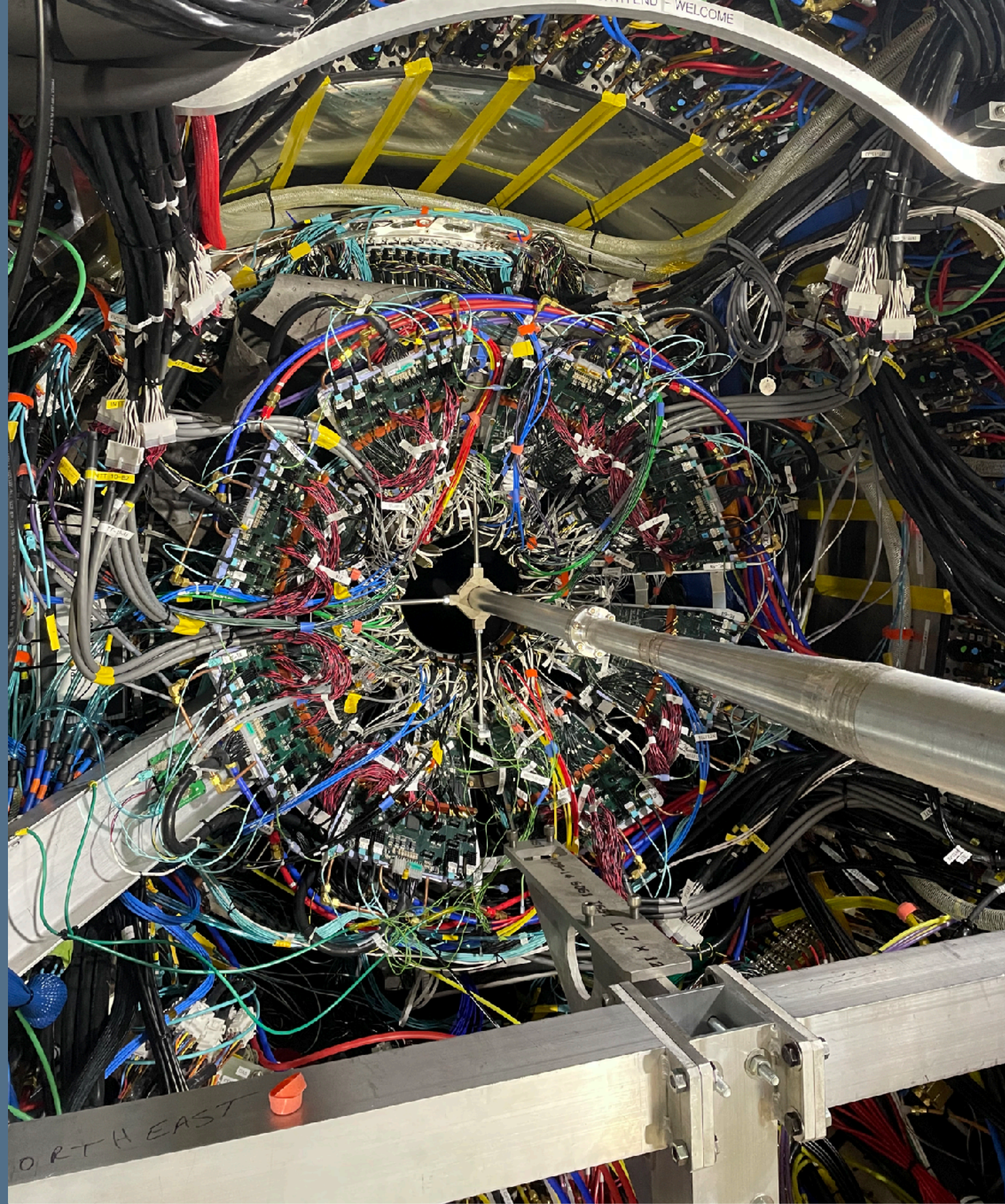


sPEHNIX - INTT commissioning

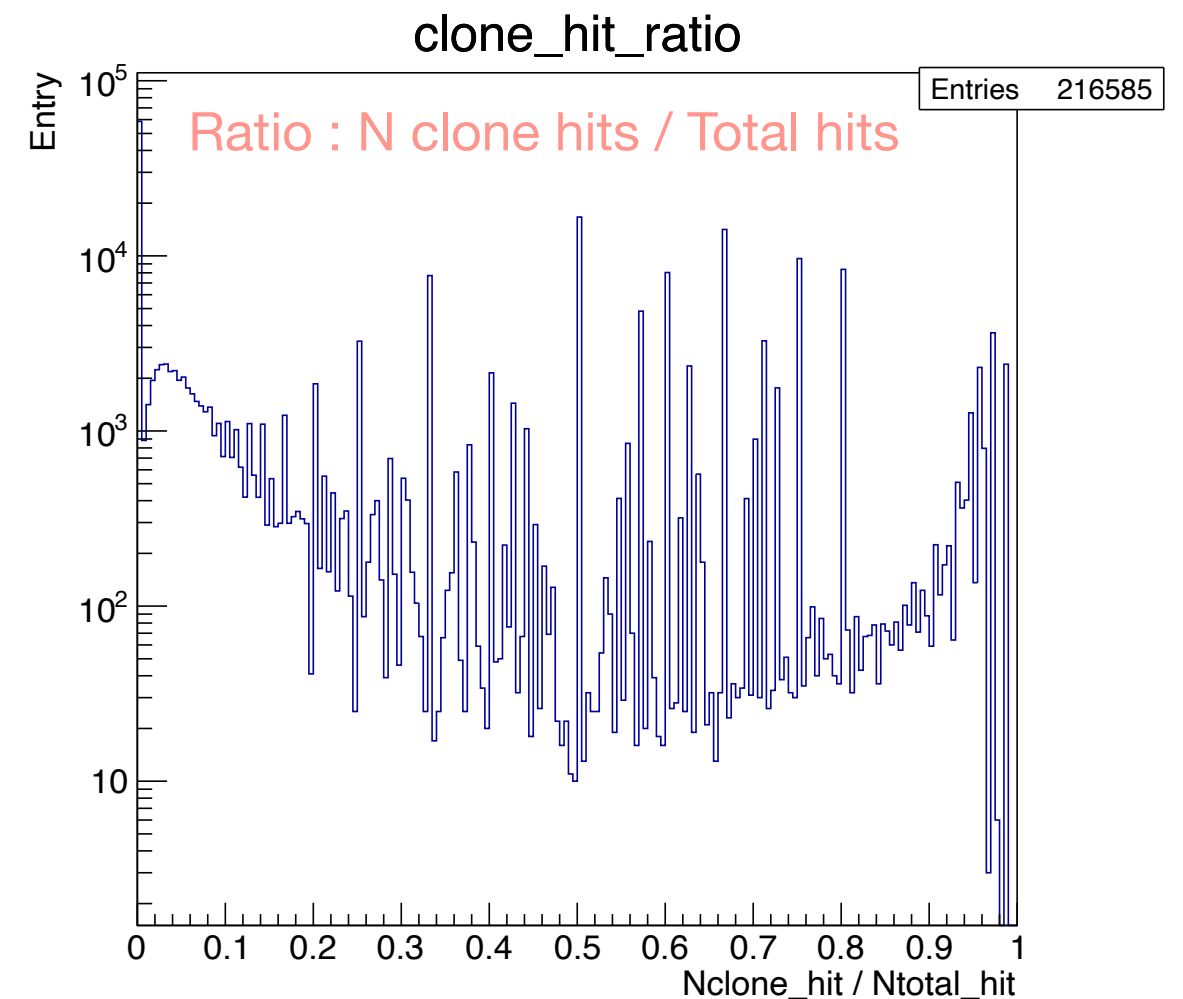
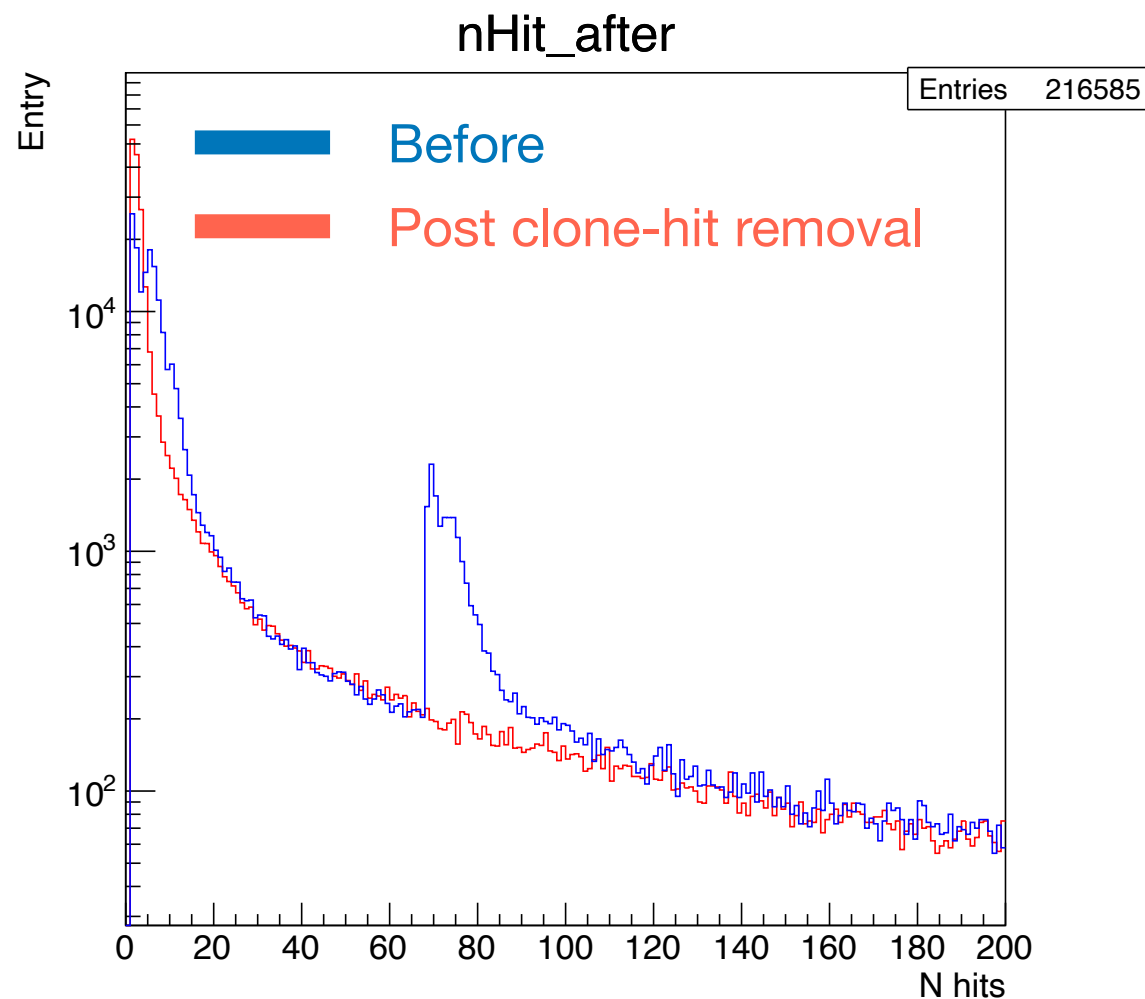
Cheng-Wei Shih, Chia-Ming Kuo
National Central University



2023/08/31 INTT meeting



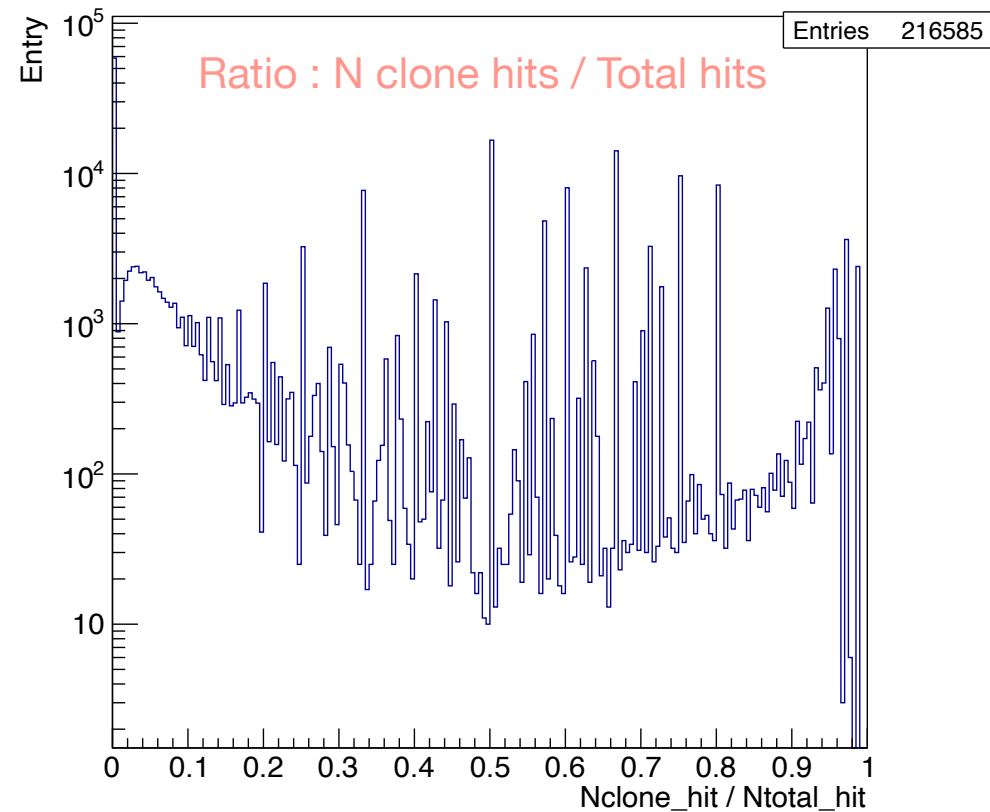
- Clone hit : In one event (same bco_full), same pid, module, chip_id and chan_id. The adc might (can) be different



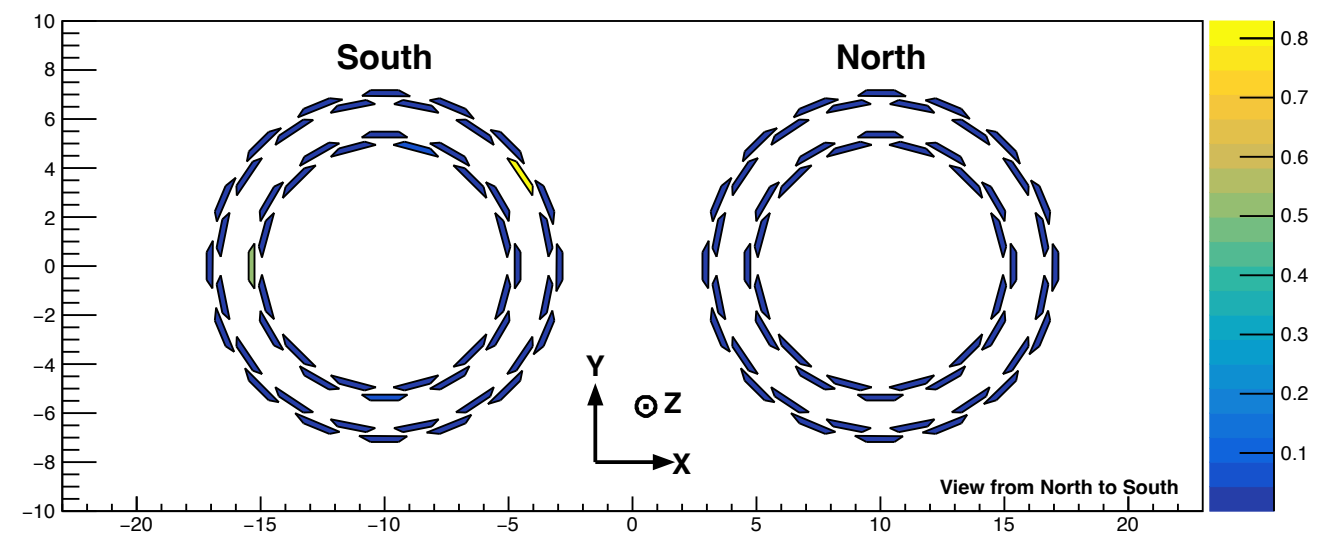
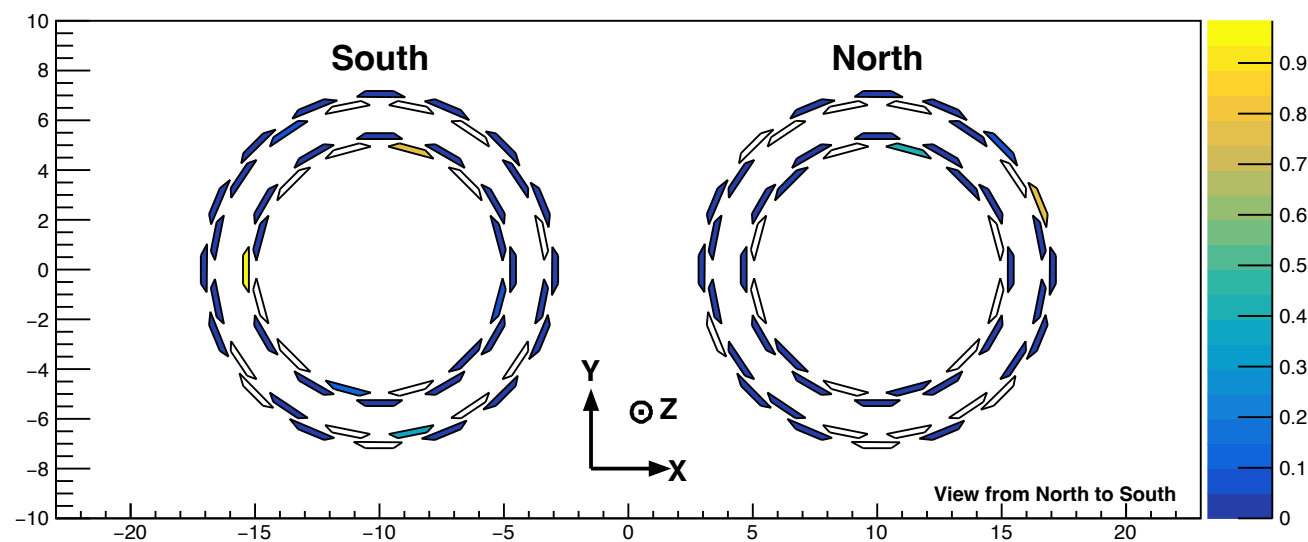
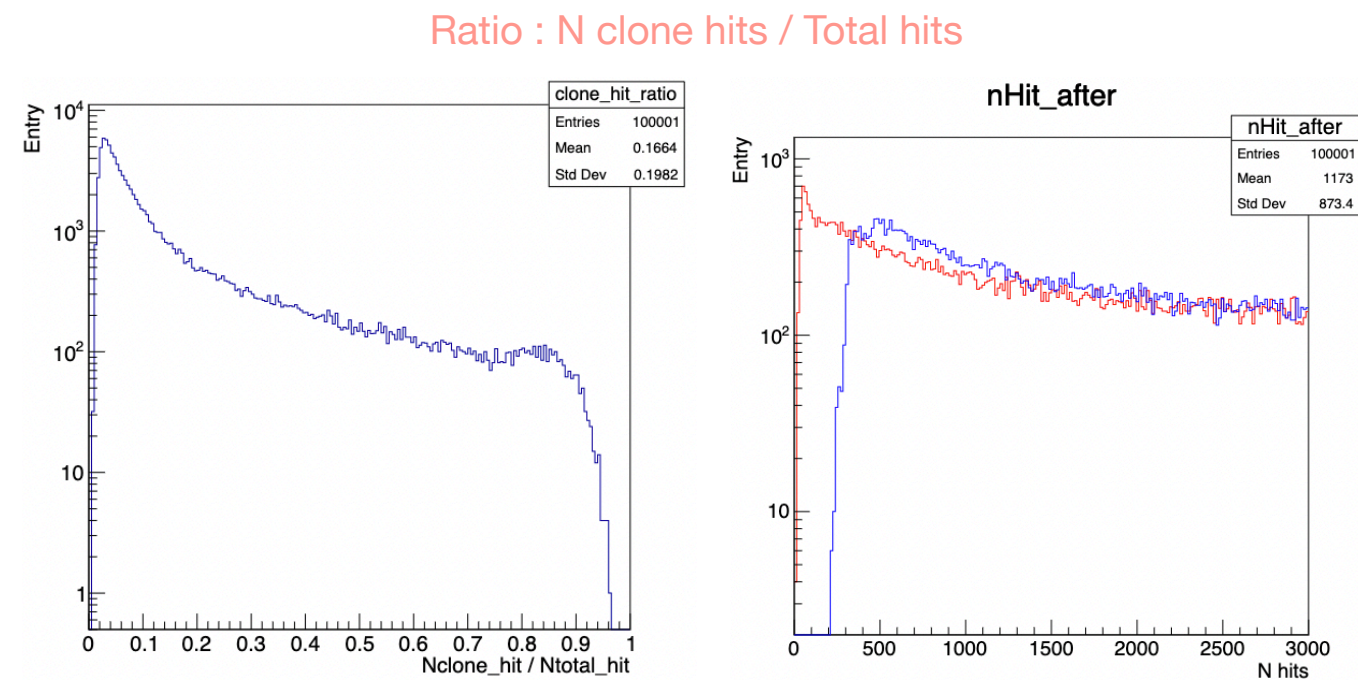
Clone hit rate can be up to > 90% !

INTT clone hit ratio - Comparison

Cosmic run 25952, Aug 25, 2023



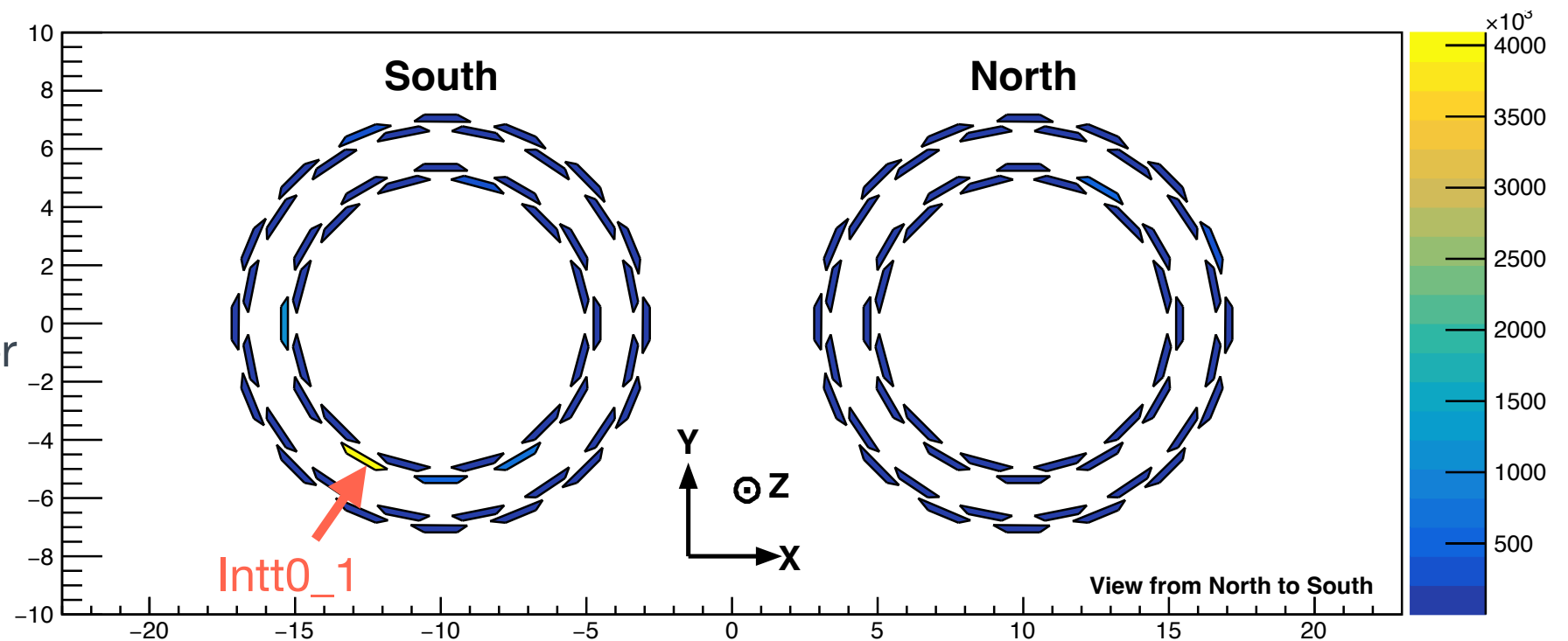
ZF collision run 20869, July 8, 2023



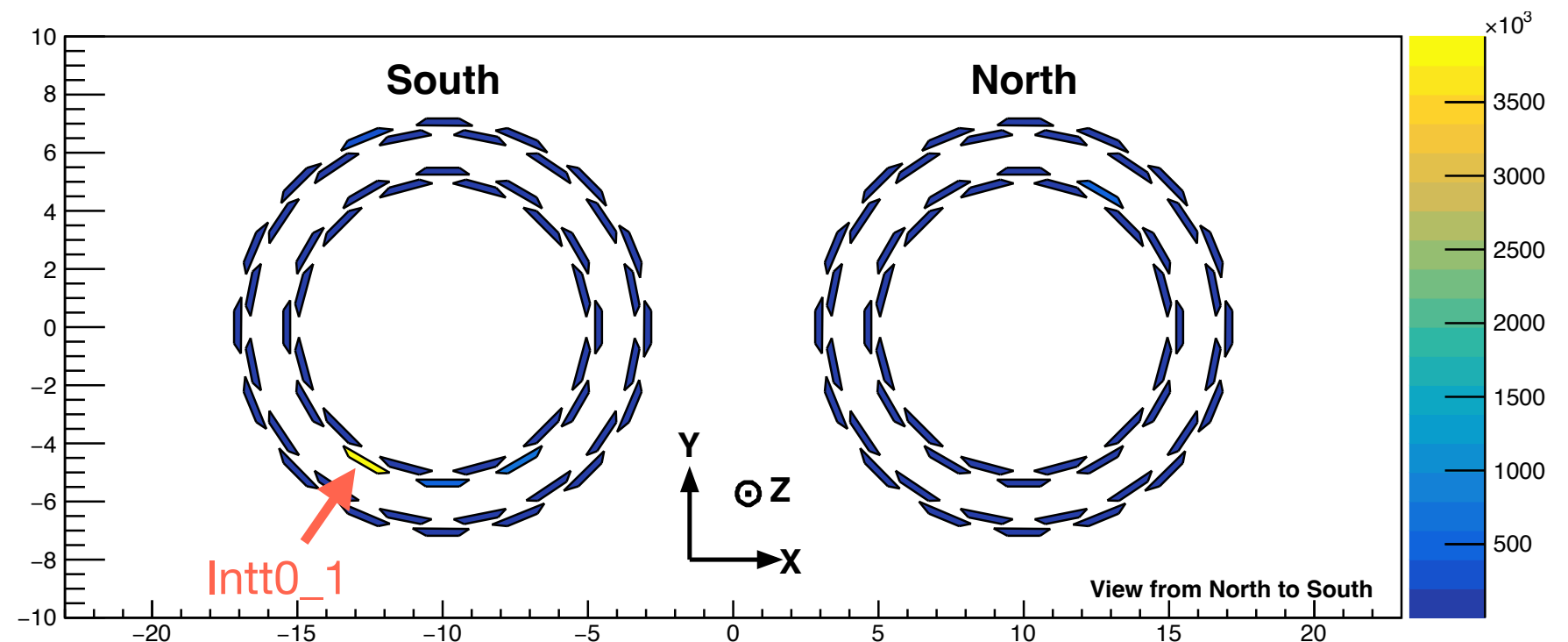
The more hit detected the higher chance having clone hit ?
→ Detection efficiency check needed (maybe)
Clone hit ratio run dependent ? → Stability monitoring!

- Clone hit : In one event (same bco_full), same pid, module, chip_id and chan_id. The adc might (can) be different.

All hits of each half-ladder



N hits of each half-ladder,
post clone-hit removal

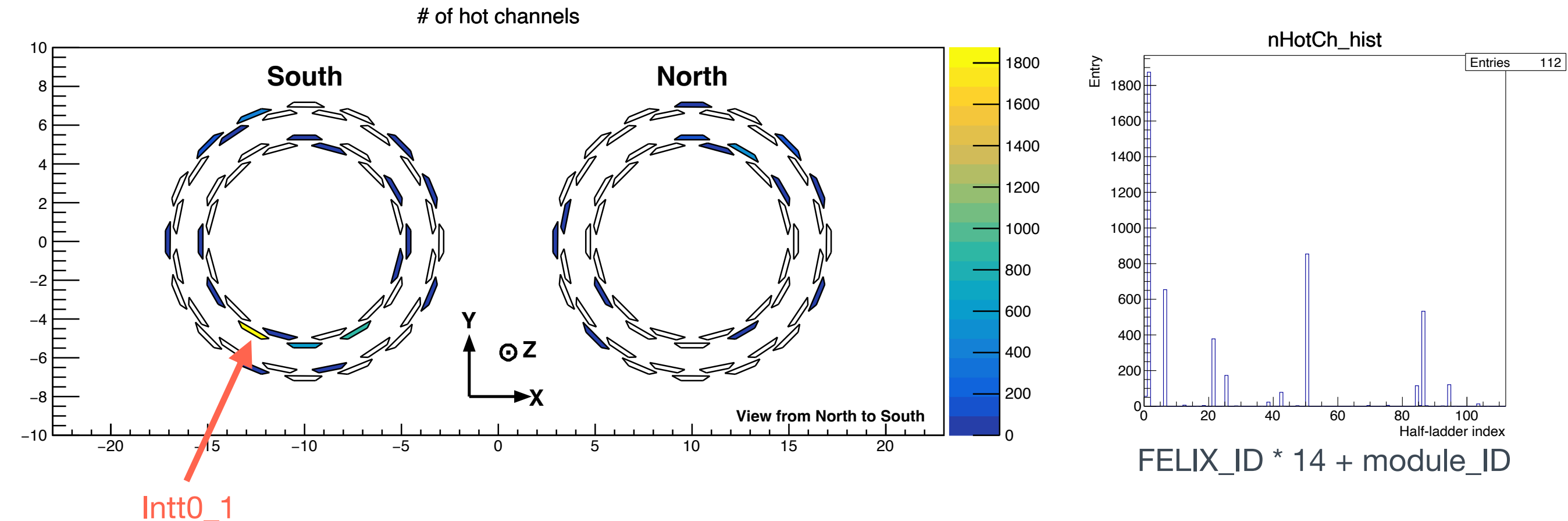


Hot channel finder for cosmic rays

Cosmic run 25952

- Purpose : To provide the INTT seeds for the other subsystems (MVTX, TPC ?) efficiently
- Procedures
 1. Remove the clone hits
 2. Calculate the total hits of type A sensors and type B sensors, independently
 3. If the channel that “(channel hit / corresponding total hit) > C * nominally expected hit ratio” → considered as a hot channel (C : constant)

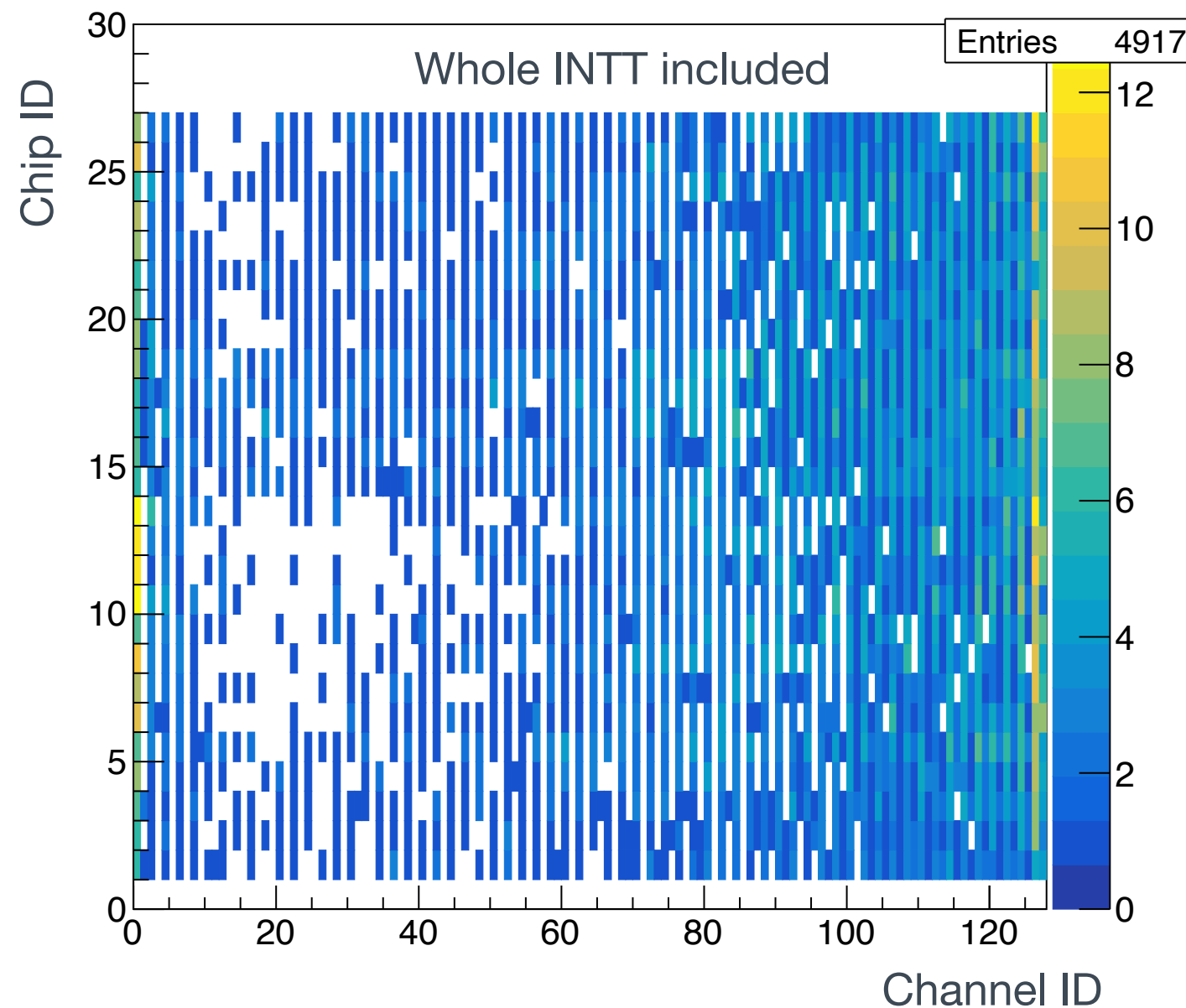
If C = 10, 4917 channels were masked



Hot channel finder for cosmic rays

Cosmic run 25952

If $C = 10$, 4917 channels were masked

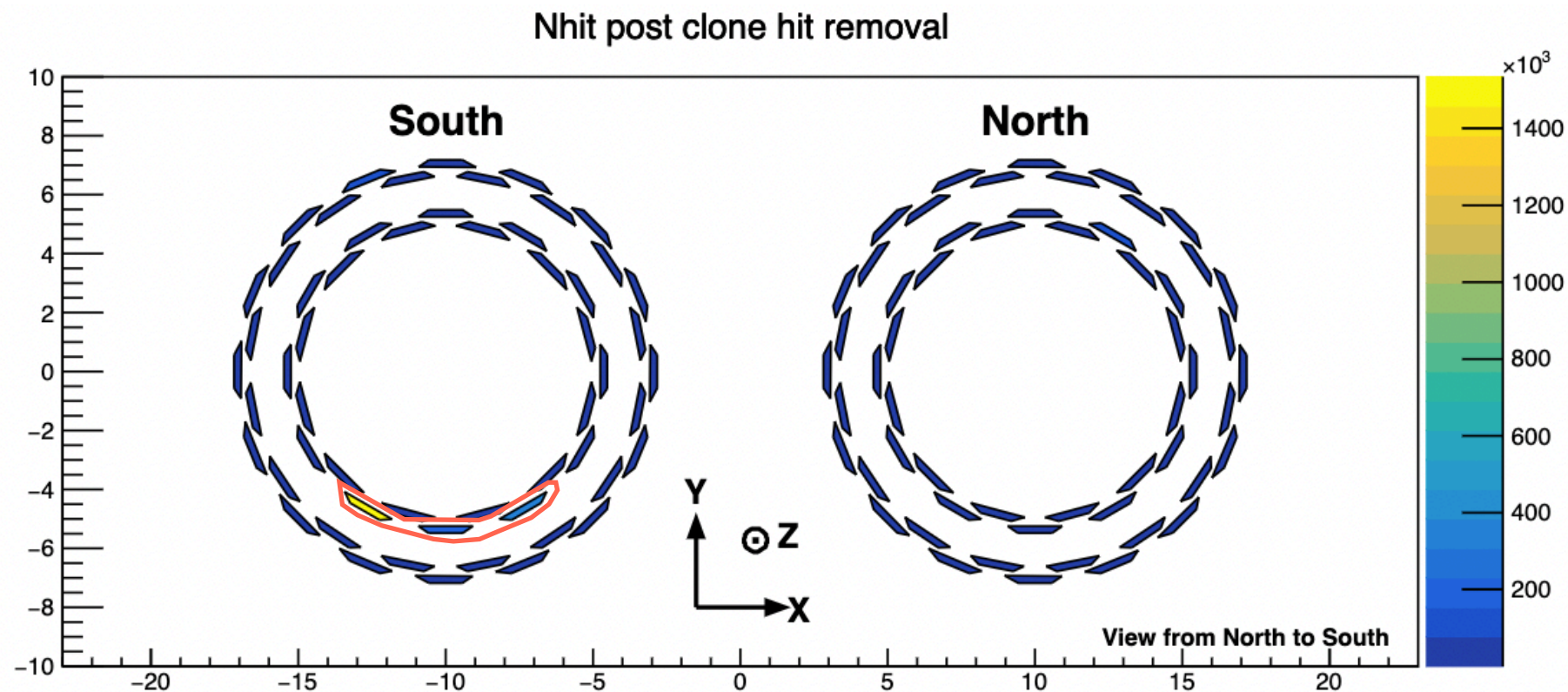


Hot channels usually appear at the edges
Fish-bone behavior...

The half-ladders that seem to be problematic

Cosmic run 25952

- Intt0_1 (B0L101S, RC-0S, Port C1)
→ Seems to be new
- Intt0_6 (B0L100S, RC-0S, Port A1)
→ Found to have unstable TLK issue in calibration test
- Intt3_8 (B0L111S, RC-7S, Port B1)
→ seems to be new

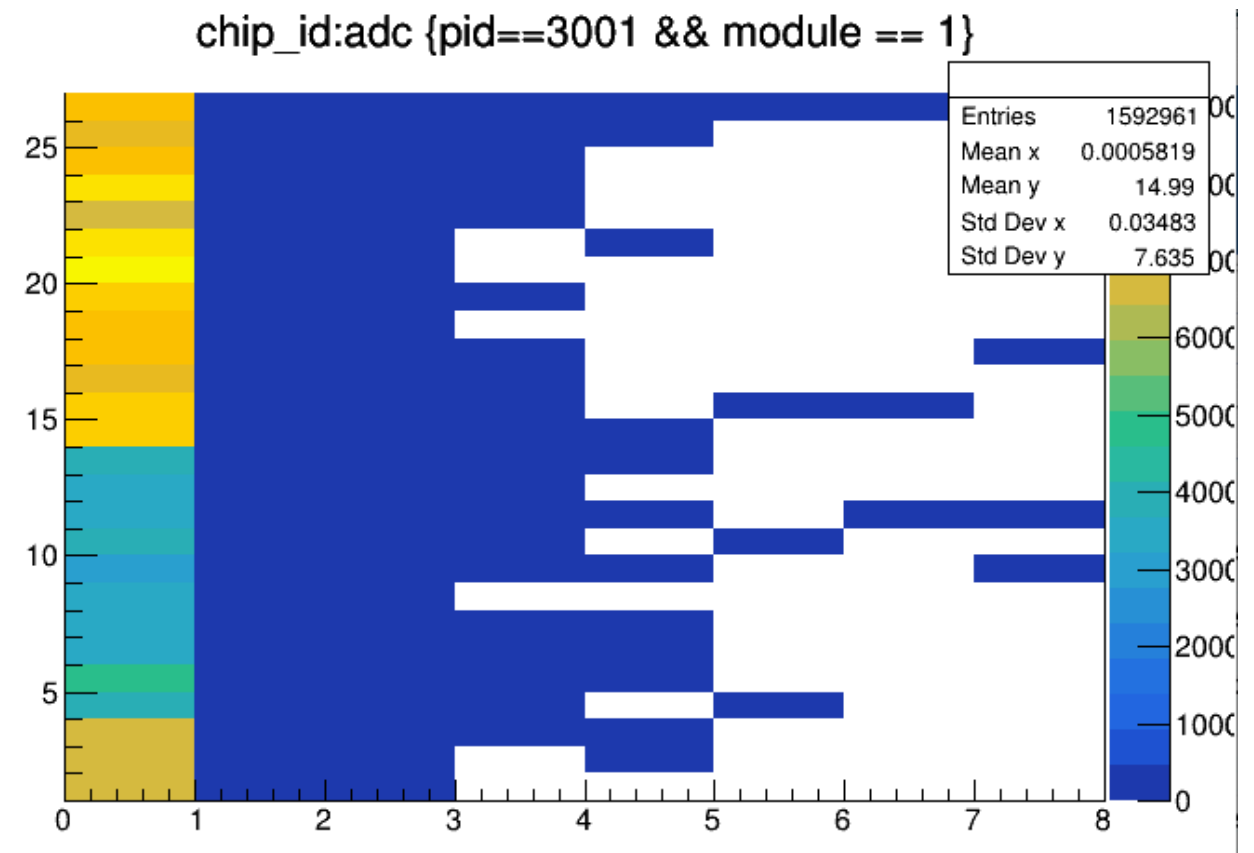
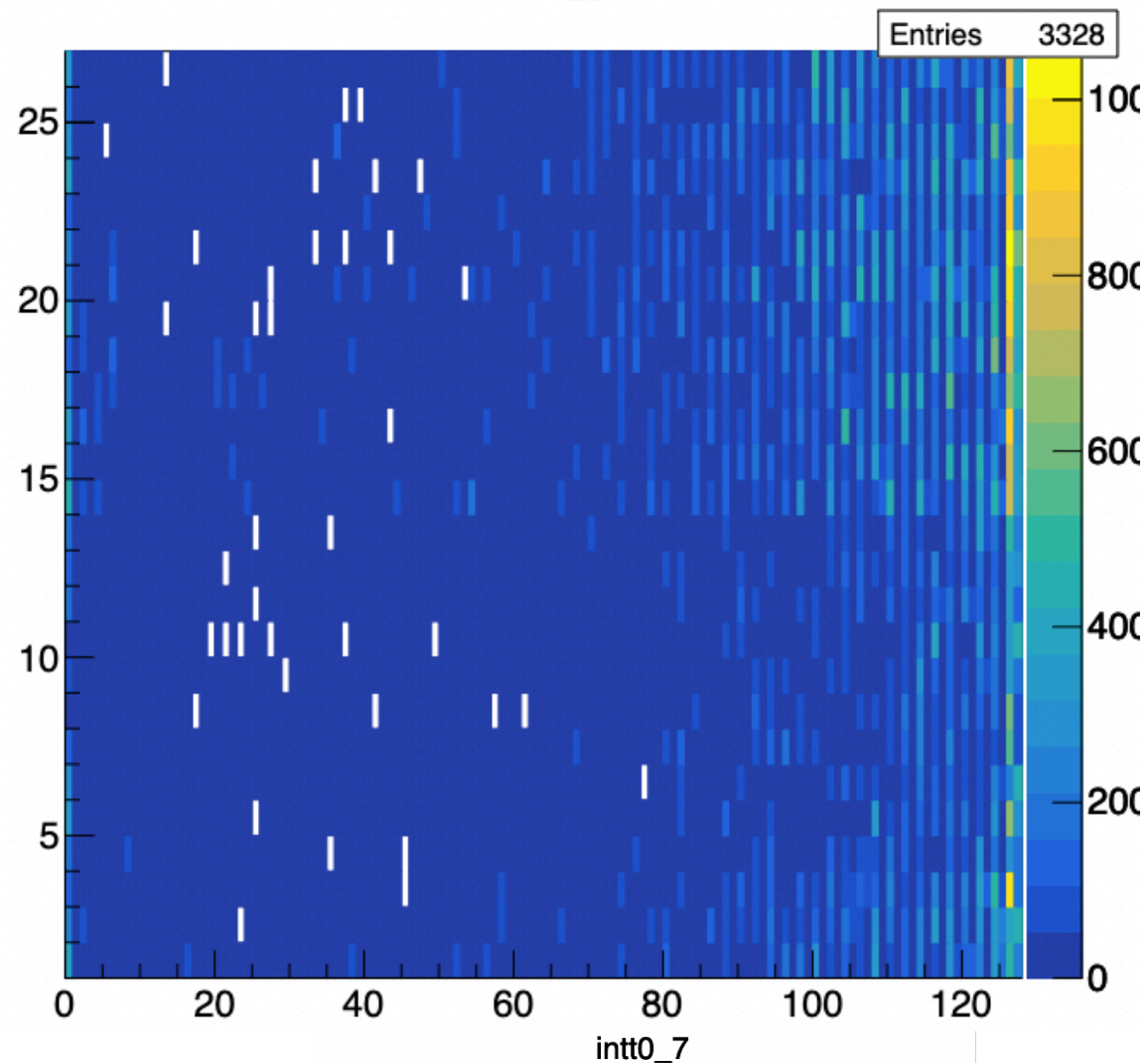


Post clone-hit removal, number of hits in the half-ladder

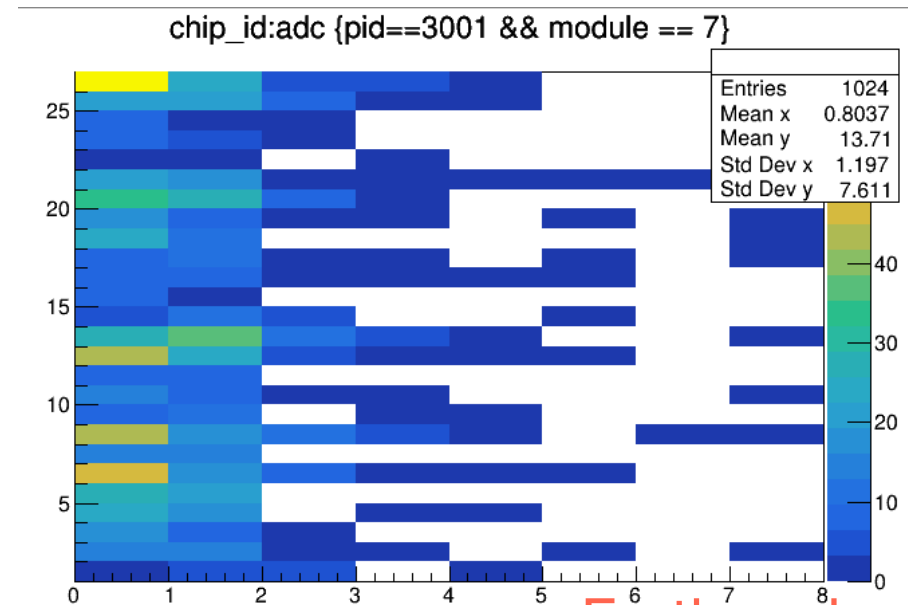
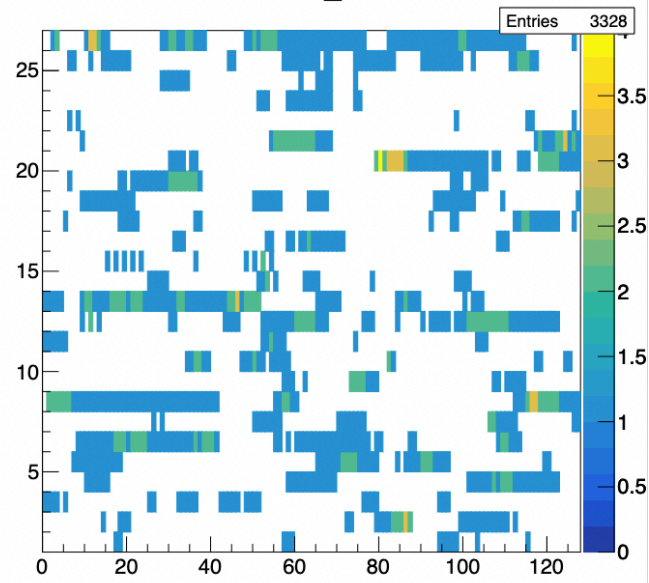
Intt0_1 (B0L101S, RC-0S, Port C1)

Cosmic run 25952

intt0_1



Nominal

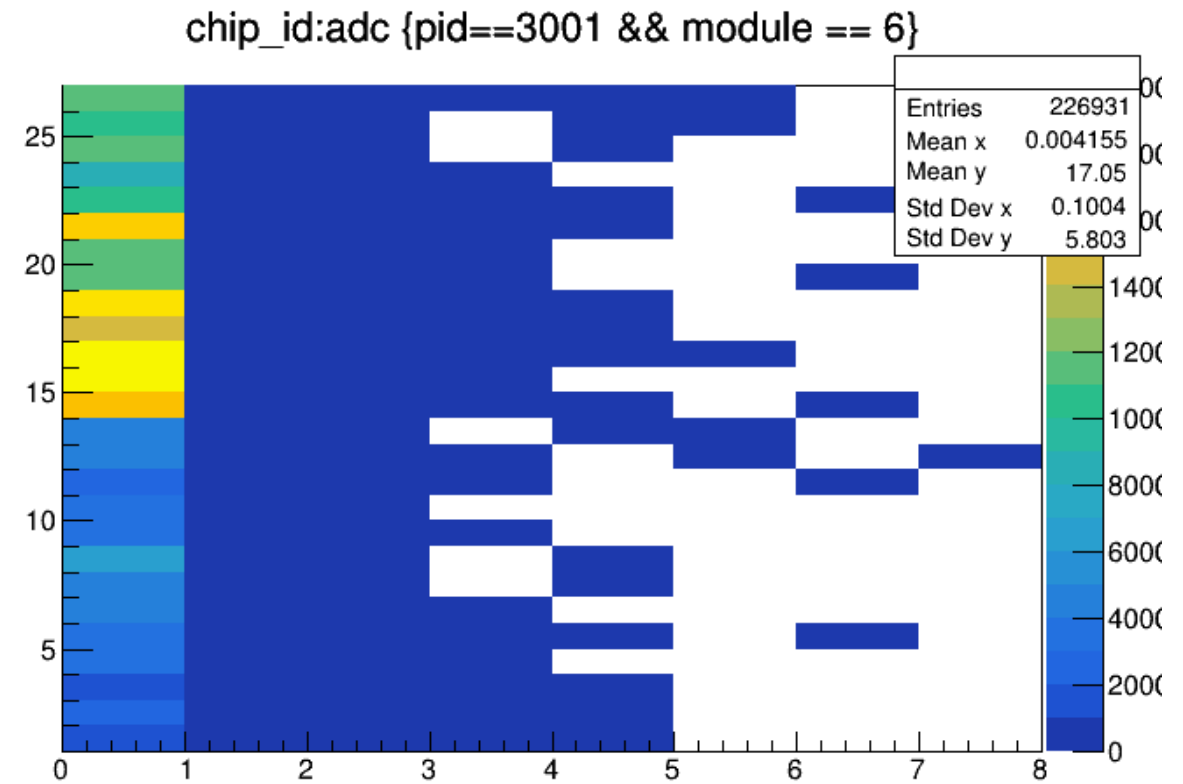
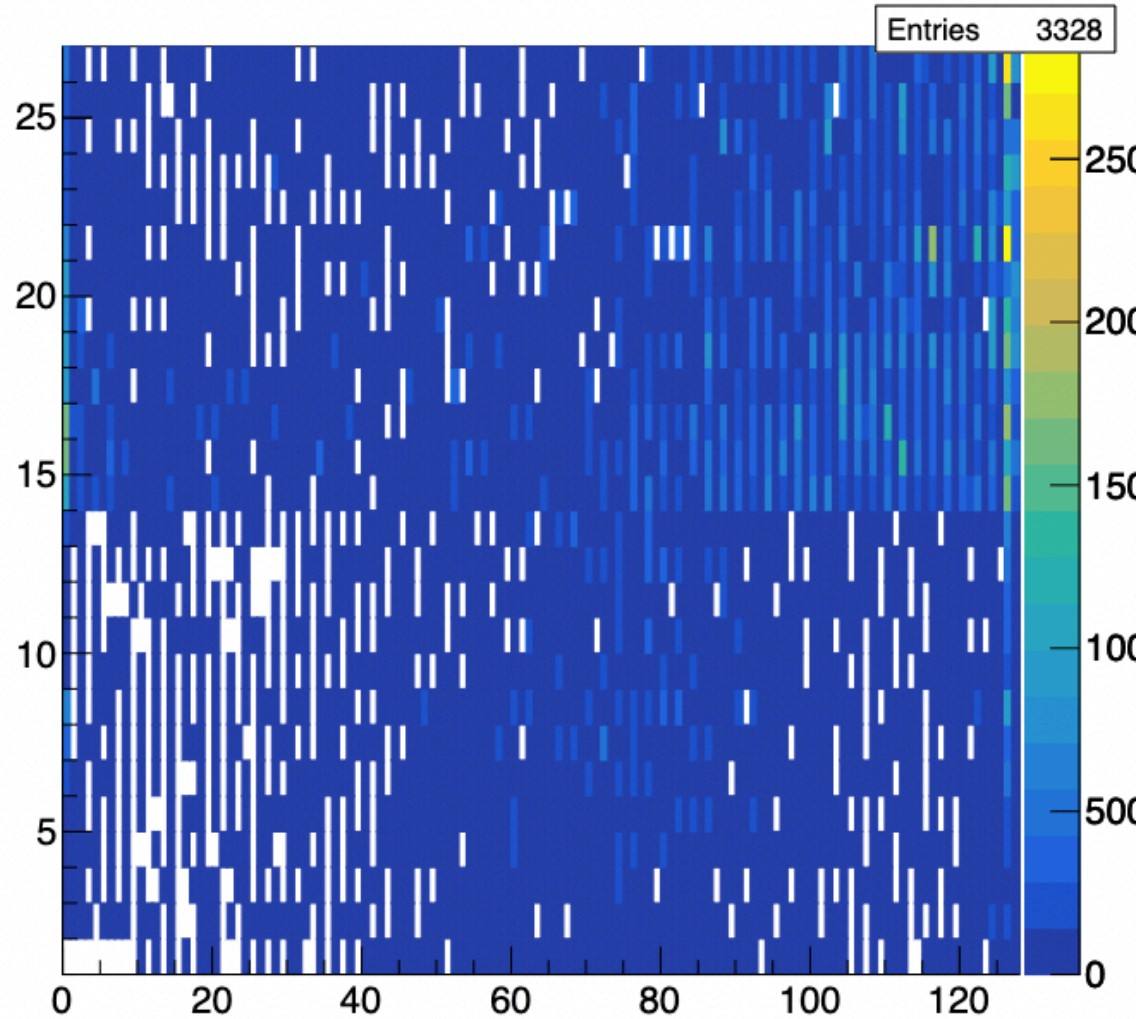


Further checks needed

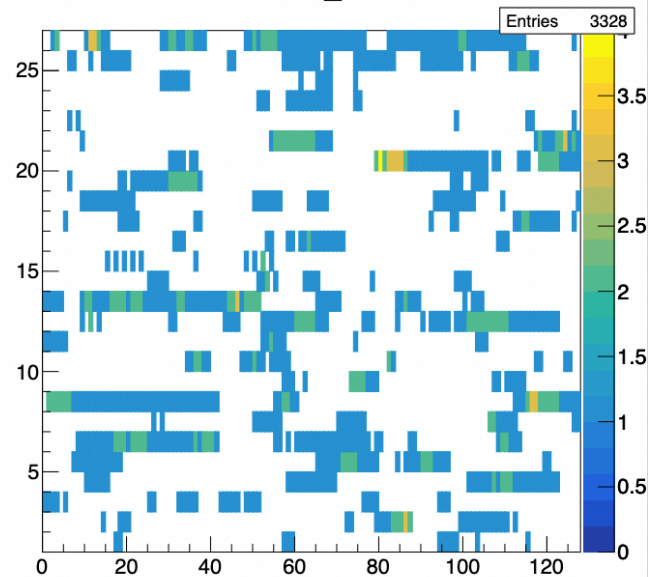
Intt0_6 (BOL100S, RC-0S, Port A1)

Cosmic run 25952

intt0_6

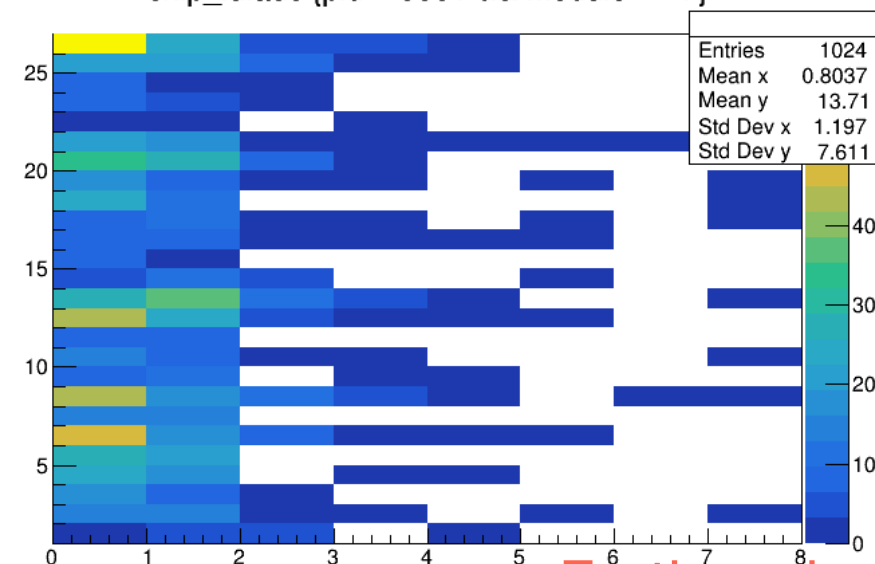


intt0_7



Nominal

chip_id:adc {pid==3001 && module == 7}

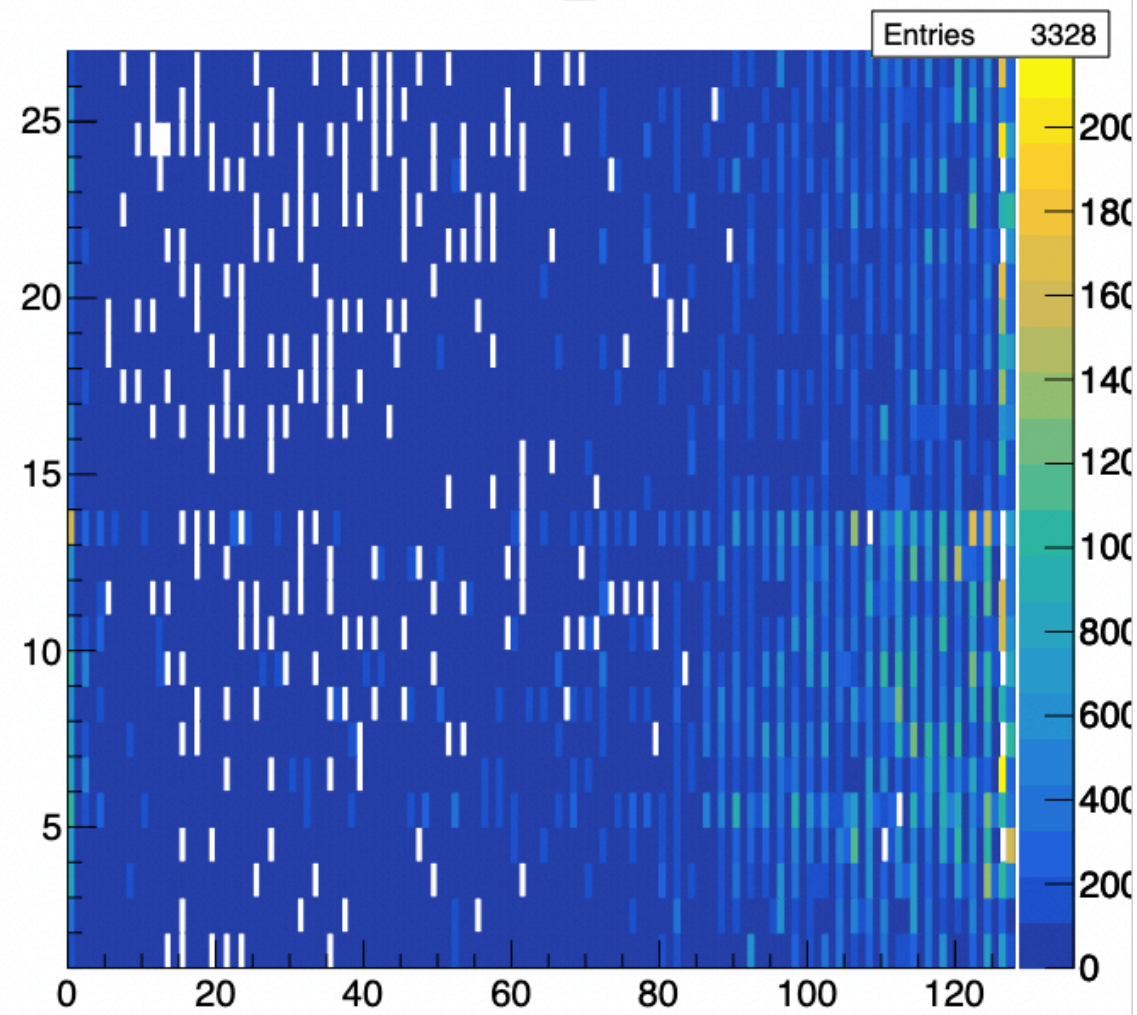


Further checks needed

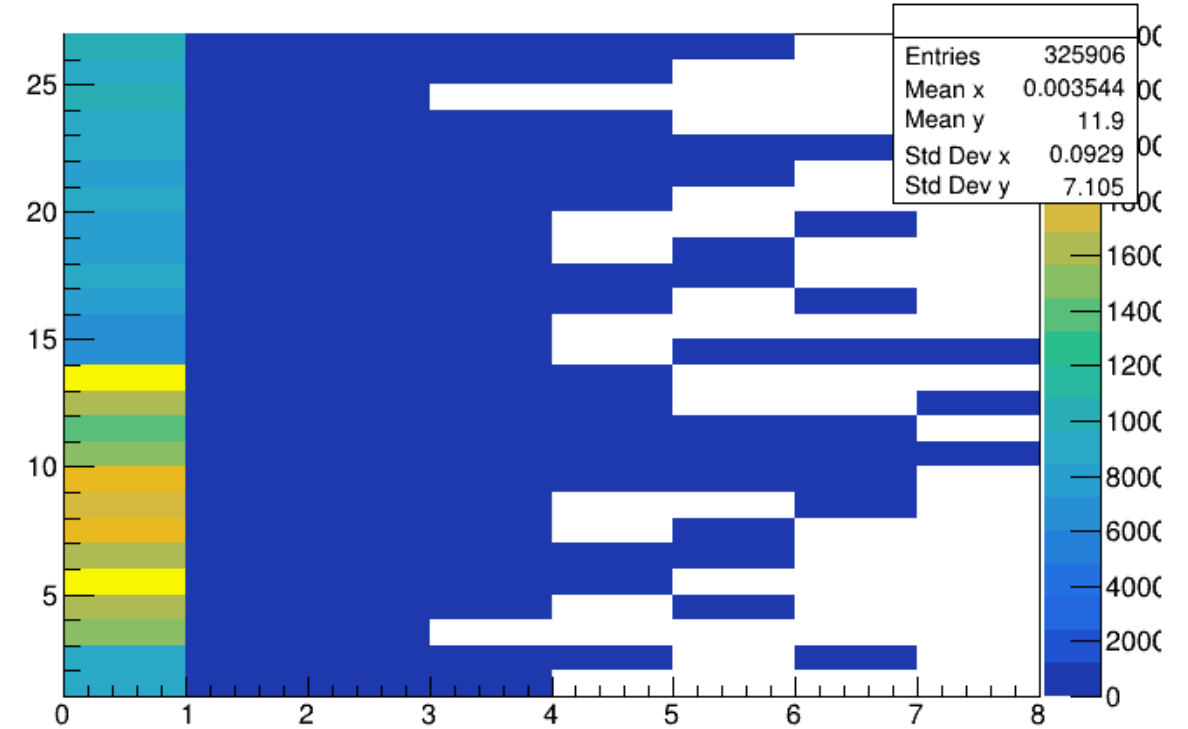
Intt3_8 (B0L11S, RC-7S, Port B1)

Cosmic run 25952

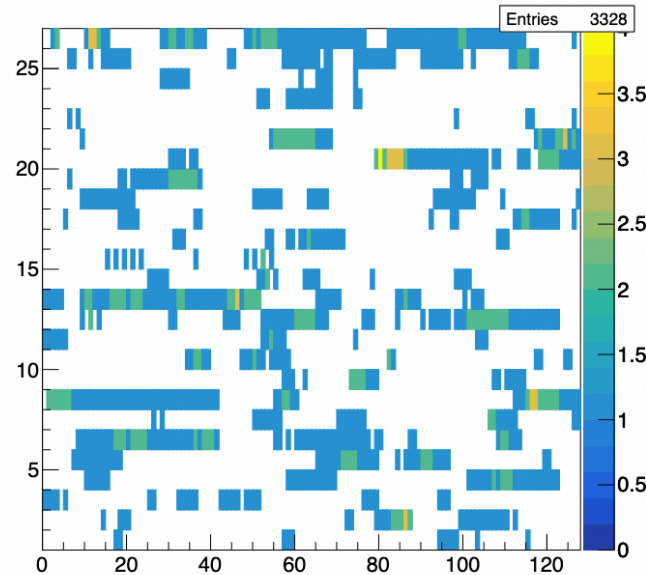
intt3_8



chip_id:adc {pid==3004 && module == 8}

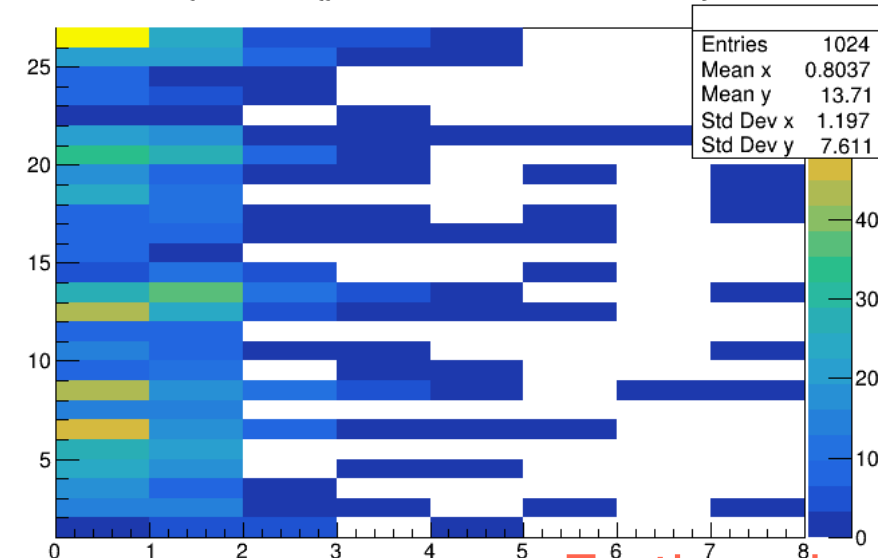


intt0_7



Nominal

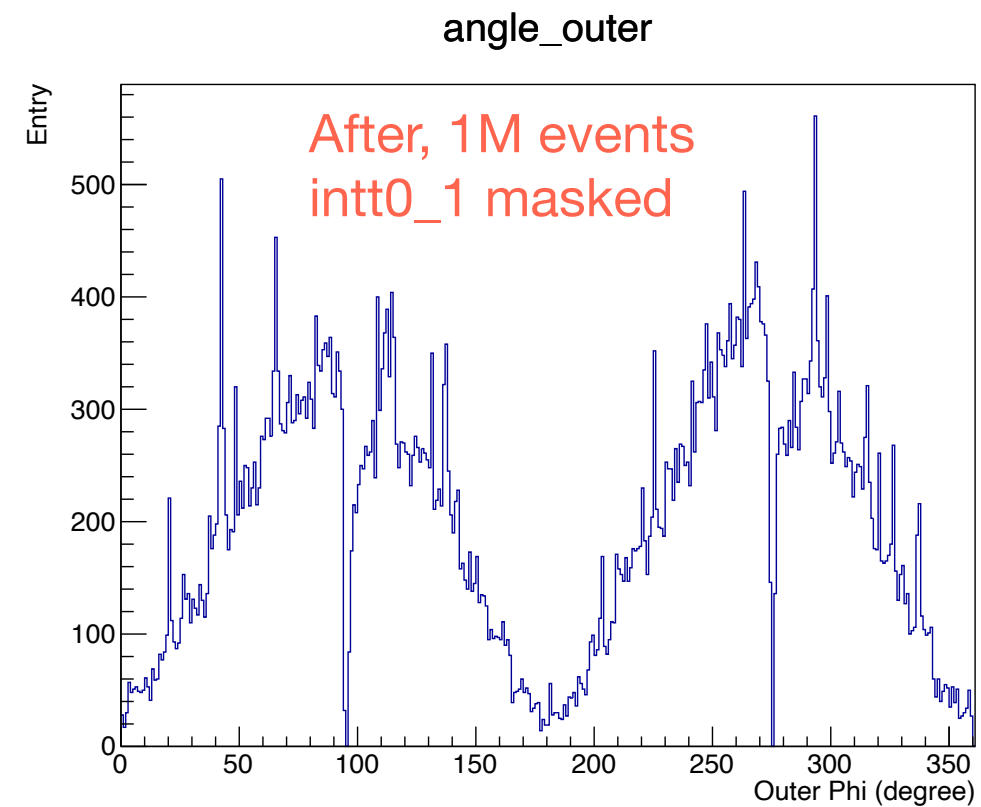
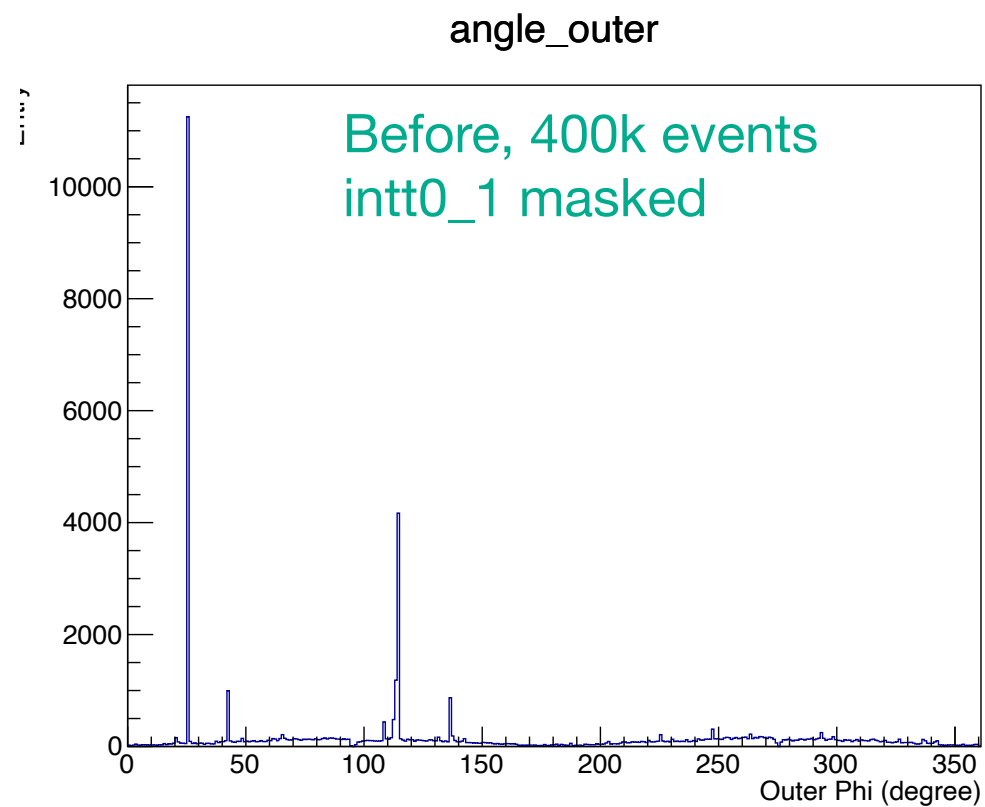
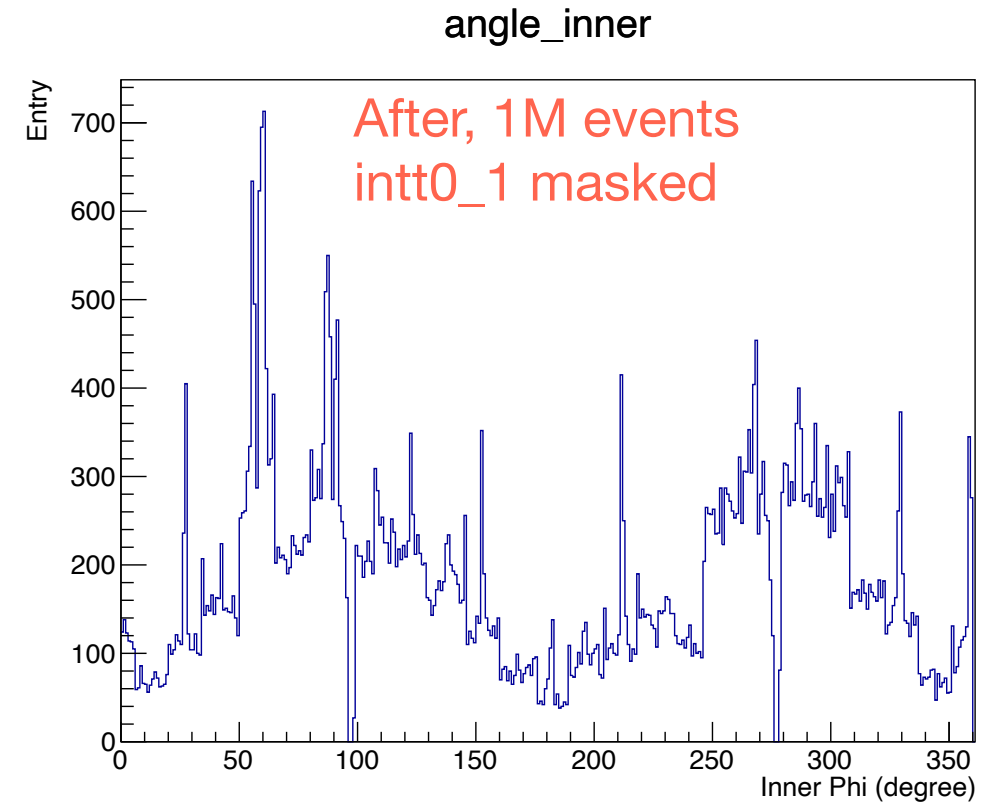
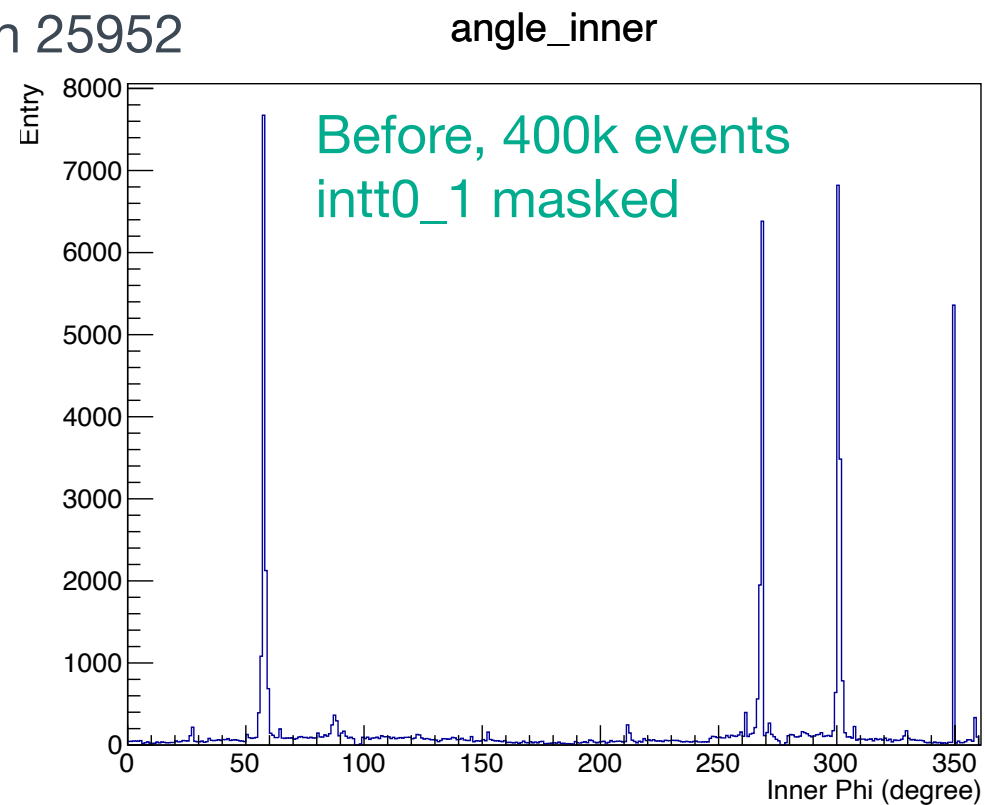
chip_id:adc {pid==3001 && module == 7}



Further checks needed

Cosmic finder performance

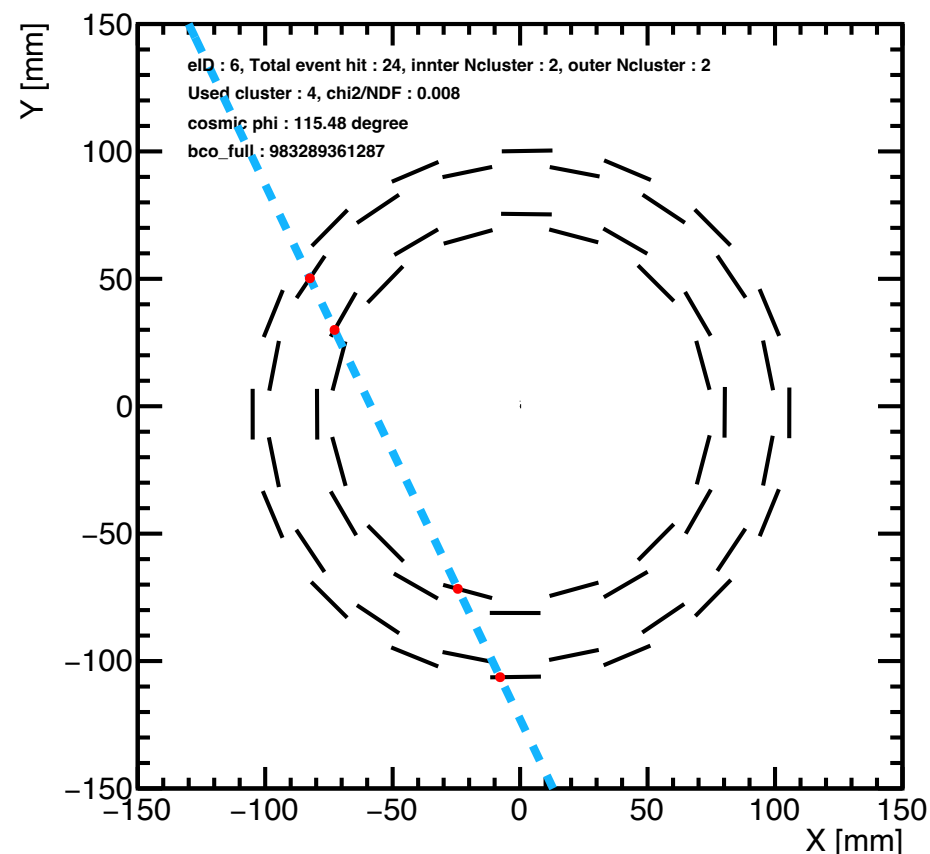
Cosmic run 25952



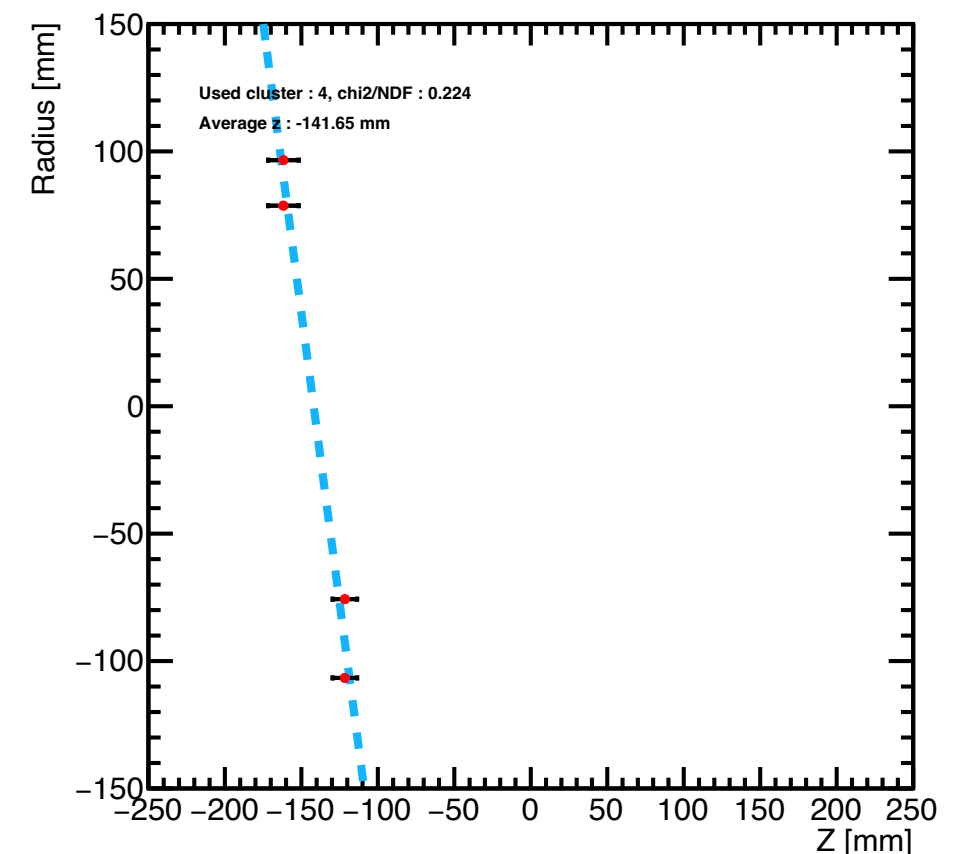
The empty region (~95 degree, 275 degree) → gap b/w west & east halves, survey data included

- Hot channel finder post clone hit removal
- Hot channel removed & intt0_1 masked
- Clustering
- Total hits < 500
- Cluster size <= 4
- 1-hit cluster with adc0 removed
- $NHit_{inner} == 2 \ \&\& \ NHit_{outer} == 2$
- Linear fit, $\chi^2/NDF_{xy} < 5 \ \& \ \chi^2/NDF_{rz} < 5$ (INTT z strip width considered)

INTT event display X-Y plane



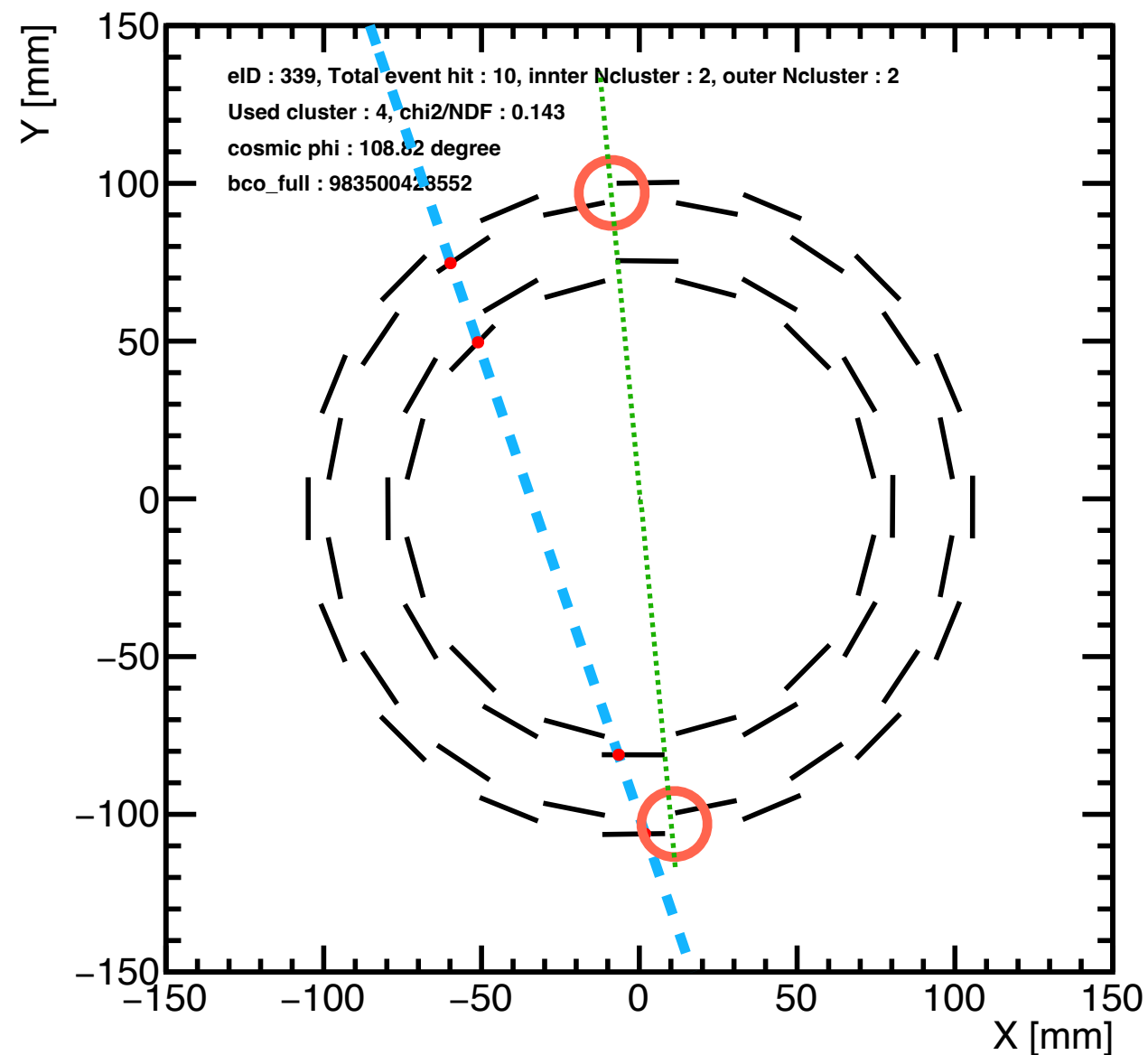
INTT event display r-Z plane



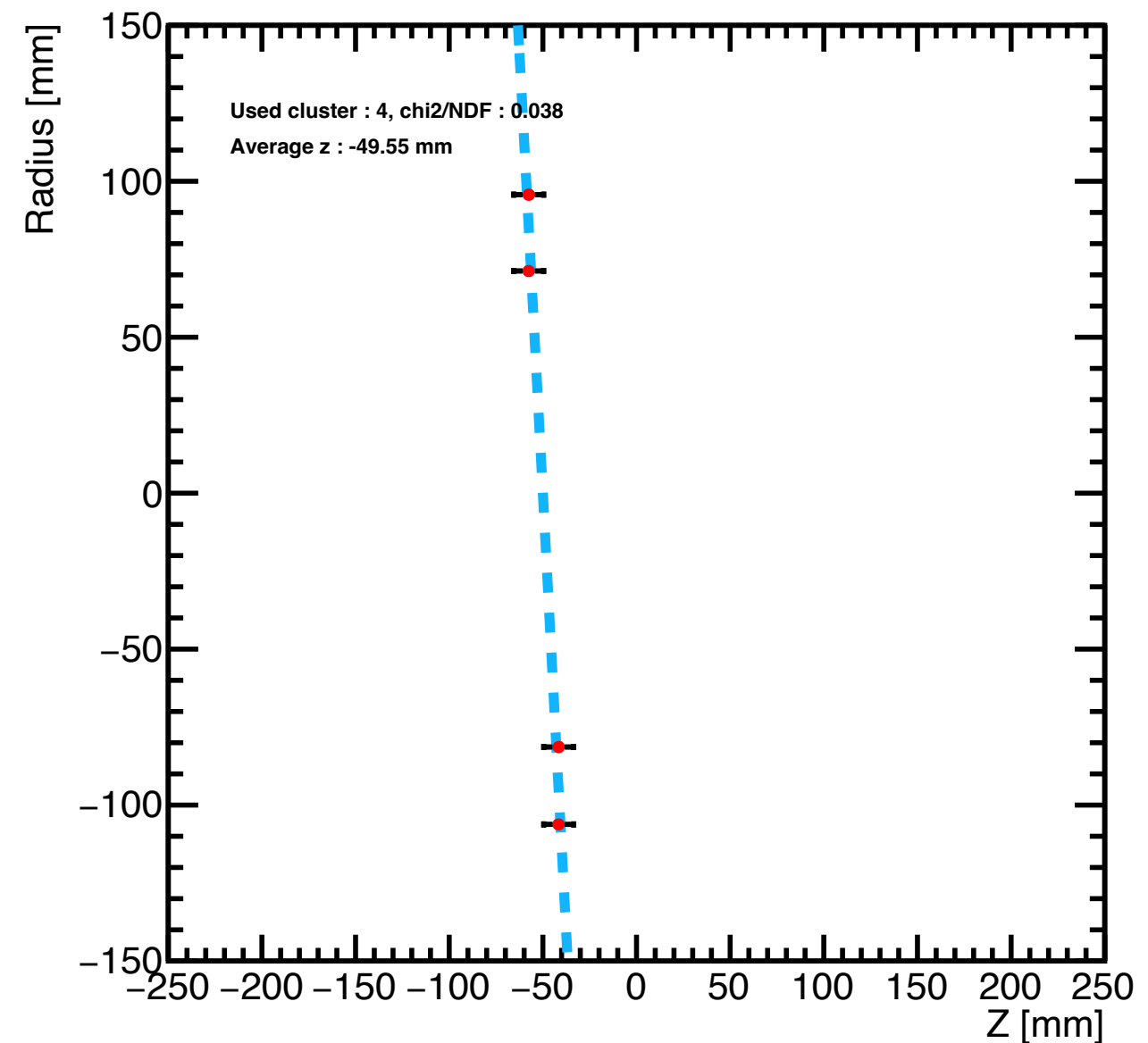
- The INTT cosmic seed provider was developed
 - Clone hit removal, hot channel finder, clustering and cosmic track candidates finder were included
- The clone-hit rate can be up to 90%
 - The higher hits detected, the more chance to have clone hits ?
 - Run by run dependent ? → Stability monitoring !
 - Detection efficiency studied with cosmic rays is needed
- Some half-ladders seem to be problematic
 - Cosmic tracks for further confirm
 - Calibration test would be the powerful tool to confirm
- There seems to have gaps b/w halves in phi map, according to the survey data (first order)

Backup

INTT event display X-Y plane



INTT event display r-Z plane



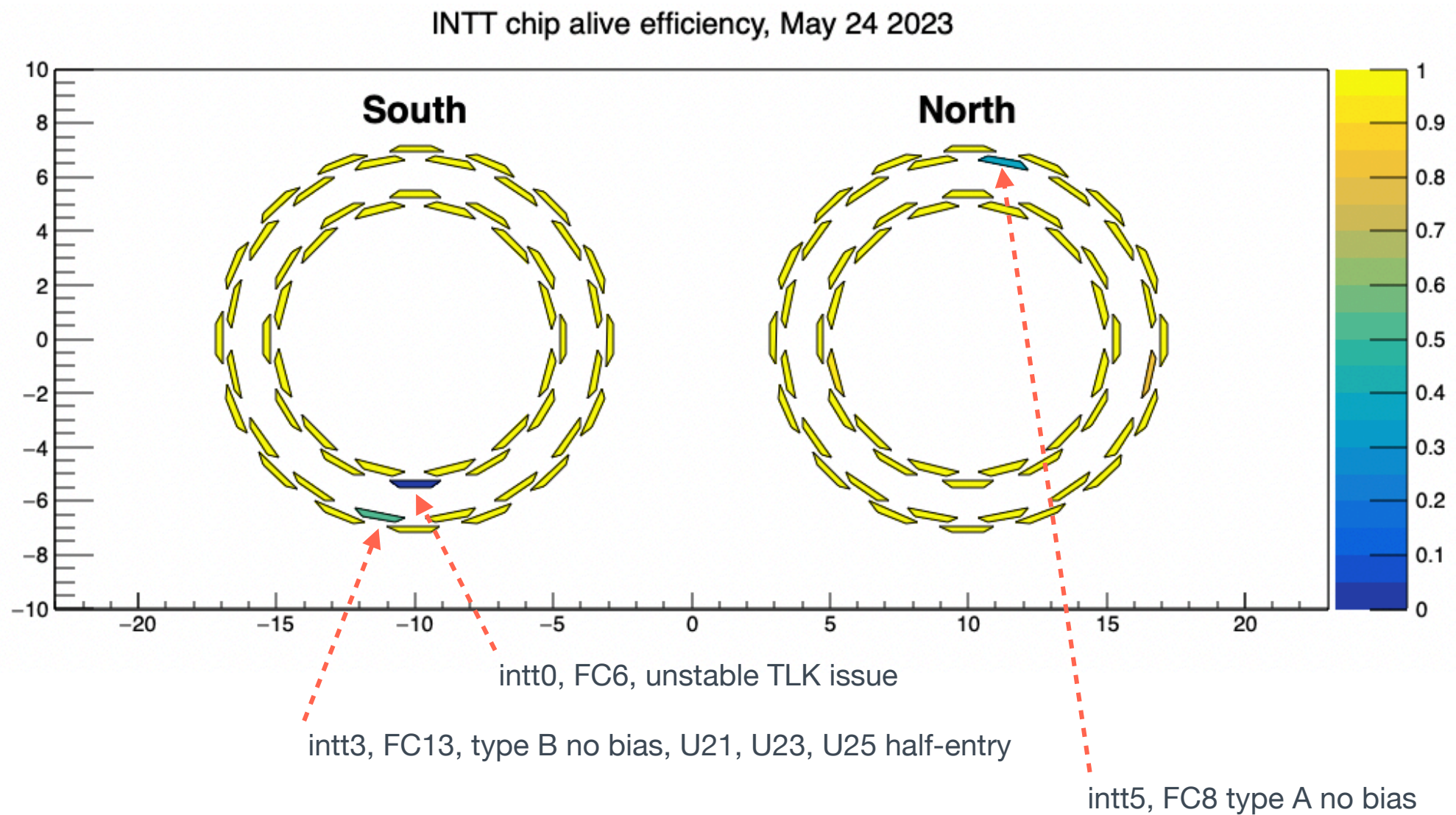
Plot has to be mirrored

TH2INTT - current INTT chip alive efficiency



Chip alive : the chip that can read the **collision** data

According to : [Latest INTT status on wiki](#)



General speaking (only up to chip level) : 2849 / 2912 chips are good