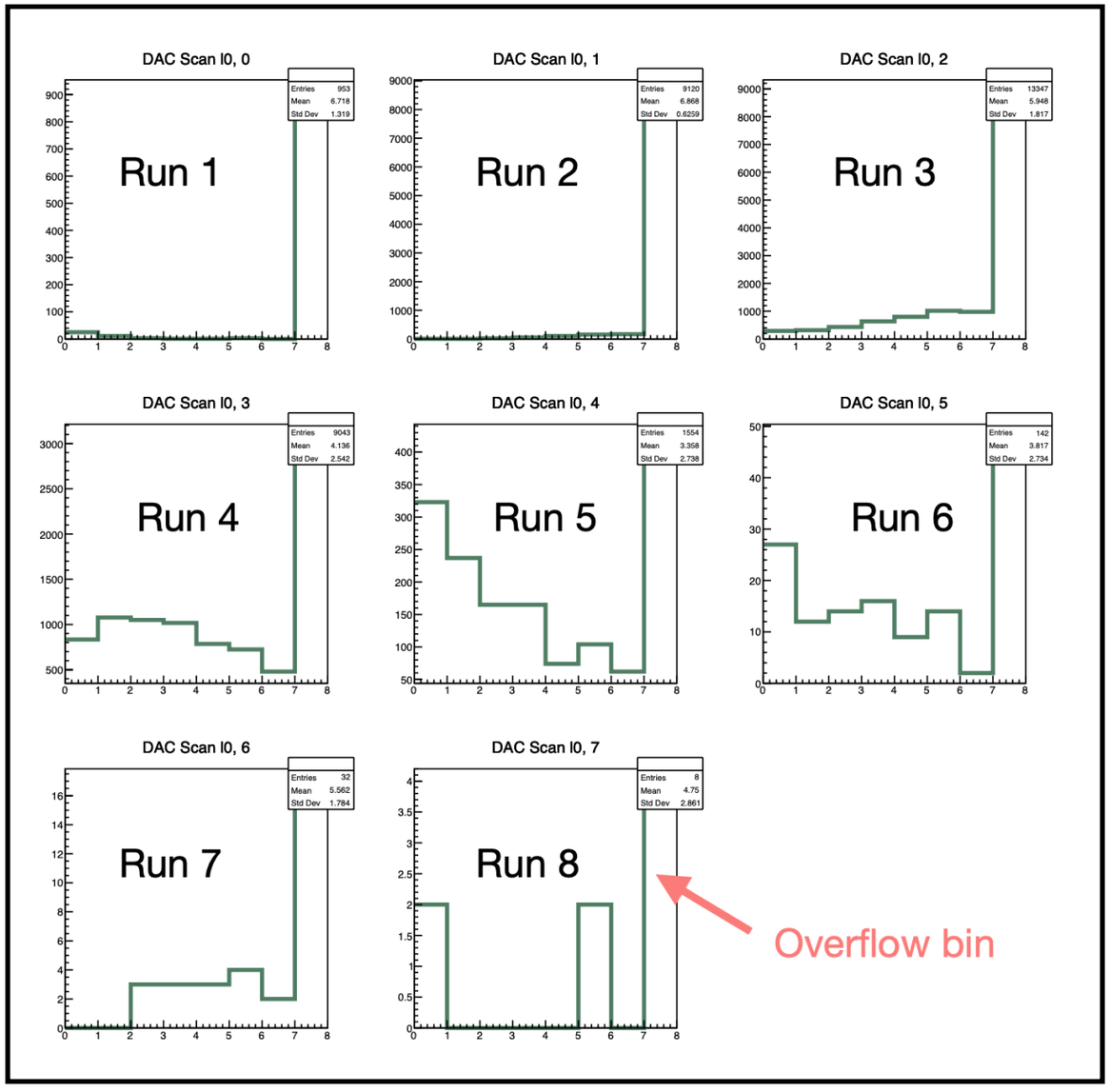
2023/07/28 Group meeting

DAC Scan

checked files (DAC7 to DAC3) :
beam_intt4-00021527-0000_event_base
beam_intt4-00021040-0000_event_base
beam_intt4-00021035-0000_event_base
beam_intt4-00021025-0000_event_base
beam_intt4-00021019-0000_event_base



INTT beam test 2021

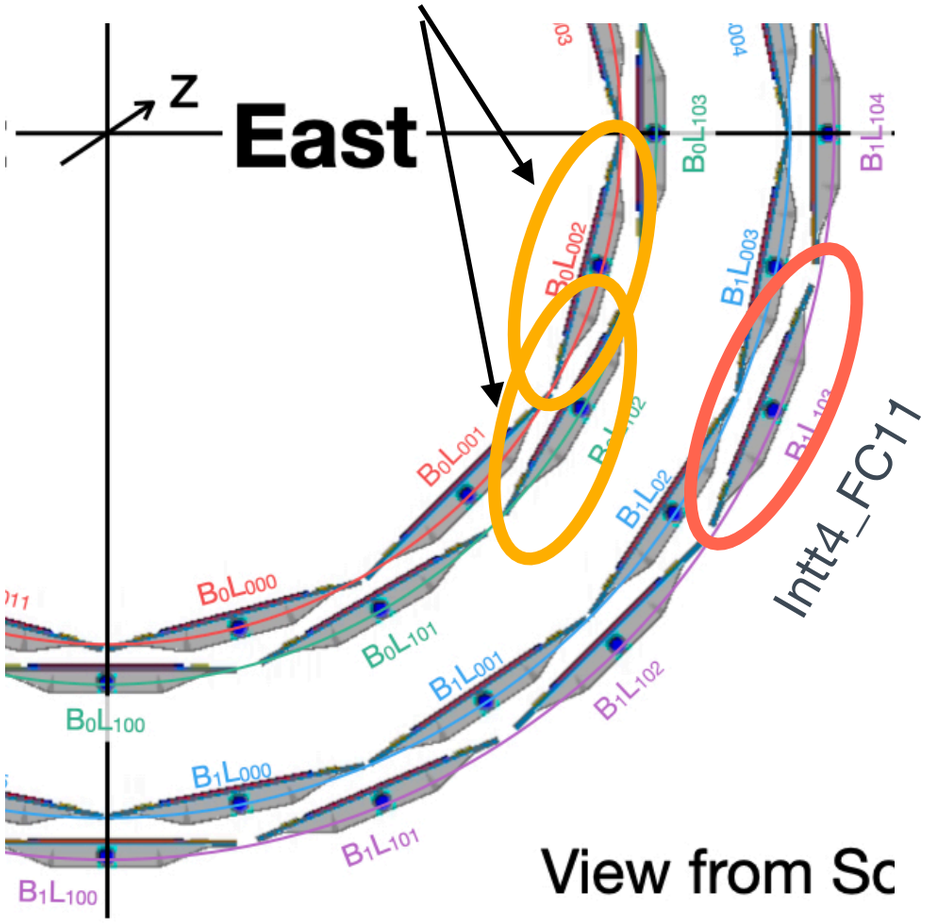


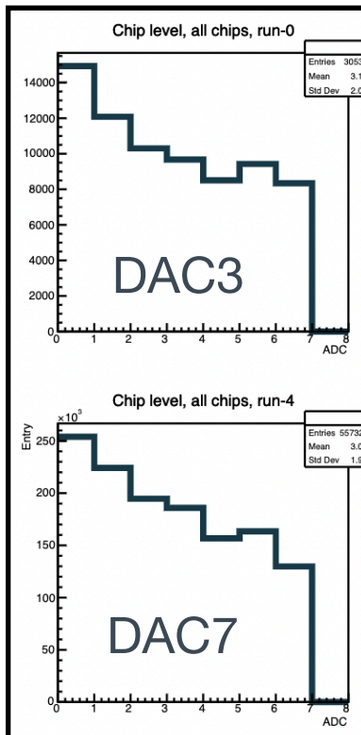
DAC Scan - current results

Focus on FC 11 of INTT4

Applied selection :
1. Multiplicity cut
2. Geometry requirement

At least one cluster from these two ladders





adc 7 excluded

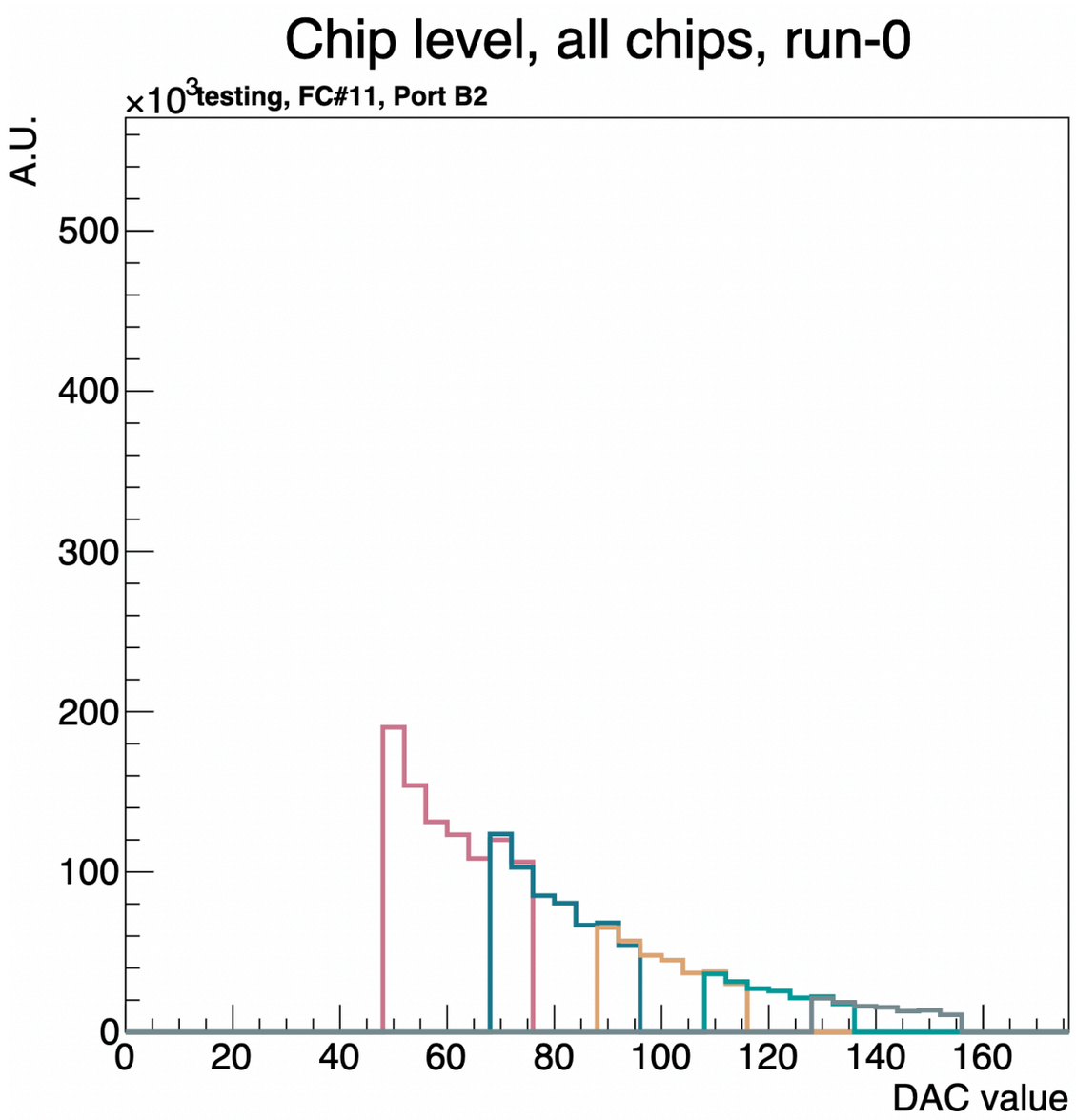
testing

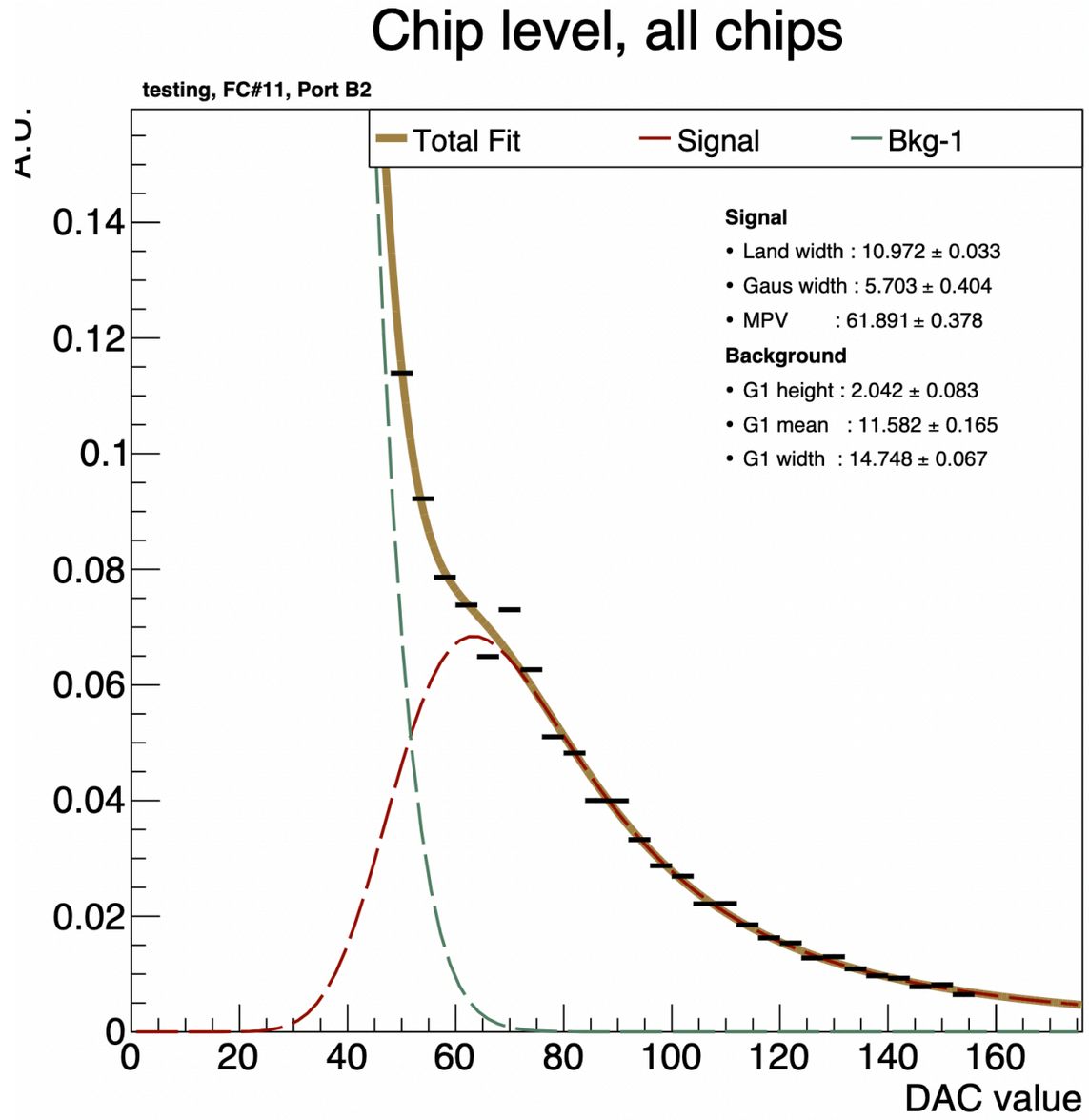
FC#11, Port B2, All chips

Bin8 set content 0

DAC Scan - current results

Only single hit cluster considered





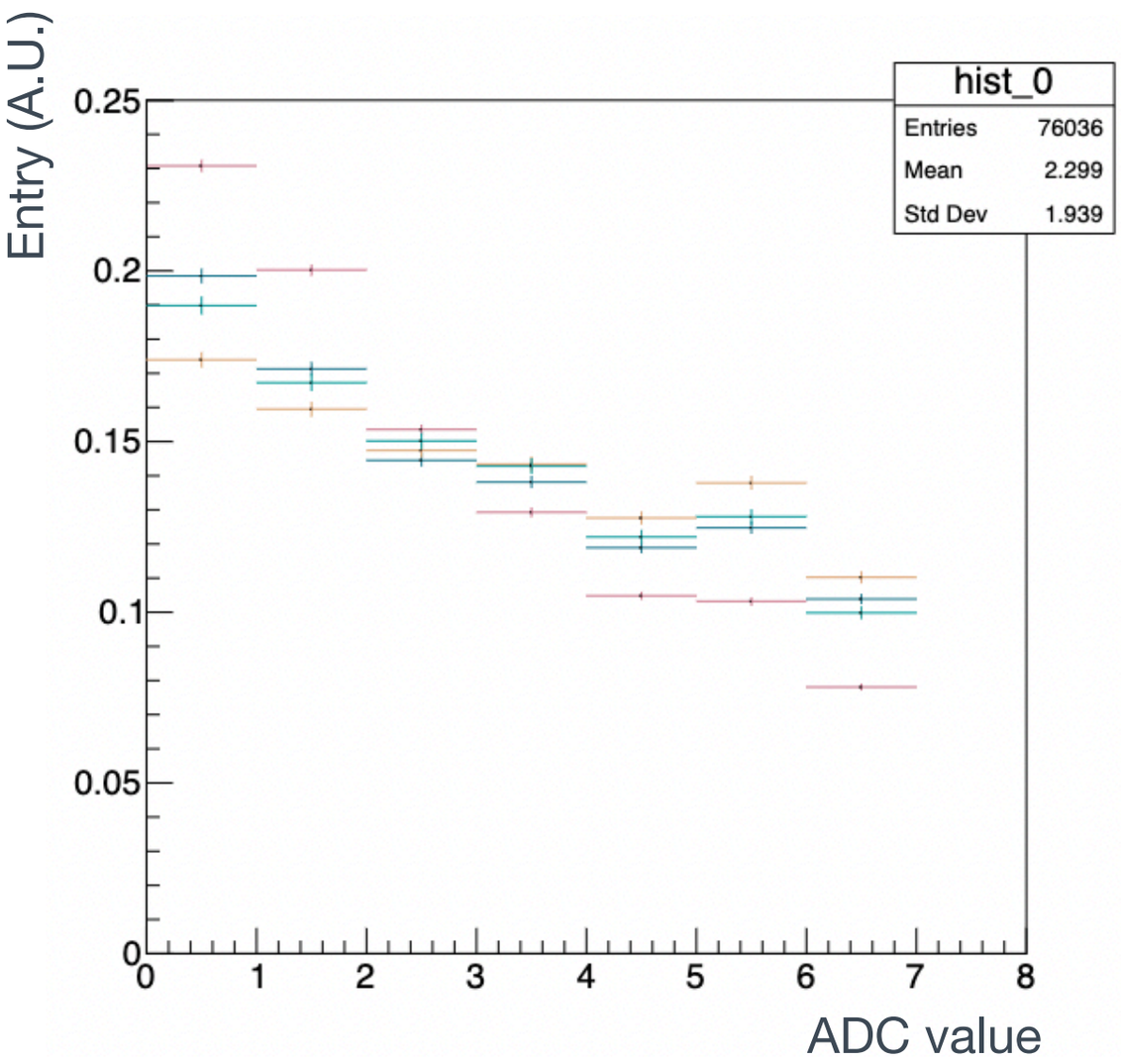
This run seems to be unsuccessful since we have some clues that the DAC config was not set properly

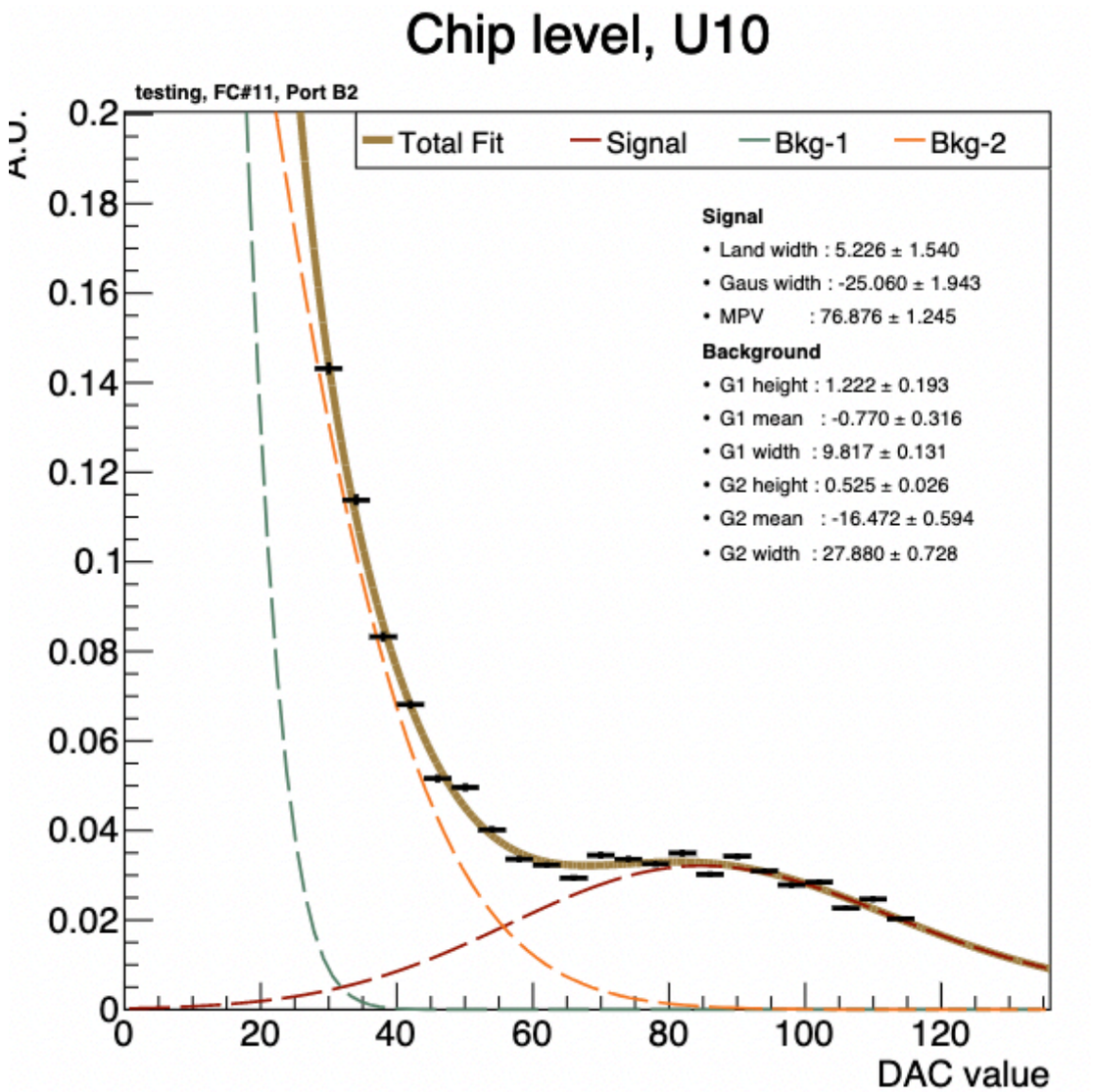
DAC Scan - new run

This time we kind of sure that the DAC setting is correct

DAC5 to DAC2

Same selection (rough geometry cut)



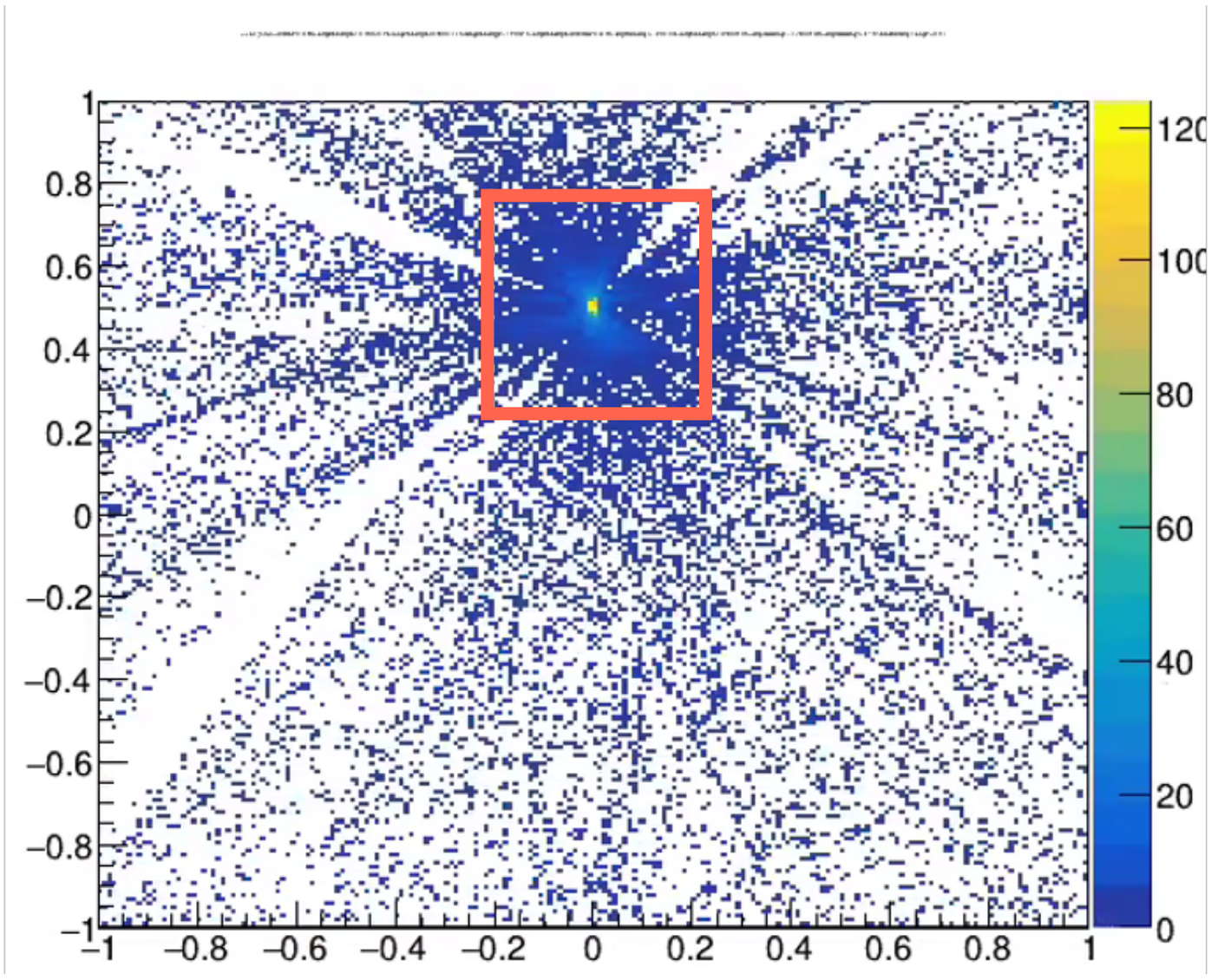


At least the adc distributions don't seem to be so similar among different DAC setting

The Background seems to be still huge
-> more tighter selection is needed

DAC Scan - Plan

- Strategy
  - Perform the tracking
  - Set the cut based on DCA_{xy} and Z vertex



Plot made by Takashi

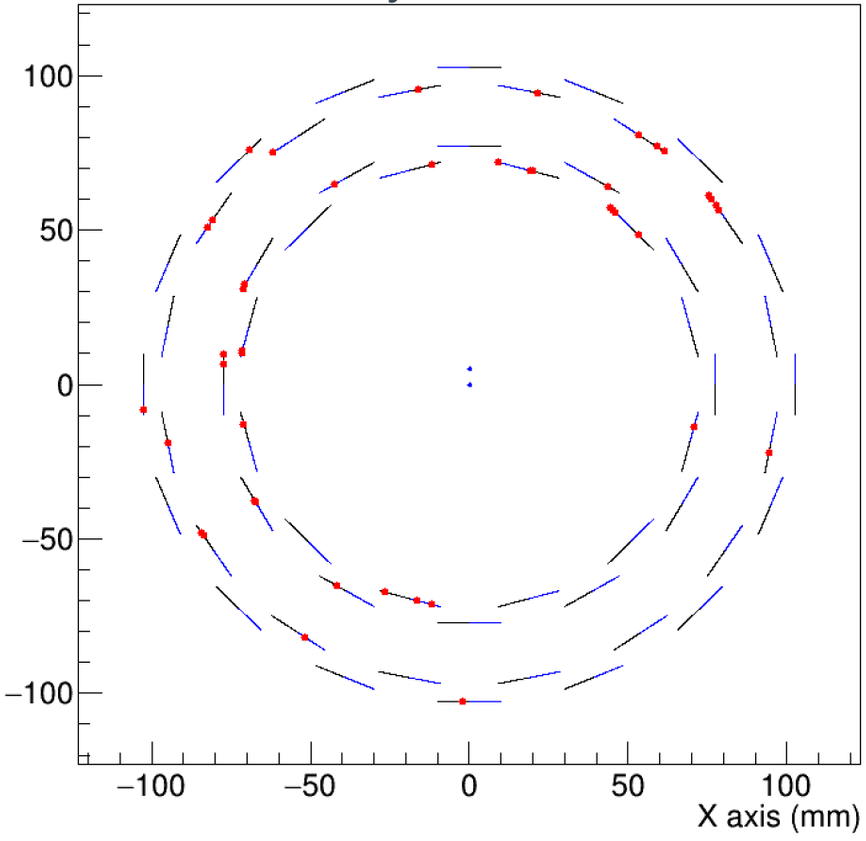
DAC Scan - status of new plan

I did the clustering, hit position conversion myself (not using the sPHENIX F4A framework)
-> Good chance to cross check the F4A conversion
-> Few things was found
1. X axis mirrored
2. Z position correction
3. clustering method check

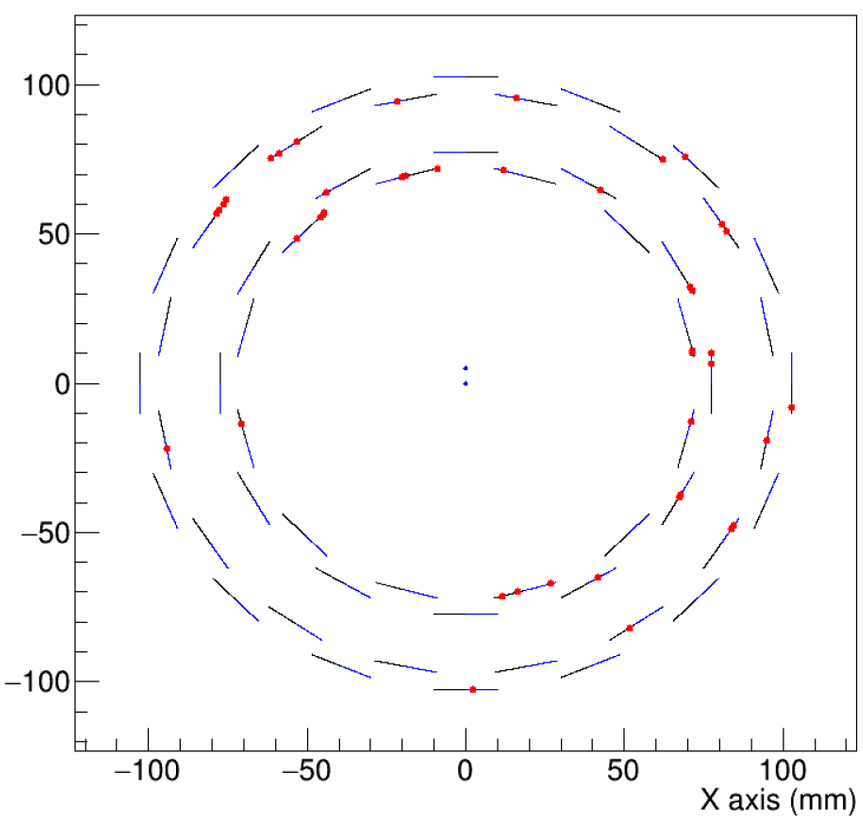
Now I am able do the clustering and pos. conversion correctly

run 20869 Zero Field, event 12, Z < 0

My code



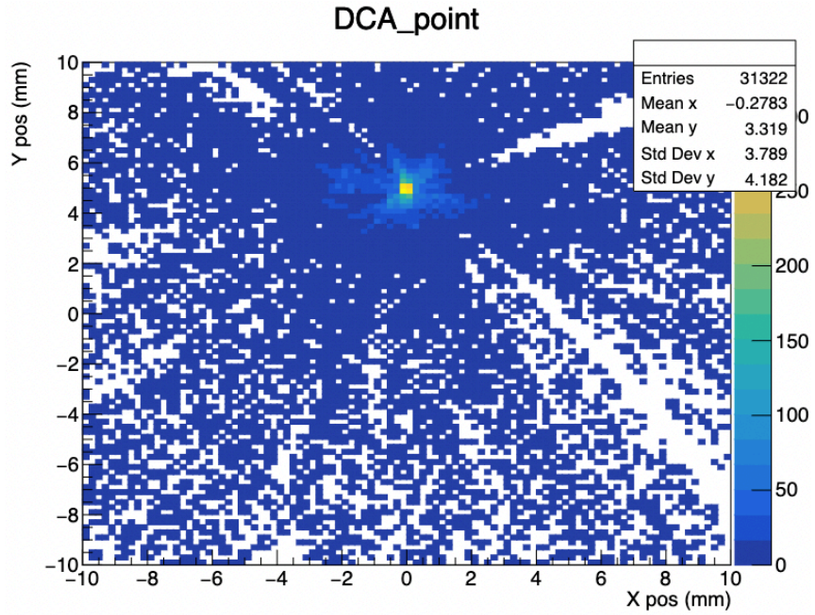
Takashi's code (F4A framework)



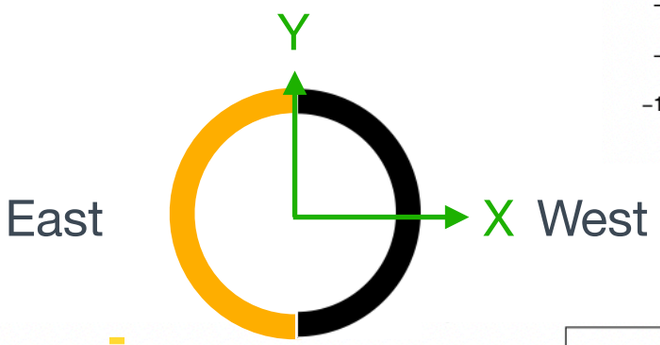
X axis mirrored (Acknowledged)

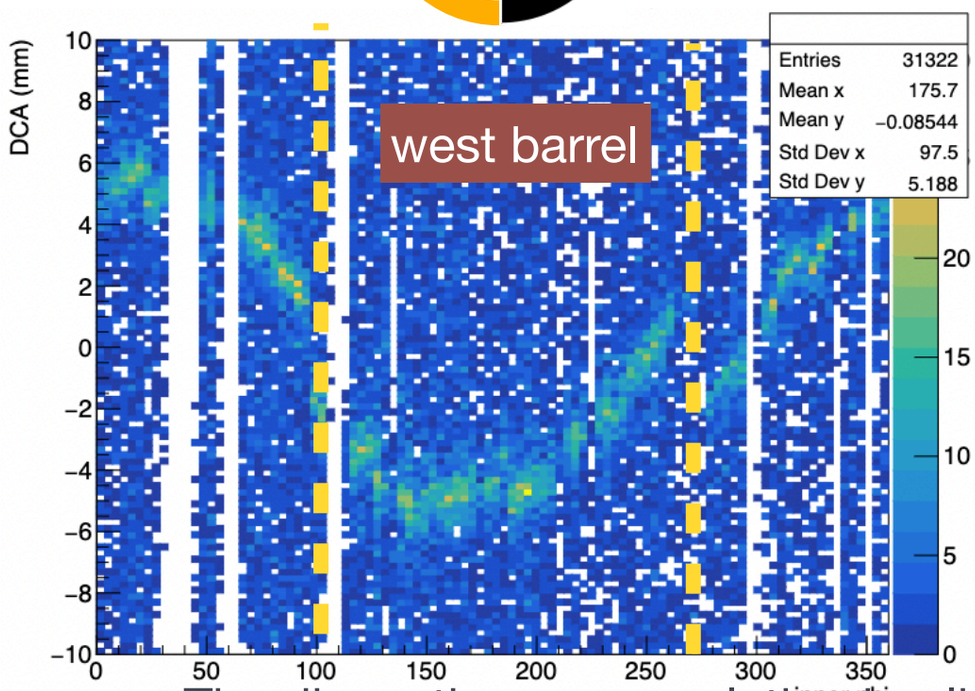
INTT geometry check

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



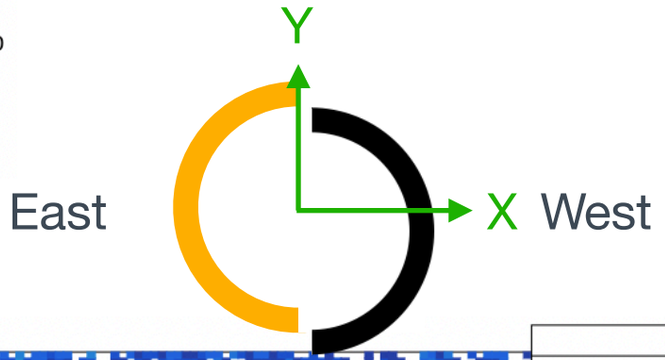
If using the nominal geometry (no correction)

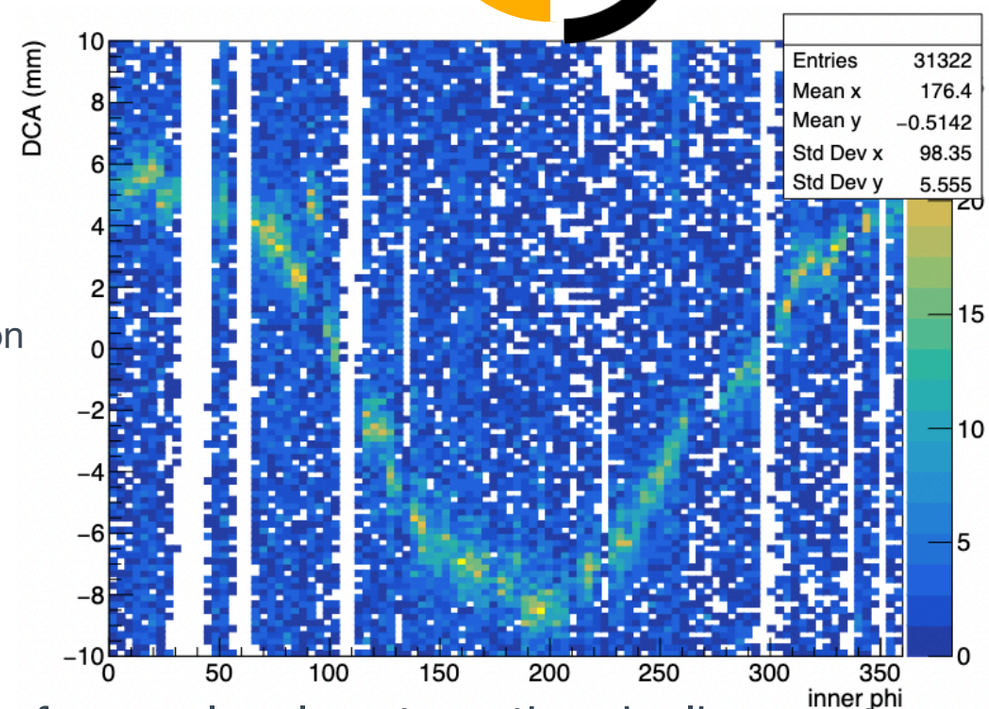




Add the correction

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



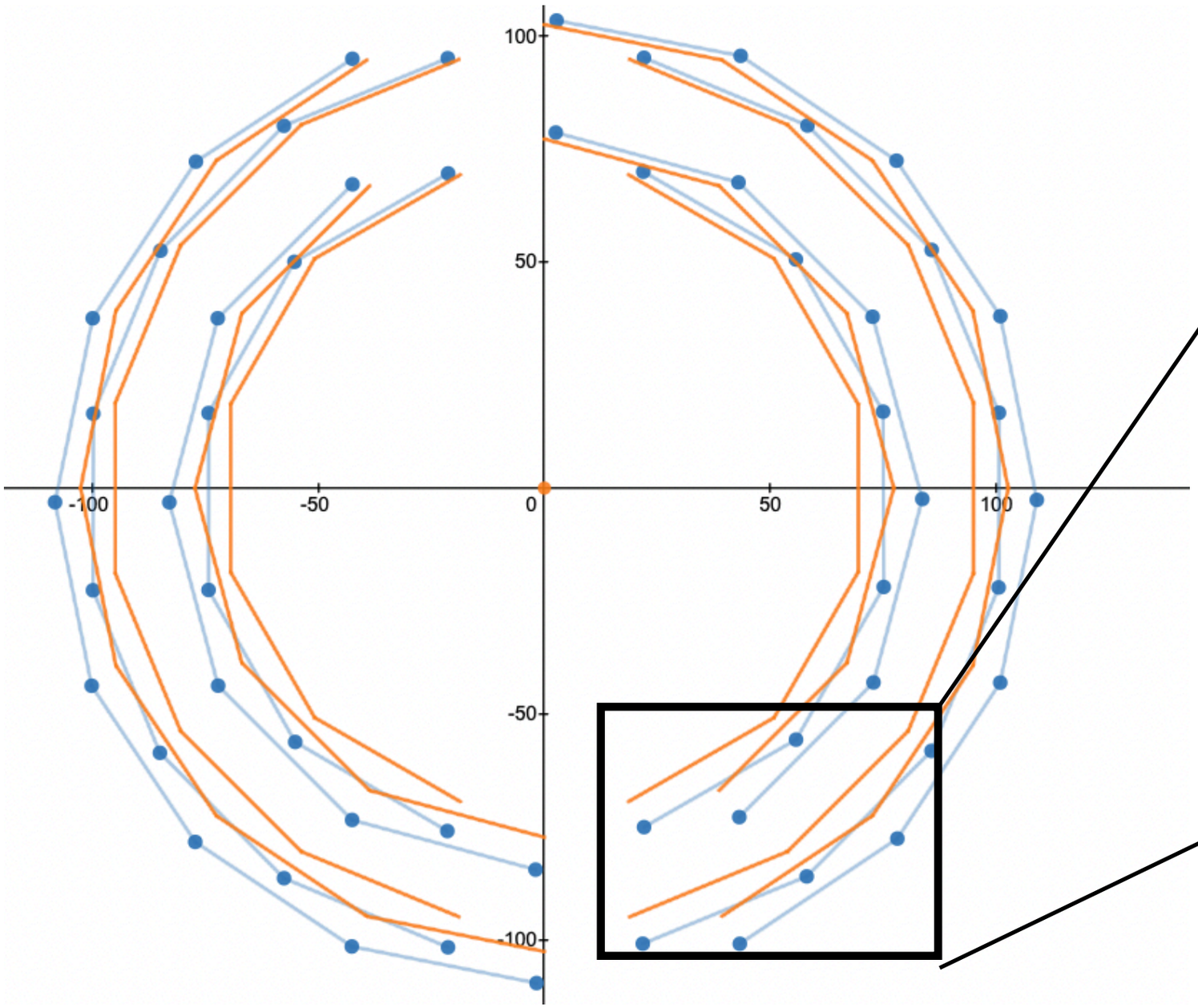


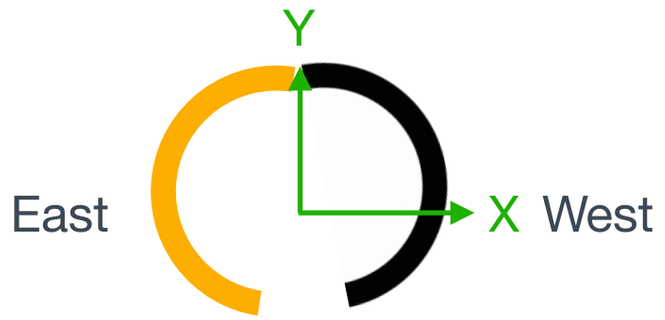
The discontinuous correlation implies the existence of ~ mm level systematic misalignment
-> The halves are not close

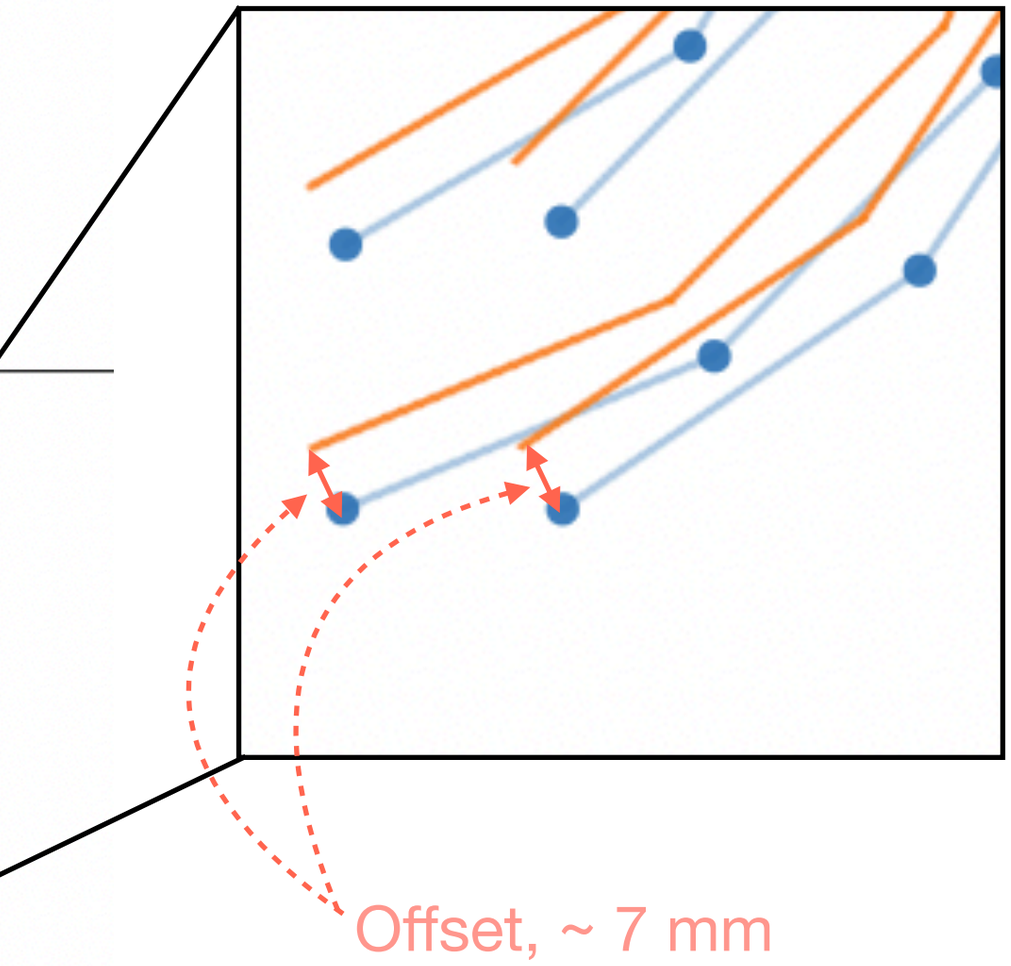
Glance of INTT Survey data

Blue point : the center position of south-side-type-B sensor
Joint point of orange line : INTT nominal position

Survey data conversion made by Joseph





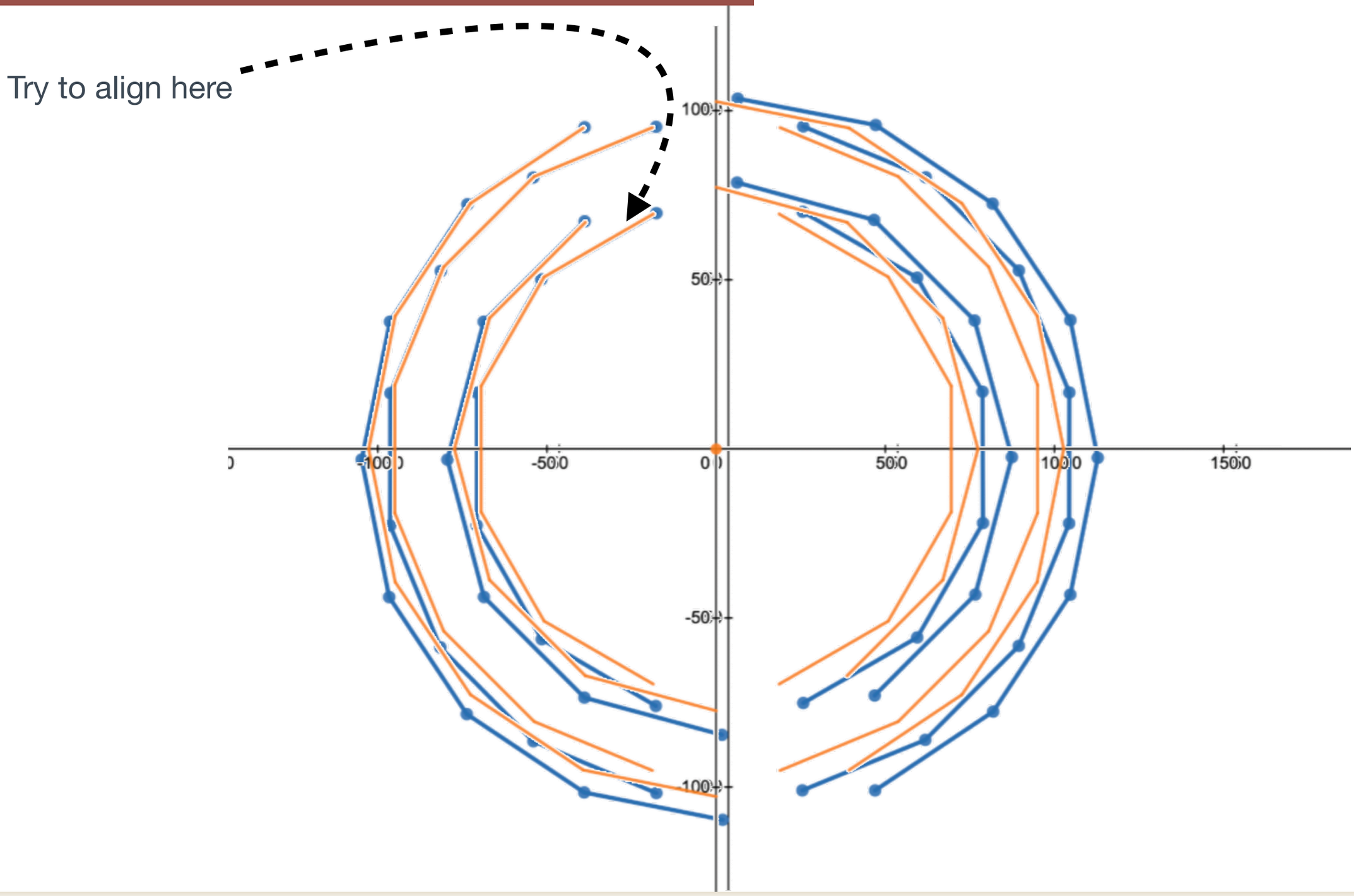


Turns out that the INTT has a systematic offset when insertion

Glance of INTT Survey data

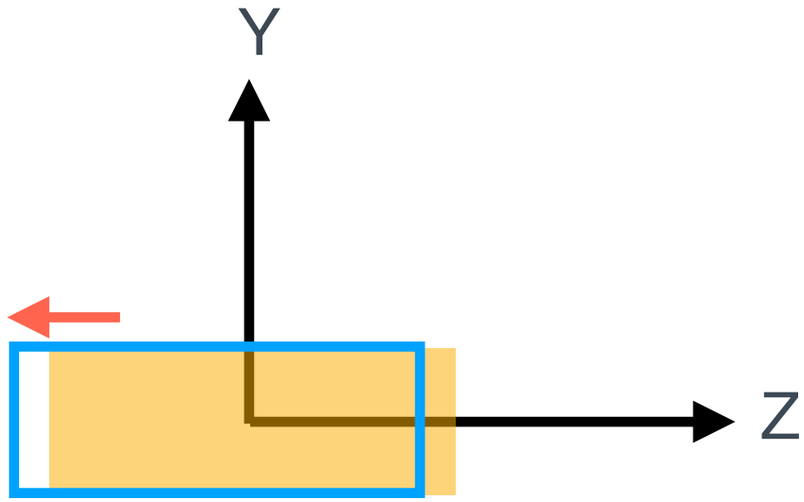
Blue point : the center position of south-side-type-B sensor
Joint point of orange line : INTT nominal position

Survey data conversion made by Joseph



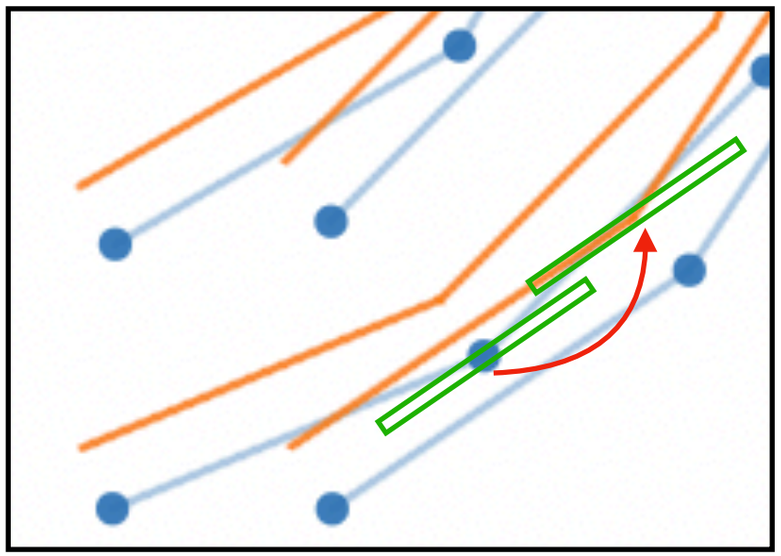
Glance of INTT Survey data

- The average z position of south-type-B sensor is -186.462 mm
- The nominal center position of south-type-B is -181.75 mm
  - Offset in Z axis : 4.712 mm towards to south



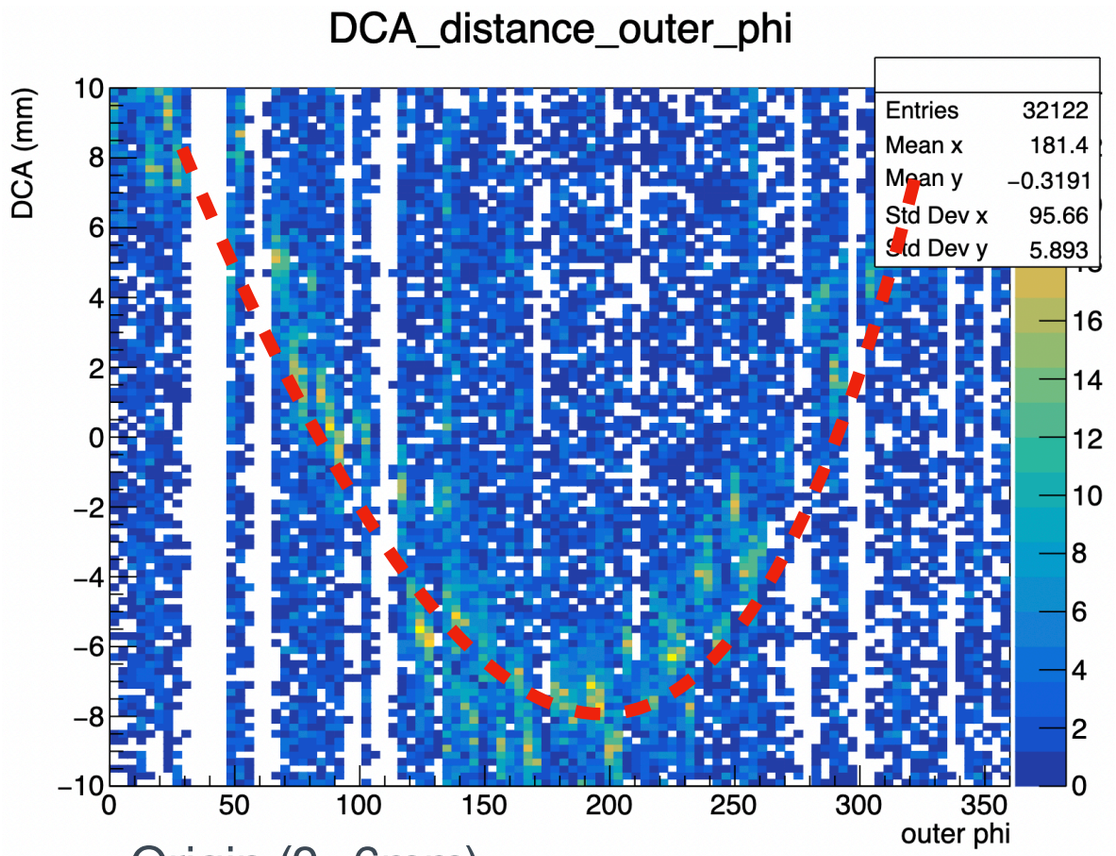
Survey data conversion made by Joseph

Introducing the survey data - first attempt



Try to replace the ladder center position by the survey data
Only X and Y columns are considered

hitsetkey	alpha	beta	gamma	x	y	z
16982528	−0.26253	+0.00110	−0.00059	−21.27081	−75.85949	−70.28777
16998912	−0.26384	+0.00110	−0.00090	−21.46096	−75.90736	−186.45825
17015296	−0.26068	+0.00089	−0.00081	−21.09835	−75.76660	+60.76268
17031680	−0.26244	+0.00093	−0.00038	−20.93735	−75.73496	+176.94476
16981504	−0.78478	+0.00077	+0.00033	−54.99117	−56.22769	−70.25475
16997888	−0.78815	+0.00048	−0.00179	−55.11142	−56.18837	−186.41177
17014272	−0.78370	+0.00022	−0.00023	−54.93090	−56.24875	+60.85369
17030656	−0.78374	+0.00037	+0.00045	−54.88777	−56.29958	+177.04160
16980480	−1.30229	+0.00030	+0.00063	−74.29693	−22.51740	−70.38355
16996864	−1.30314	+0.00031	−0.00058	−74.28391	−22.54561	−186.54303
17013248	−1.30448	+0.00013	−0.00053	−74.28084	−22.47108	+60.73021
17029632	−1.30672	+0.00010	−0.00023	−74.27625	−22.43234	+176.90217
16979456	+1.31524	−0.00049	+0.00070	−74.27946	+16.66439	−70.22052
16995840	+1.31438	−0.00048	−0.00052	−74.27526	+16.63011	−186.38000
17012224	+1.31304	−0.00065	−0.00047	−74.25030	+16.70021	+60.89324
17028608	+1.31080	−0.00069	−0.00016	−74.23399	+16.73480	+177.06520
16978432	+0.79824	−0.00073	+0.00065	−55.25404	+50.14665	−70.34780
16994816	+0.80029	−0.00063	−0.00044	−55.28476	+50.09862	−186.51888
17011200	+0.80003	−0.00091	+0.00006	−55.21795	+50.23178	+60.71648
17027584	+0.80039	−0.00074	+0.00041	−55.17332	+50.30207	+176.90786
16977408	+0.27603	−0.00010	+0.00034	−21.28279	+69.72589	−70.51379
16993792	+0.27082	−0.00147	+0.00059	−21.29183	+69.67282	−186.67248
17010176	+0.27111	−0.00042	+0.00023	−21.27133	+69.75546	+60.56596
17026560	+0.27079	−0.00015	+0.00064	−21.28276	+69.80061	+176.76246
16976384	−0.25678	+0.00030	−0.00051	+21.89138	+69.91976	−70.13015



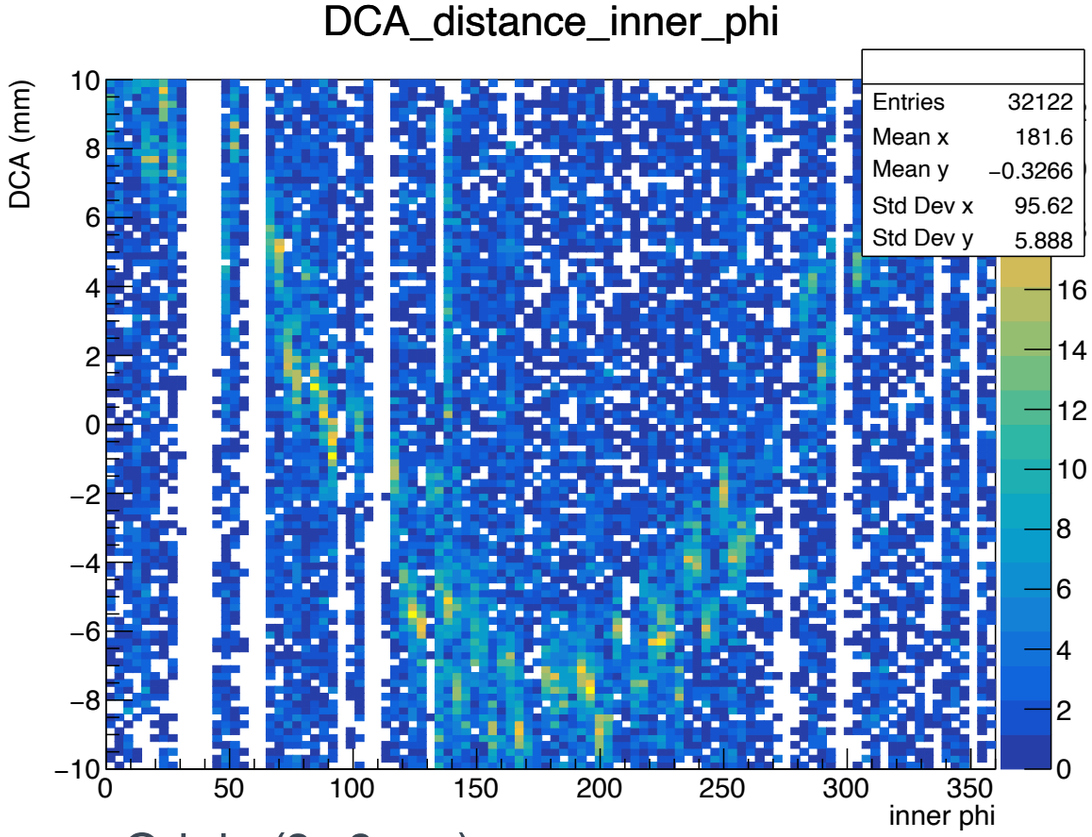
Origin (0,-6mm)

Correlation seems to be more smooth

Introducing the survey data - second trail

Replace the ladder center position & ladder rotation by the survey data
Only alpha, X and Y columns are considered

hitsetkey	alpha	beta	gamma	x	y	z
16982528	−0.26253	+0.00110	−0.00059	−21.27081	−75.85949	−70.28777
16998912	−0.26384	+0.00110	−0.00090	−21.46096	−75.90736	−186.45825
17015296	−0.26068	+0.00089	−0.00081	−21.09835	−75.76660	+60.76268
17031680	−0.26244	+0.00093	−0.00038	−20.93735	−75.73496	+176.94476
16981504	−0.78478	+0.00077	+0.00033	−54.99117	−56.22769	−70.25475
16997888	−0.78815	+0.00048	−0.00179	−55.11142	−56.18837	−186.41177
17014272	−0.78370	+0.00022	−0.00023	−54.93090	−56.24875	+60.85369
17030656	−0.78374	+0.00037	+0.00045	−54.88777	−56.29958	+177.04160
16980480	−1.30229	+0.00030	+0.00063	−74.29693	−22.51740	−70.38355
16996864	−1.30314	+0.00031	−0.00058	−74.28391	−22.54561	−186.54303
17013248	−1.30448	+0.00013	−0.00053	−74.28084	−22.47108	+60.73021
17029632	−1.30672	+0.00010	−0.00023	−74.27625	−22.43234	+176.90217
16979456	+1.31524	−0.00049	+0.00070	−74.27946	+16.66439	−70.22052
16995840	+1.31438	−0.00048	−0.00052	−74.27526	+16.63011	−186.38000
17012224	+1.31304	−0.00065	−0.00047	−74.25030	+16.70021	+60.89324
17028608	+1.31080	−0.00069	−0.00016	−74.23399	+16.73480	+177.06520
16978432	+0.79824	−0.00073	+0.00065	−55.25404	+50.14665	−70.34780
16994816	+0.80029	−0.00063	−0.00044	−55.28476	+50.09862	−186.51888
17011200	+0.80003	−0.00091	+0.00006	−55.21795	+50.23178	+60.71648
17027584	+0.80039	−0.00074	+0.00041	−55.17332	+50.30207	+176.90786
16977408	+0.27603	−0.00010	+0.00034	−21.28279	+69.72589	−70.51379
16993792	+0.27082	−0.00147	+0.00059	−21.29183	+69.67282	−186.67248
17010176	+0.27111	−0.00042	+0.00023	−21.27133	+69.75546	+60.56596
17026560	+0.27079	−0.00015	+0.00064	−21.28276	+69.80061	+176.76246
16976384	−0.25678	+0.00030	−0.00051	+21.89138	+69.91976	−70.13015

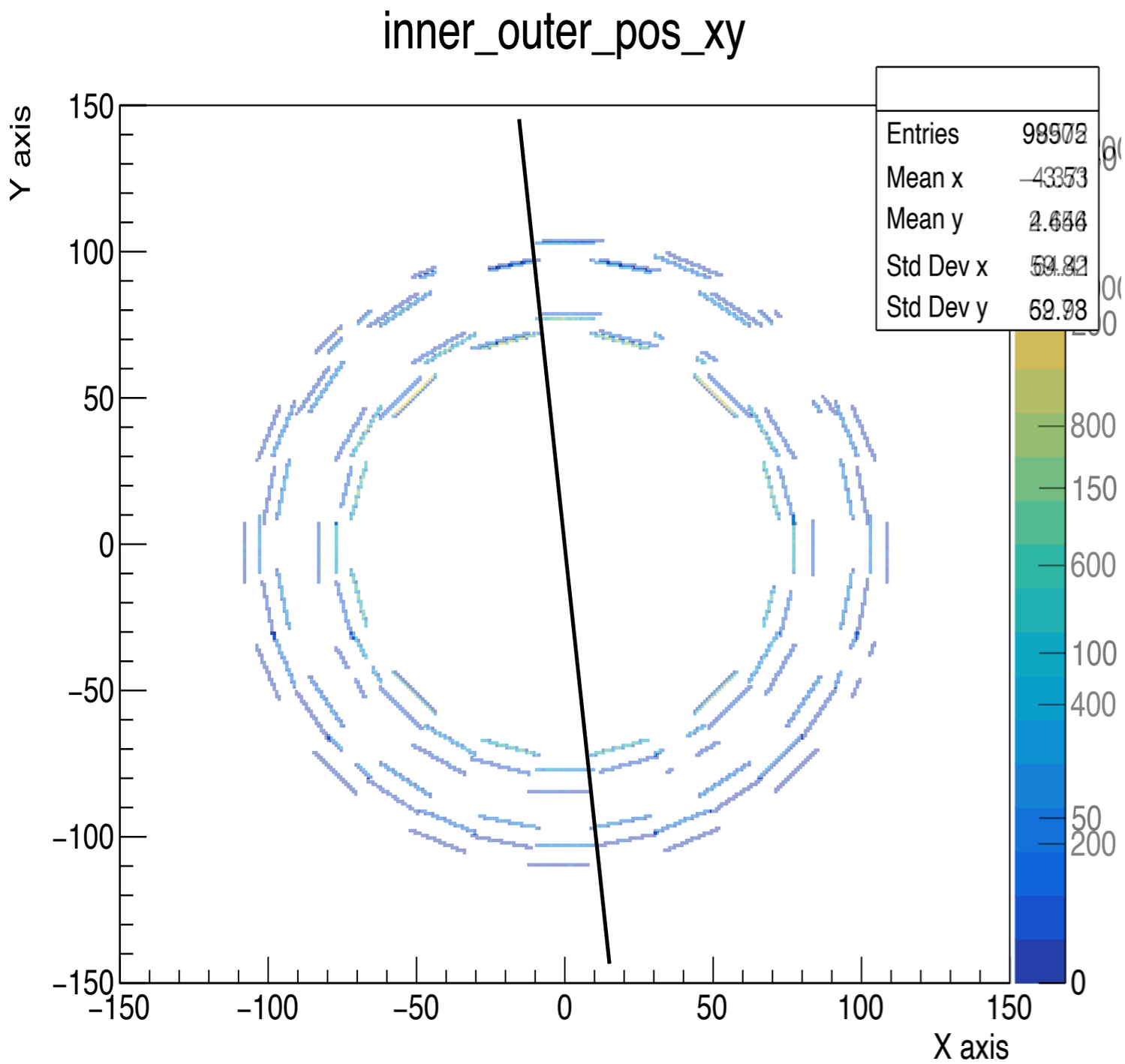


Origin (0,-6mm)

Correlation seems to be more smooth

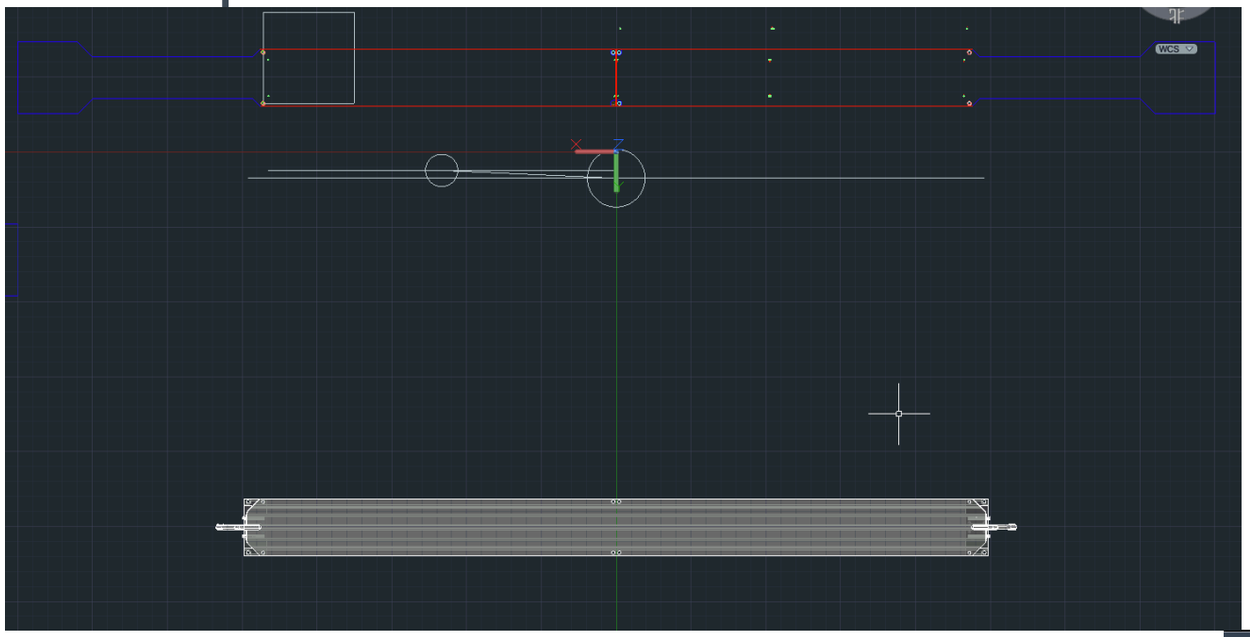
Ladder geometry comparison

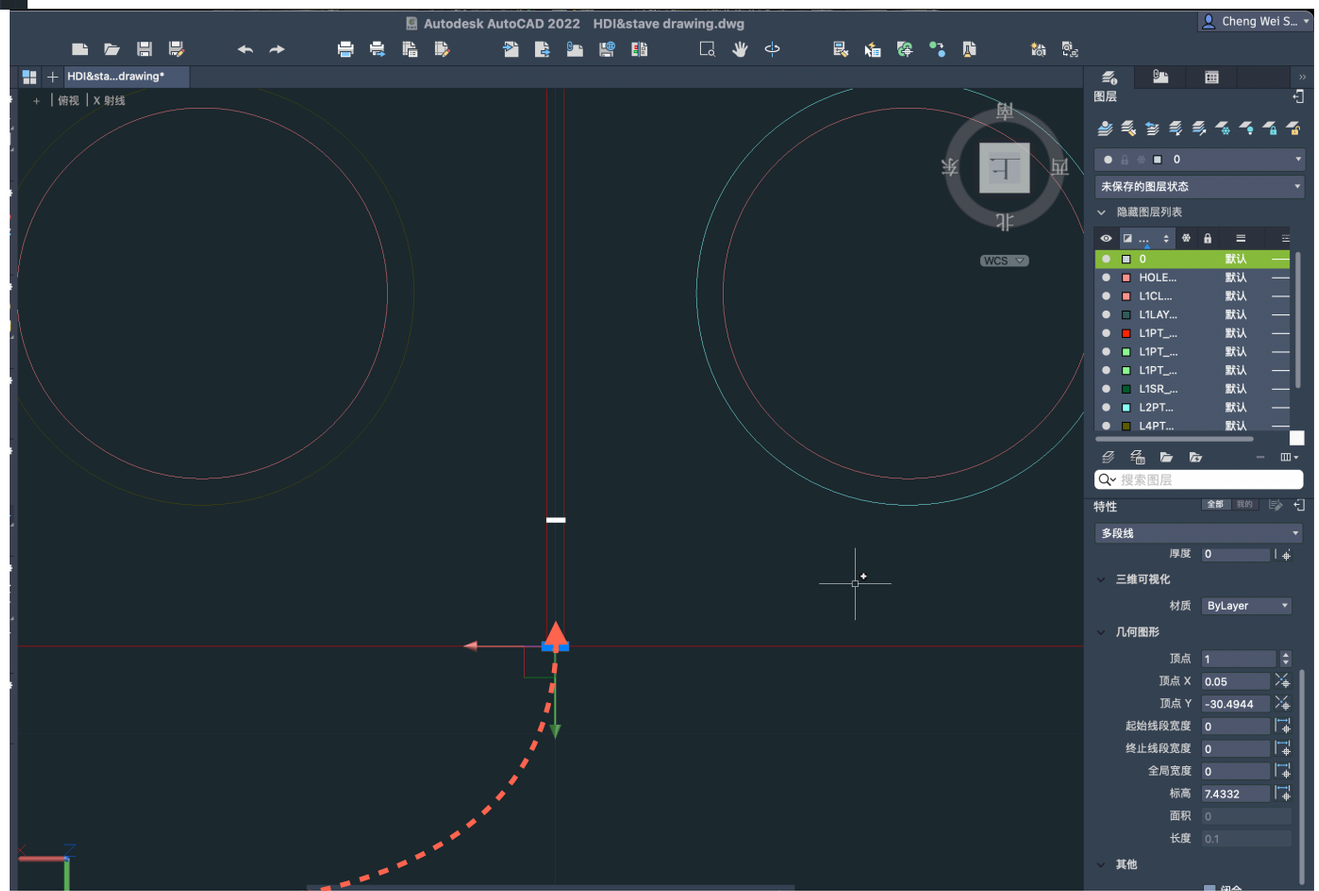
Ideal geometry v.s. survey alpha, X and Y



Z position correction

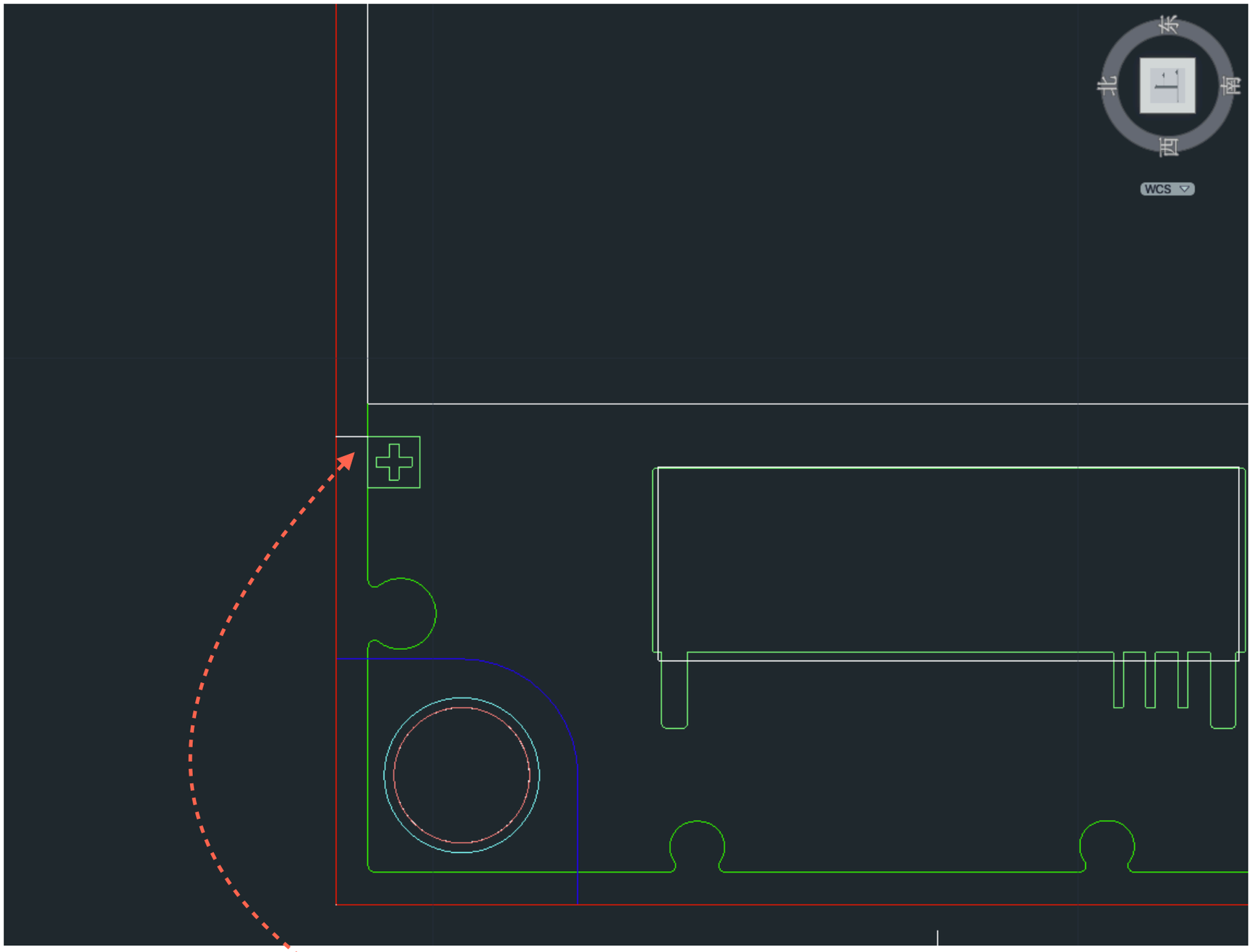
- Gap between two HDIs : 0.1 mm





Z position correction

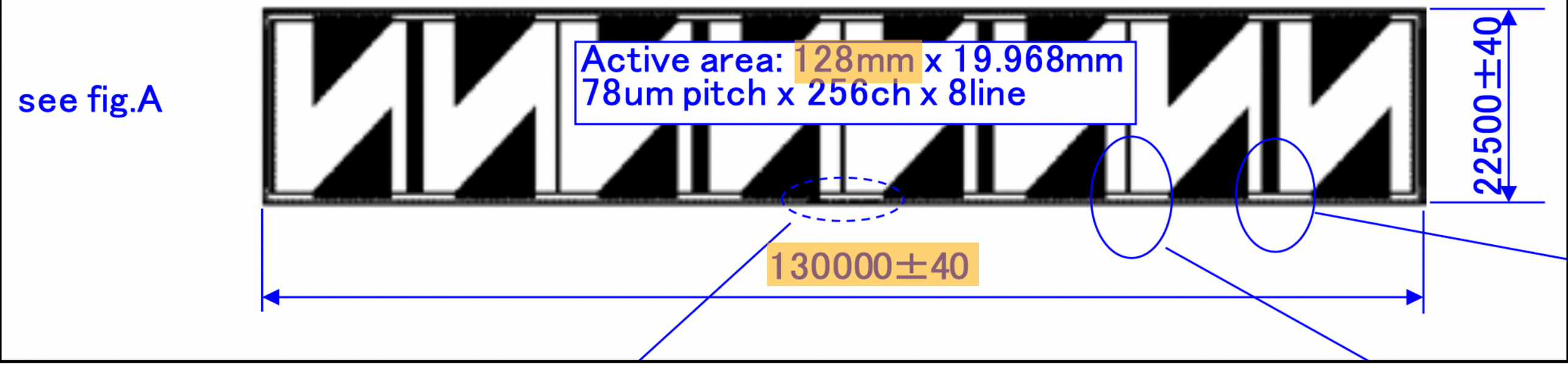
- Gap between head of HDI and sensor pad (type A) : 0.5 mm



Z position correction

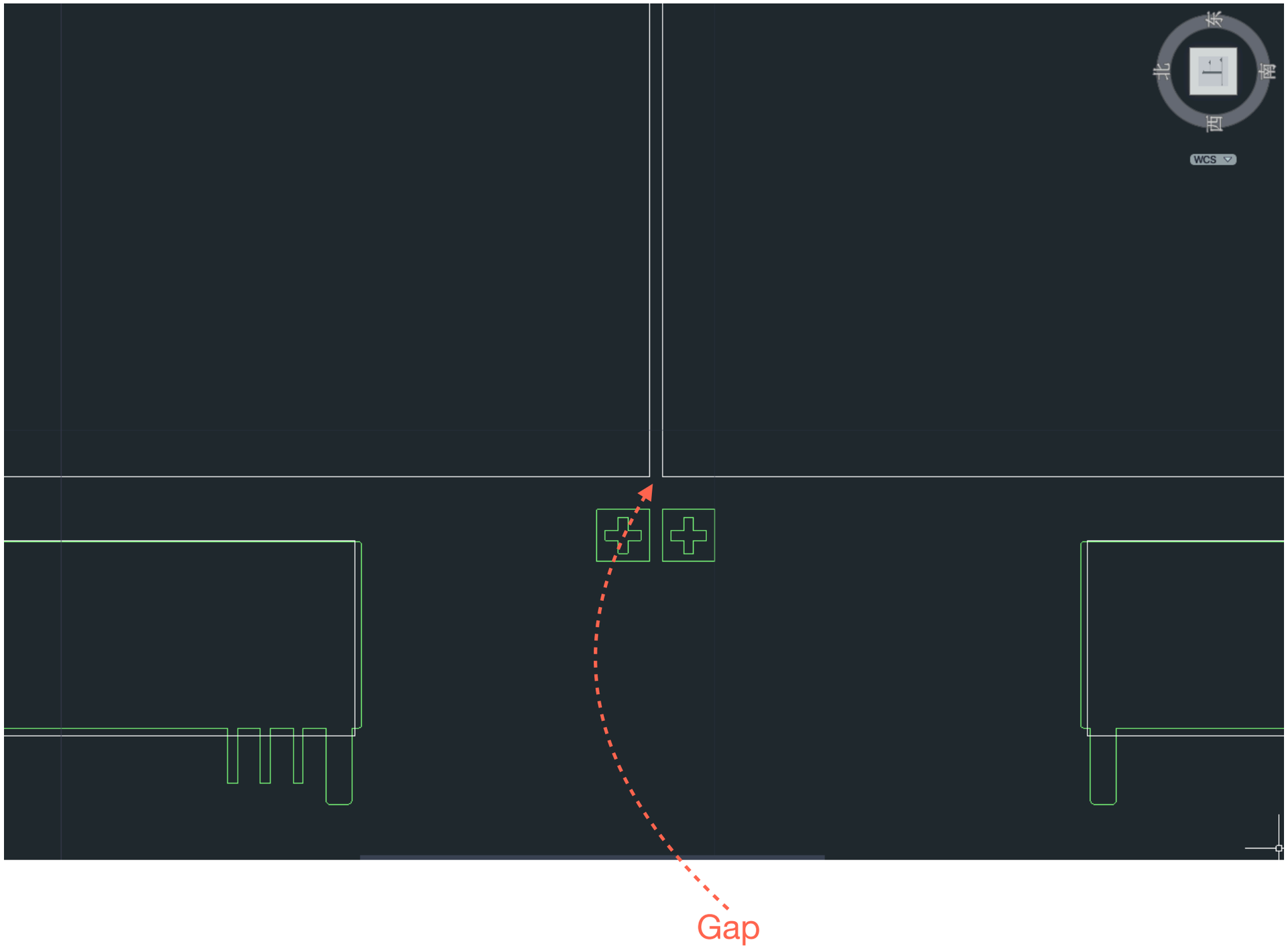
- Gap between the edge of the sensor and the edge of the active area : 1 mm

Type A



Z position correction

- Gap between type-A sensor pad and type-B sensor pad : 0.2 mm



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

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