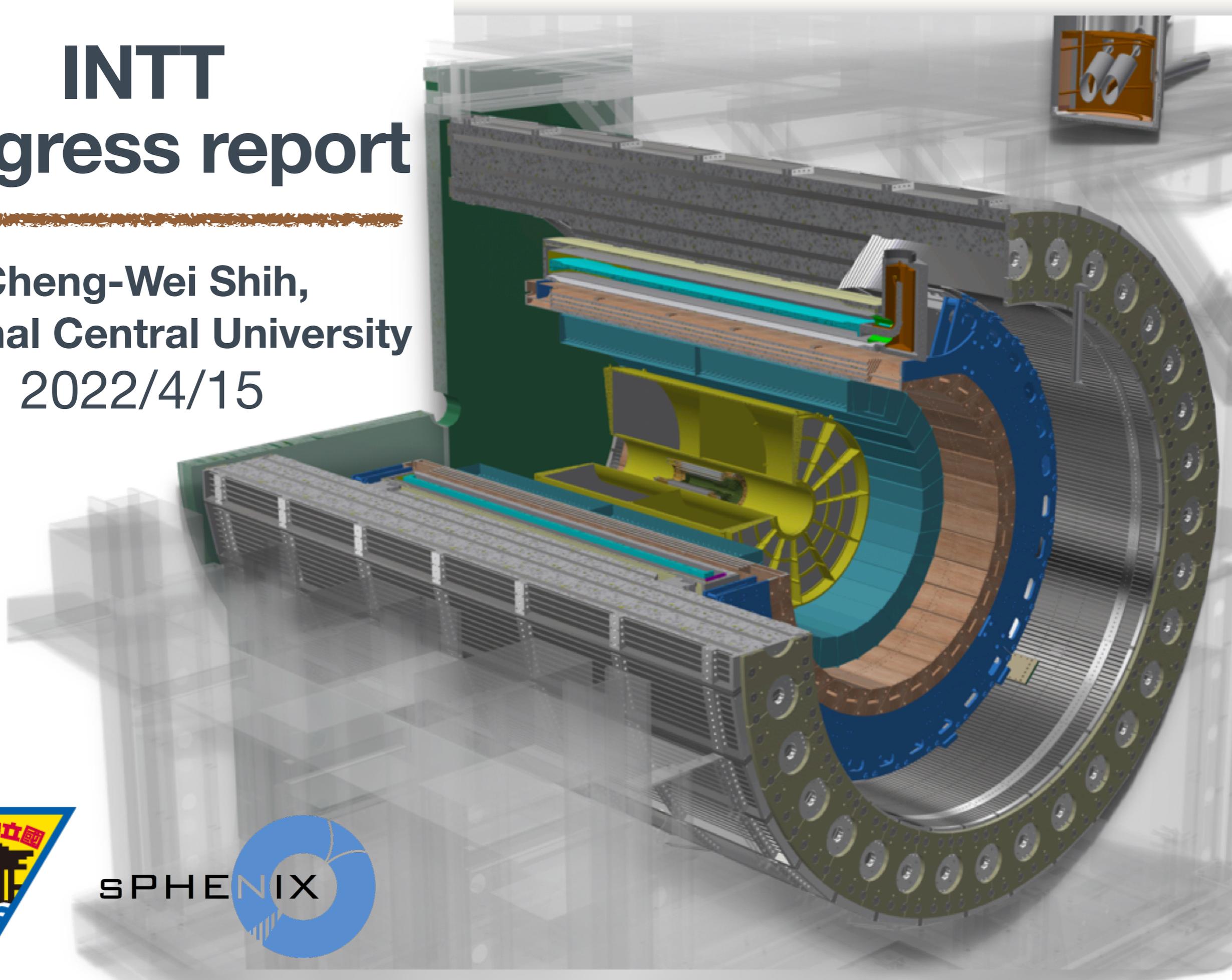


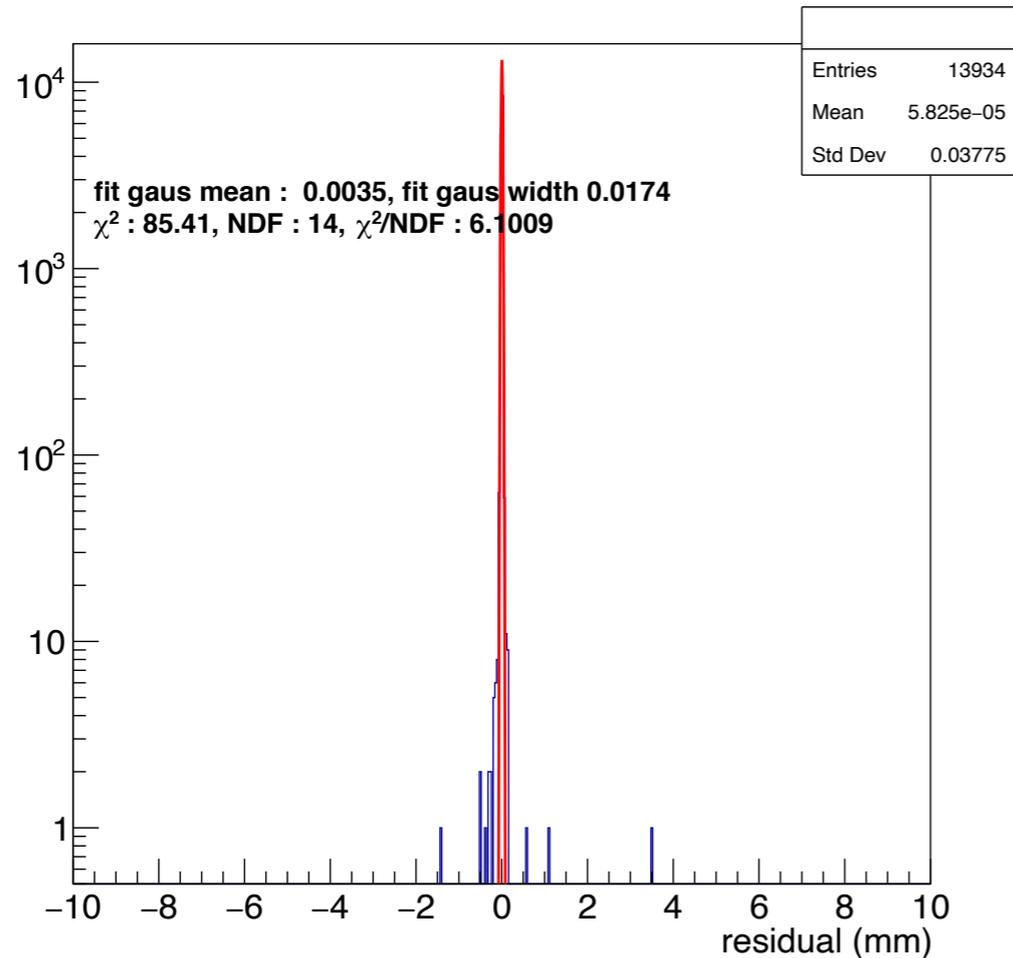
INTT progress report

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National Central University
2022/4/15

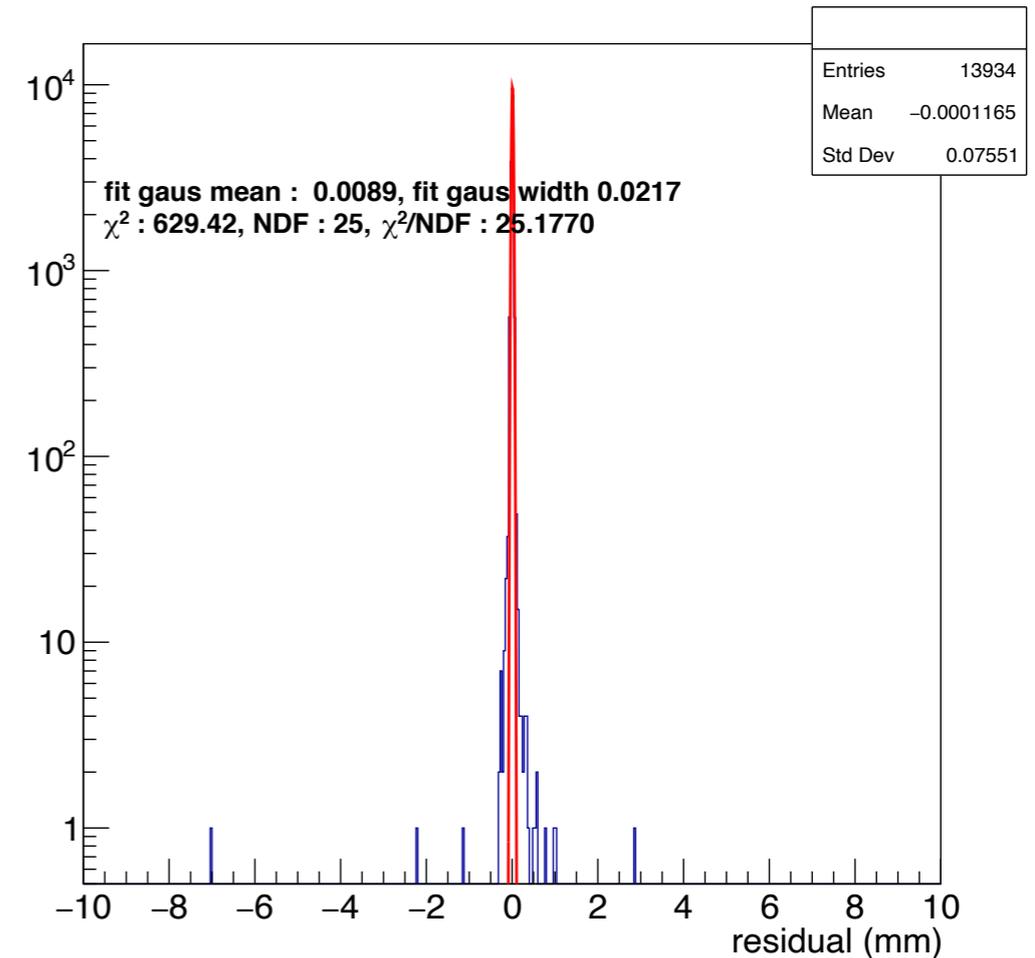


// The residual of the MC and efficiency

layer0 Y axis residual



layer1 Y axis residual



```
run file : e+_beam-para_coulomb-on_100k-events_1_convert_filter
layer 3 final counting :
N_HHH : 13522
N_LHH : 3
N_HLH : 6
N_HHL : 8
N_LLL : 738
====3-layers====efficiency results====
99.97782      +0.01207      -0.02157
99.95565      +0.01759      -0.02648
99.94087      +0.02046      -0.02915
====3-layers====efficiency results====
```

// Noise hit check , run 89

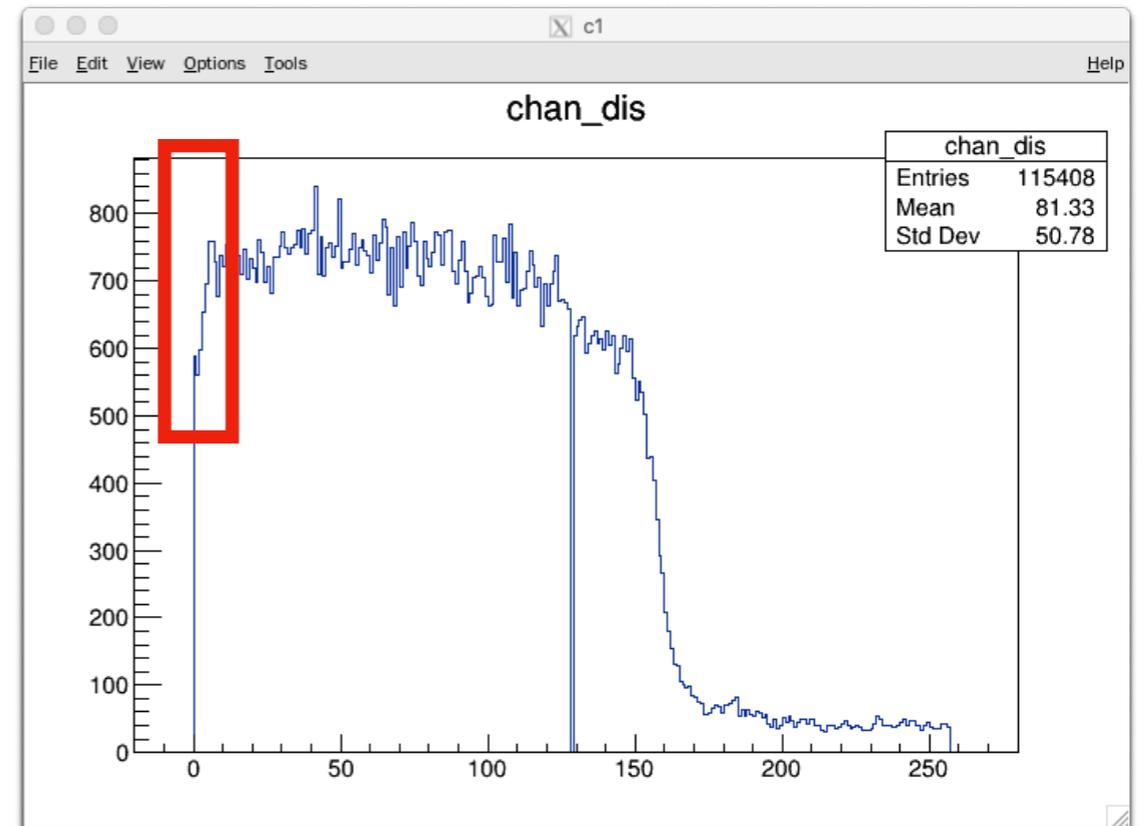
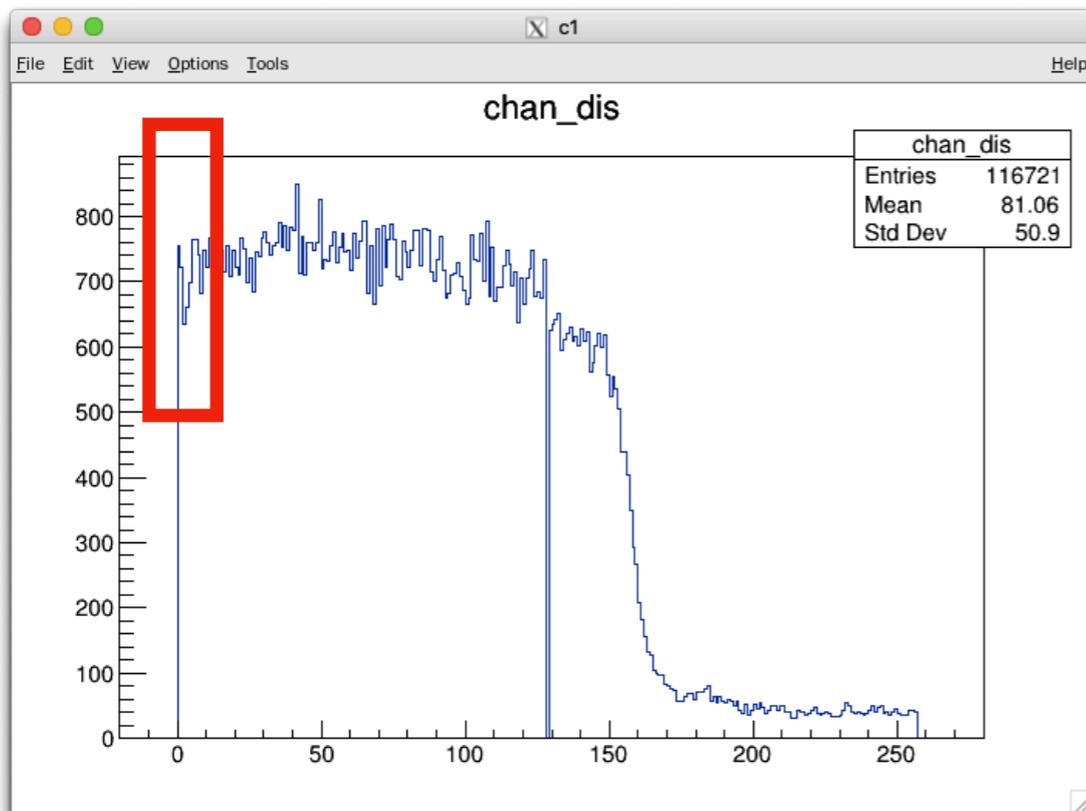
Run89
U10 || U23
layer-1

tree_both->Draw

```
(  
"int(chip_id / 14) * 256+ pow(-1, int(chip_id / 14)) * chan_id>>chan_dis",  
"module==6 && (chip_id == 10 || chip_id == 23)"  
)
```

Run89
U10 || U23
layer-1

of hit in this event > 1



tree_both->Draw

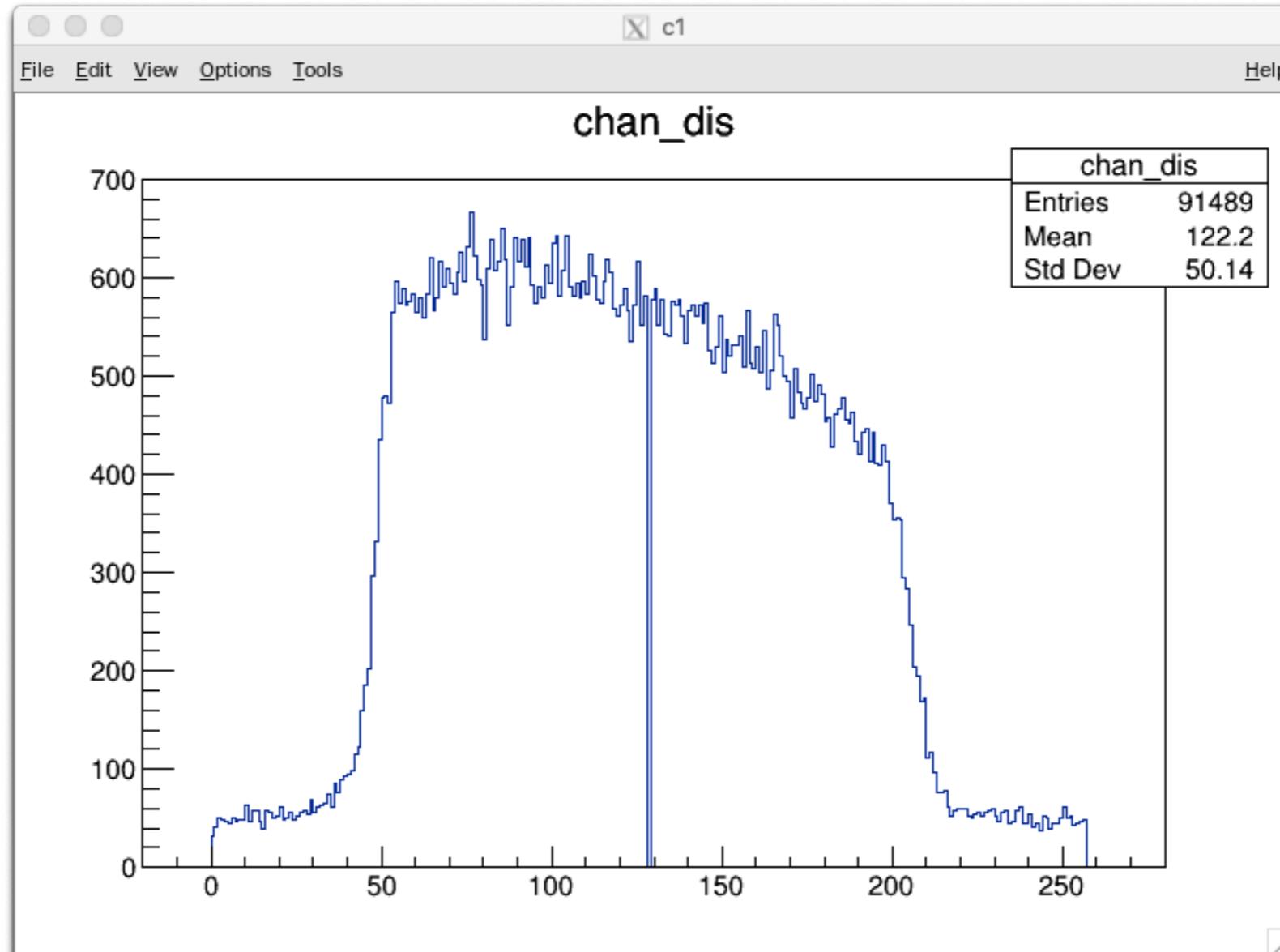
```
(  
"int(chip_id / 14) * 256+ pow(-1, int(chip_id / 14)) * chan_id>>chan_dis",  
"nele > 1 && module==6 && (chip_id == 10 || chip_id == 23)"  
)
```

// Noise hit check , run 52

Run52
U10 || U23
layer-1

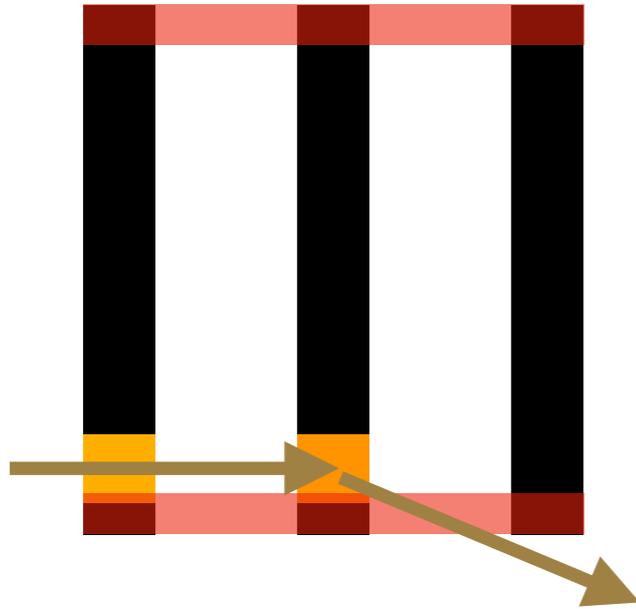
tree_both->Draw

```
(  
"int(chip_id / 14) * 256+ pow(-1, int(chip_id / 14)) * chan_id>>chan_dis",  
"module==6 && (chip_id == 8 || chip_id == 21)"  
)
```



// Testbeam - efficiency

The boundary cut was not applied before

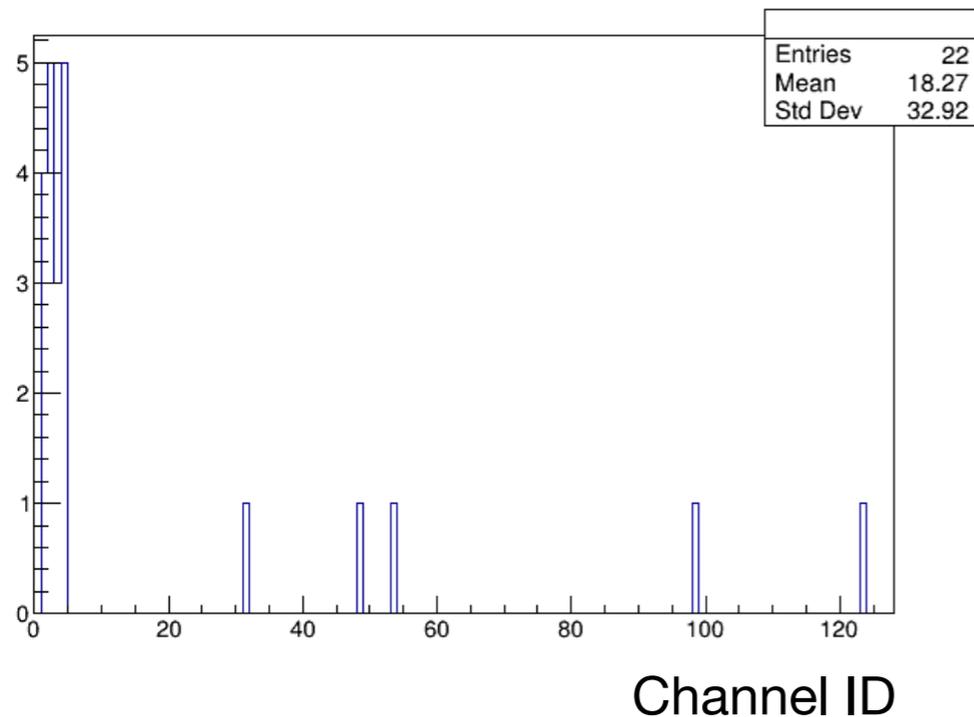


The test for new boundary cut,
exclude `chan_id <5 && chan_id >250`

Use run 89 for the test

- A. use all chips before
- B. use all chips after
- C. use chip10 only before
- D. use chip10 only after

The average position of I0 & I1 of the “110” event

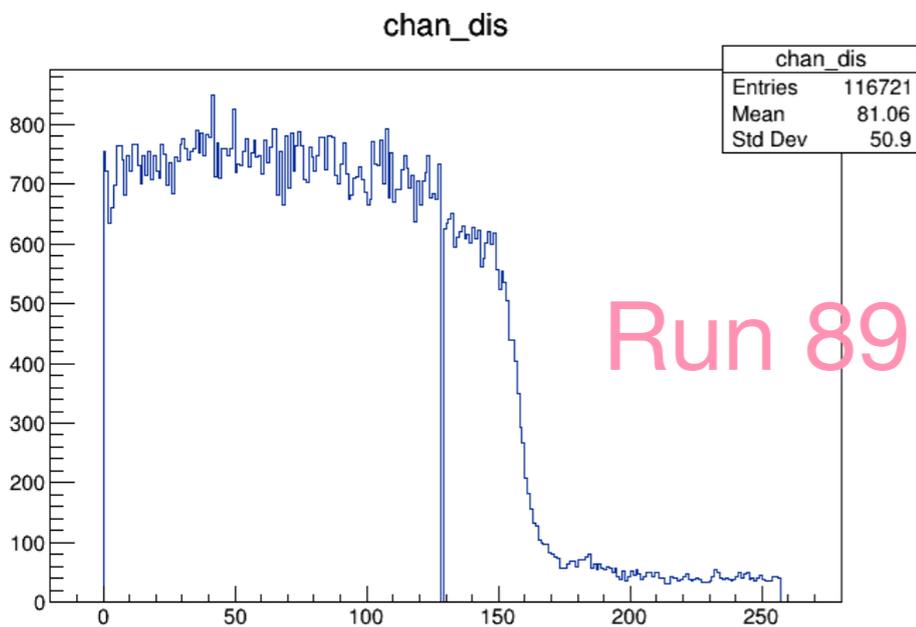
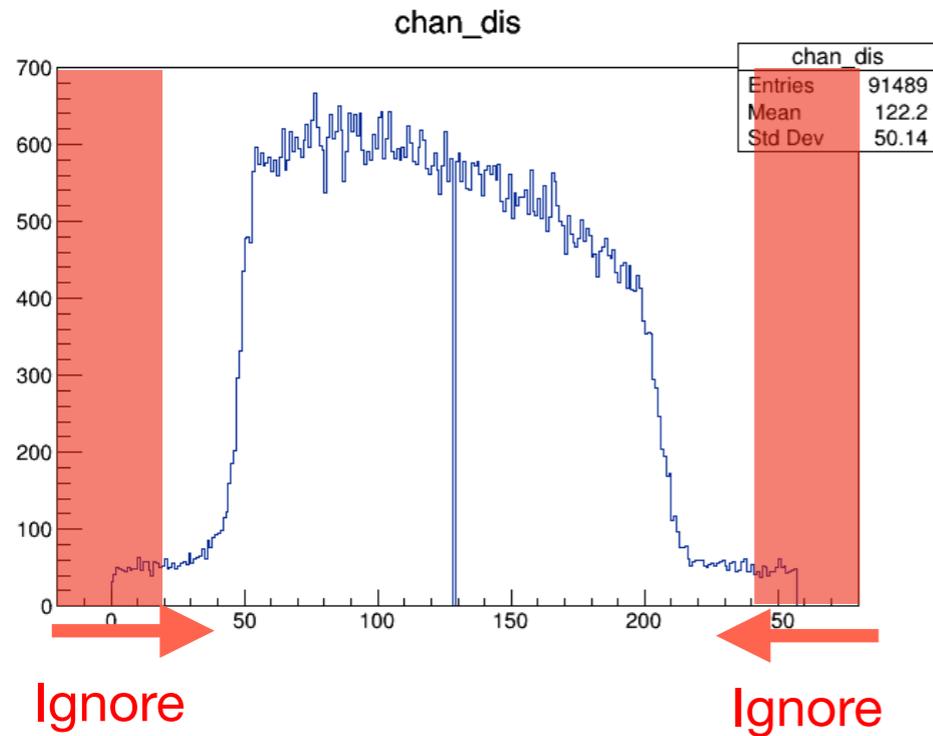


Case	effi. L0 (%)	effi. L1 (%)	effi. L2 (%)
A	99.25 ^{+0.17} _{-0.21}	99.48 ^{+0.14} _{-0.18}	97.11 ^{+0.32} _{-0.36}
B	99.30 ^{+0.16} _{-0.21}	99.49 ^{+0.14} _{-0.18}	98.42 ^{+0.24} _{-0.28}
C	99.27 ^{+0.24} _{-0.33}	99.84 ^{+0.11} _{-0.21}	96.69 ^{+0.50} _{-0.58}
D	99.24 ^{+0.25} _{-0.35}	99.83 ^{+0.11} _{-0.22}	99.07 ^{+0.27} _{-0.37}

Around 1 ~ 2% improvement !

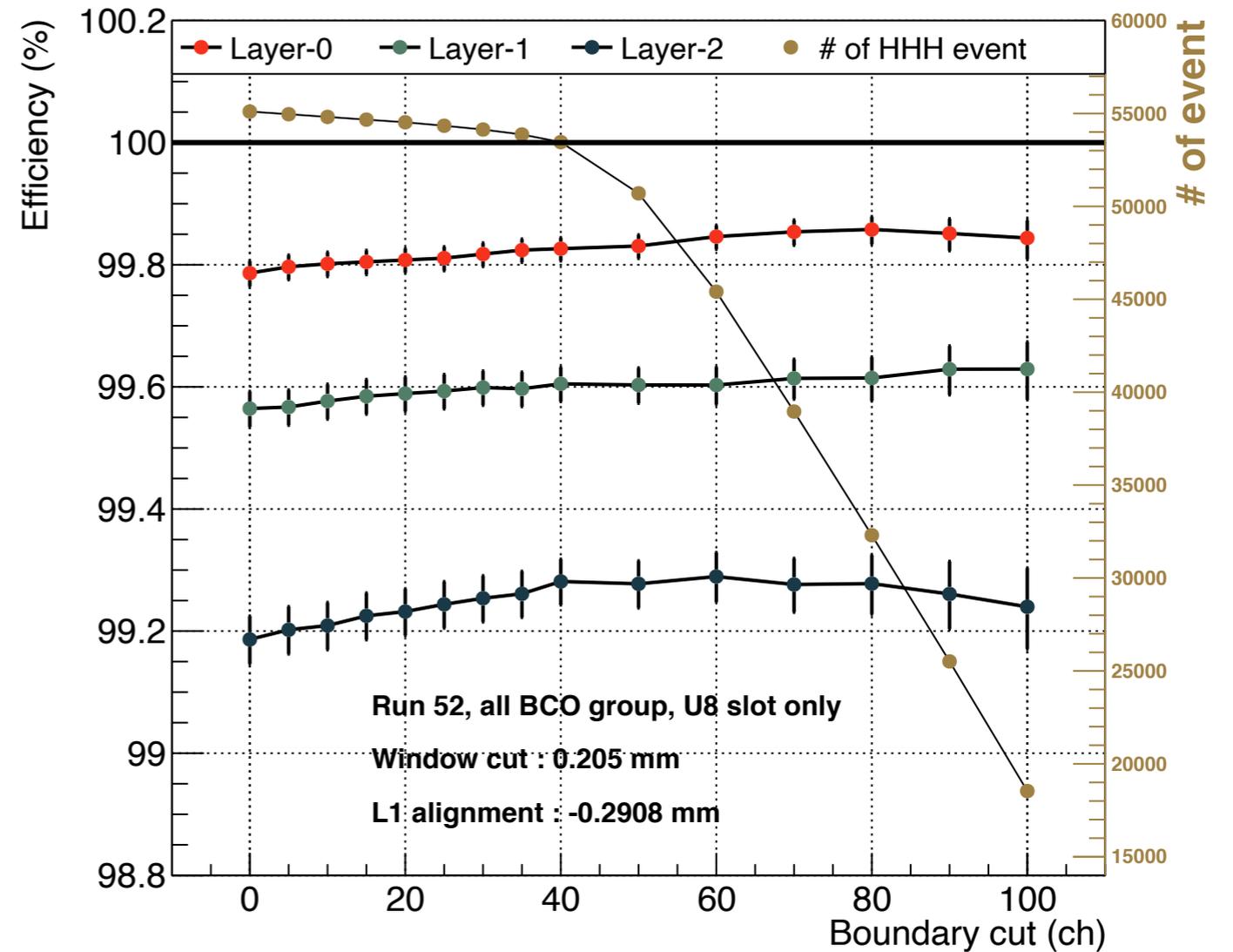
// Testbeam - boundary cut

Run 52



Run 52

Detection efficiency vs boundary cut



It's run dependence, due to the beam quality at each run

// Window cut study

U8 || U21
 run52_no_clone.root
 alignment, 0.2908 mm @ l1

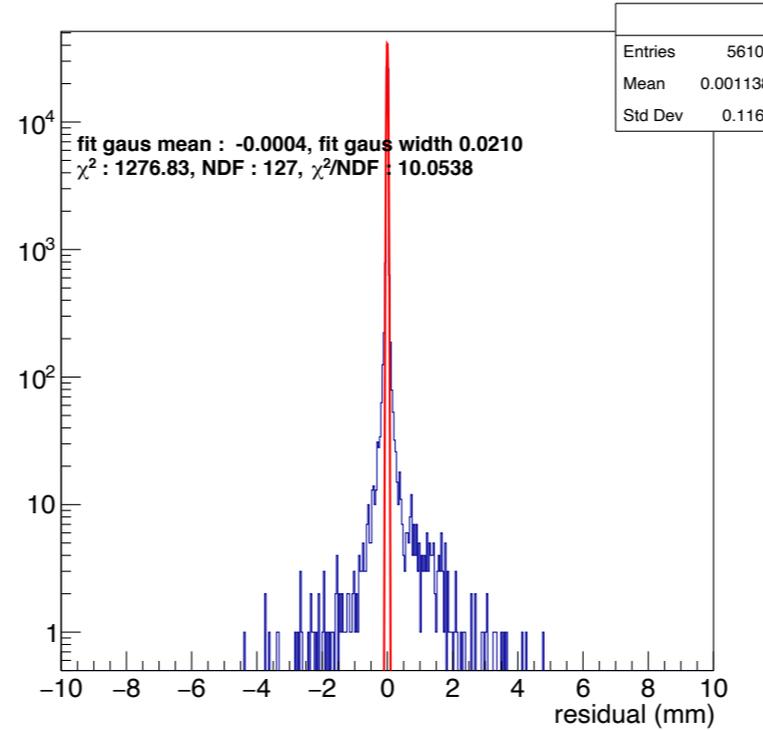
3 σ width of layer - 1
 -0.5 mm to 0.5 mm is considered

Calculate with histogram

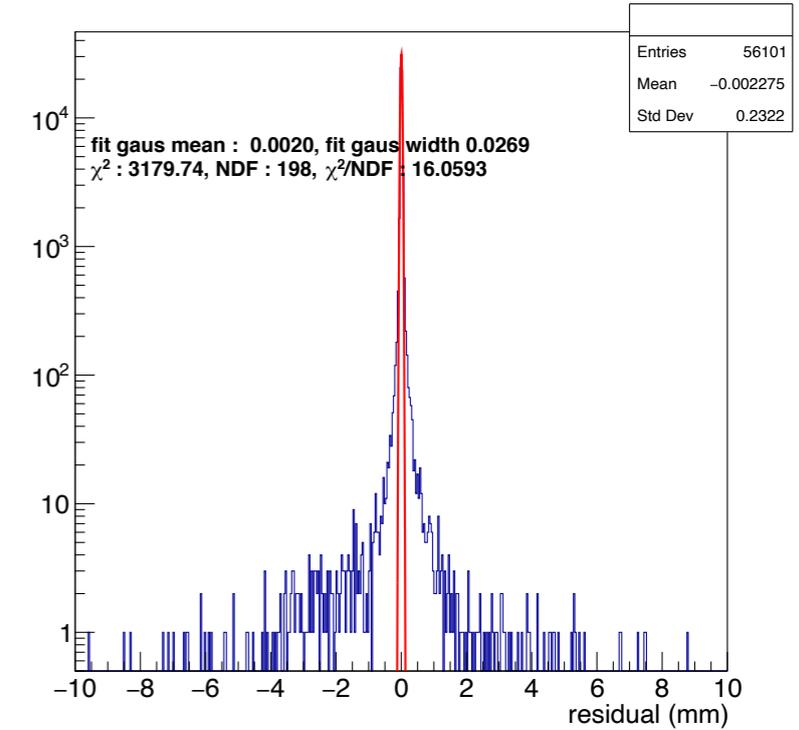
Std dev	0.132 mm
Double gaus	0.1374 mm
Effective sigma	0.333 mm

Calculate with raw data

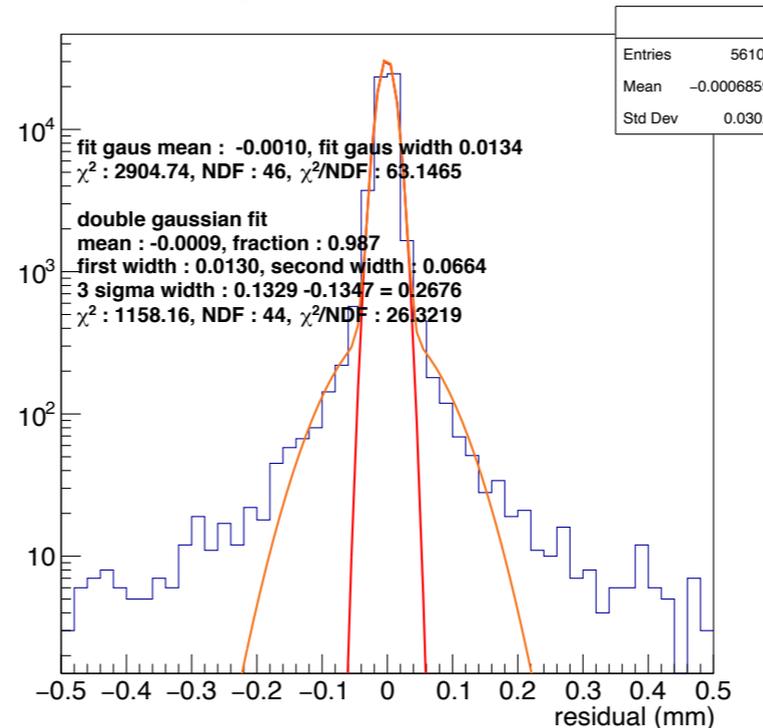
layer0 Y axis residual



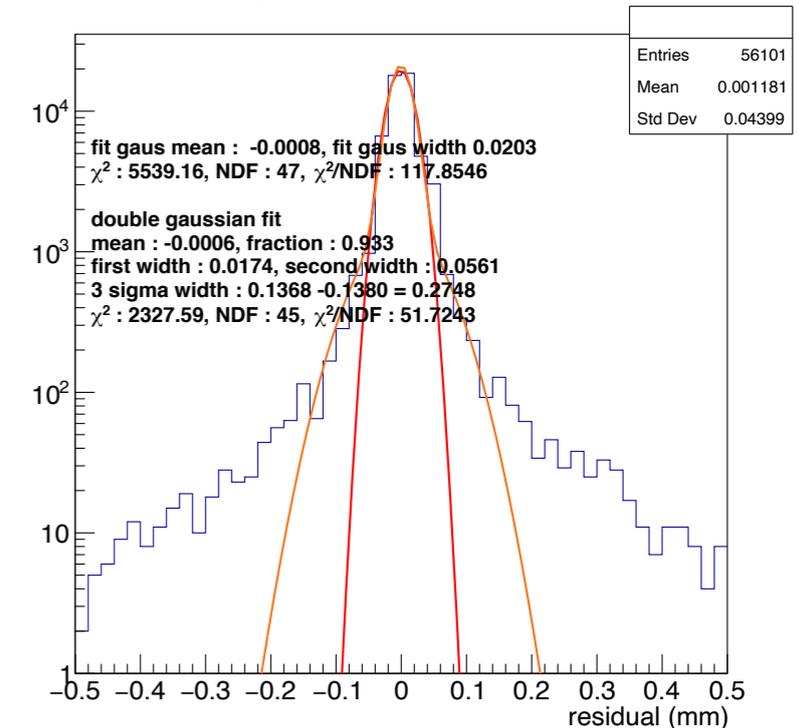
layer1 Y axis residual



layer0 Y axis residual



layer1 Y axis residual



// Window cut study

U8 || U21

run52_no_clone.root

alignment, 0.2908 mm @ l1

Boundary cut 5 ch

3σ width of layer - 1

-0.5 mm to 0.5 mm is considered

Calculate with histogram

Std dev	0.132 mm
Double gaus	0.1374 mm
Effective sigma	0.333 mm

Calculate with raw data

window size	effi. L0 (%)	effi. L1 (%)	effi. L2 (%)
0.205 mm	$99.80^{+0.02}_{-0.02}$	$99.57^{+0.03}_{-0.03}$	$99.20^{+0.04}_{-0.04}$
0.132 mm	$99.76^{+0.02}_{-0.02}$	$99.59^{+0.03}_{-0.03}$	$99.13^{+0.04}_{-0.04}$
0.137 mm	$99.73^{+0.02}_{-0.02}$	$99.60^{+0.03}_{-0.03}$	$99.00^{+0.04}_{-0.04}$
0.333 mm	$99.83^{+0.02}_{-0.02}$	$99.52^{+0.03}_{-0.03}$	$99.27^{+0.04}_{-0.04}$

* 0.205 mm : original cut, std method of run89

// Summary

- The nele cut seems to be able to reject the noise hits.
 - Run52 seems to have less noise hit at channel 0.
- The increase of the boundary does increase the efficiency of layer-2, but statistic reduces as well.
 - Final boundary → to be determined.
- 3 approaches are applied to obtain the window size.
 - The “effective sigma method” seems to be suitable, still TBD.

Back up