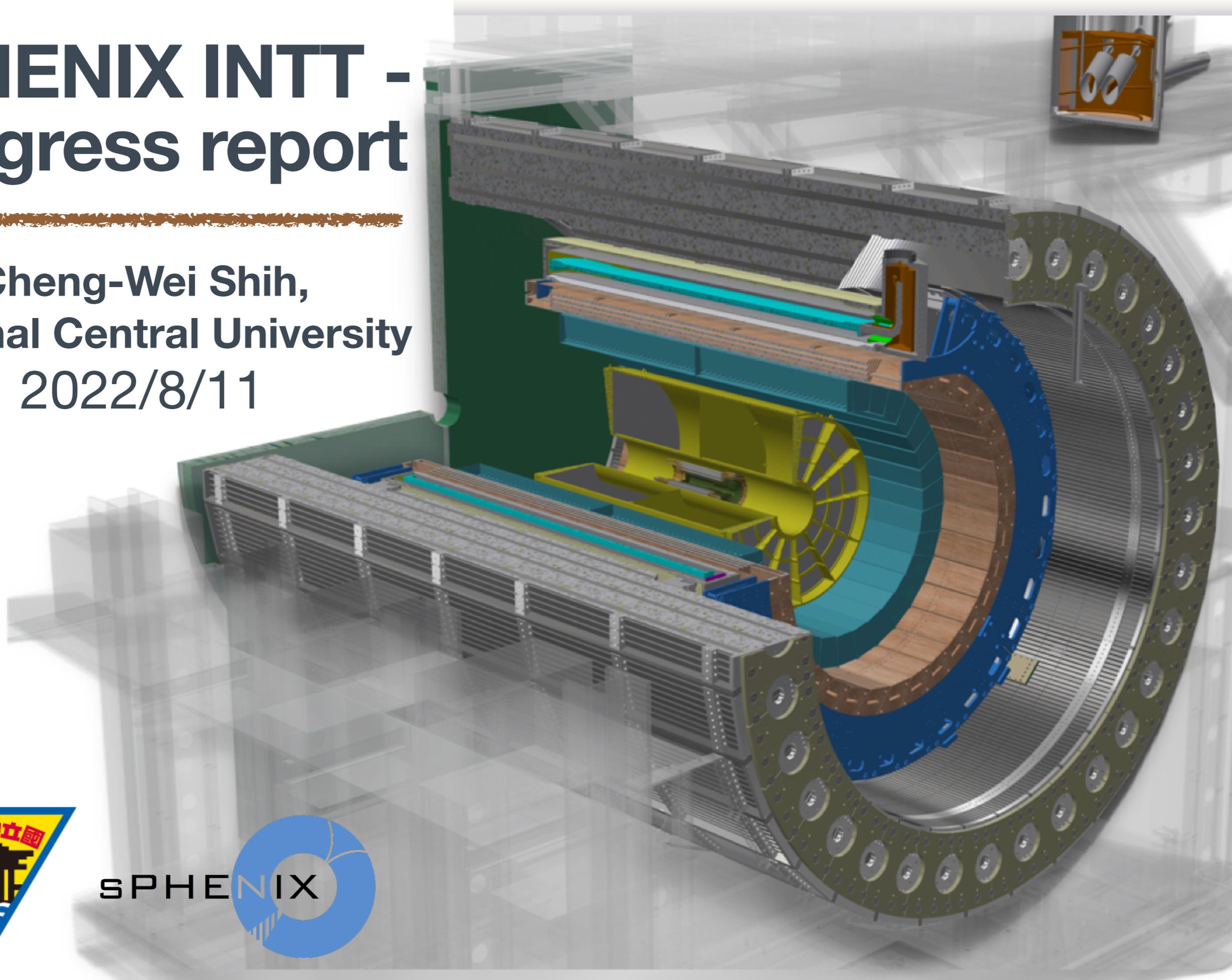


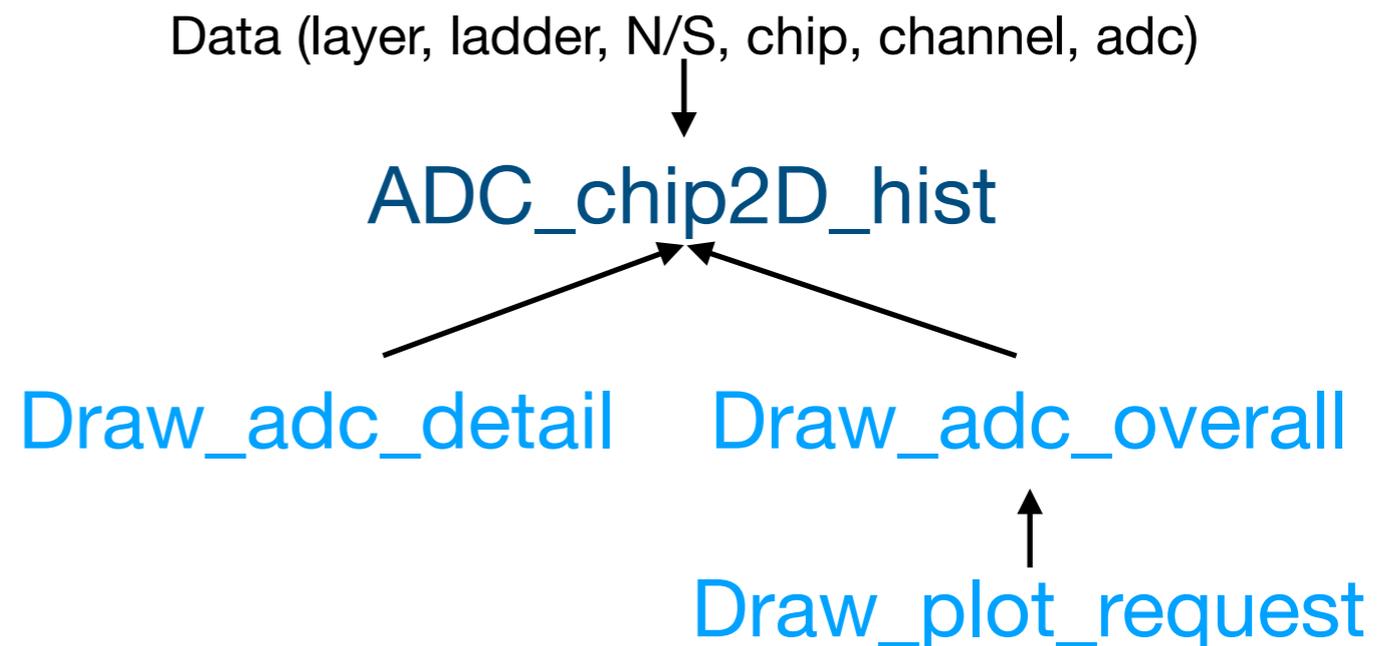
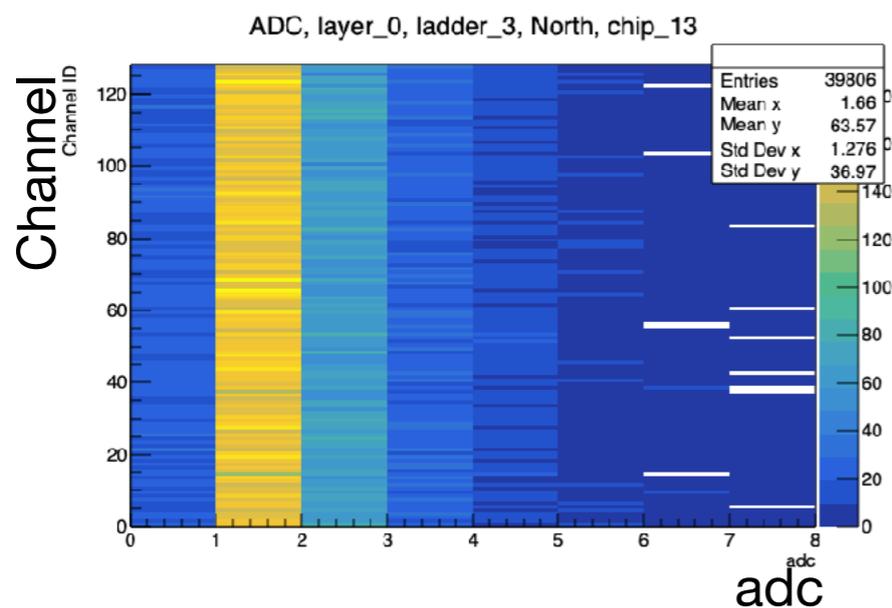
# sPHENIX INTT - progress report

Cheng-Wei Shih,  
National Central University  
2022/8/11



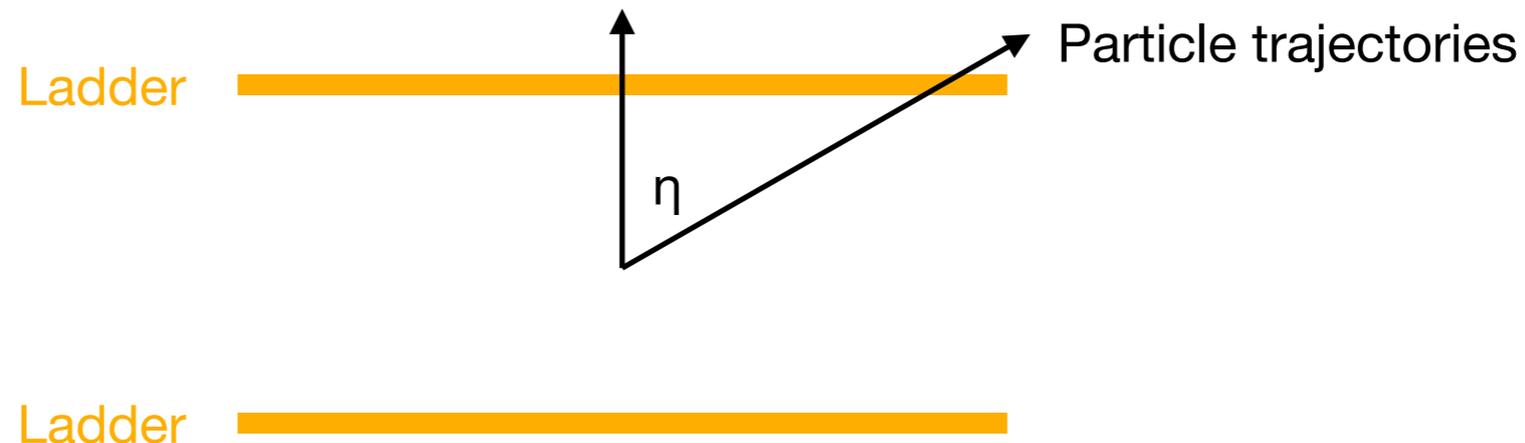
# // Online monitoring - adc part

- `int Draw_adc_detail` (Draw\_id, layer, ladder, N/S, chip, channel)  
→ 1D or 2D, chip level or channel level
- `vector<TH2F *> Draw_adc_overall` (Draw\_id)  
→ adc, adc std, entry, .etc.
- `int Draw_plot_request` (x\_axis, y\_axis, plot\_y\_min, plot\_y\_max, opt1, opt2)  
→ adc or N, chip or ladder, all or single, .etc.
- Basis : TH2D \* `ADC_chip2D_hist`; For each chip.



# // Online monitoring - adc part

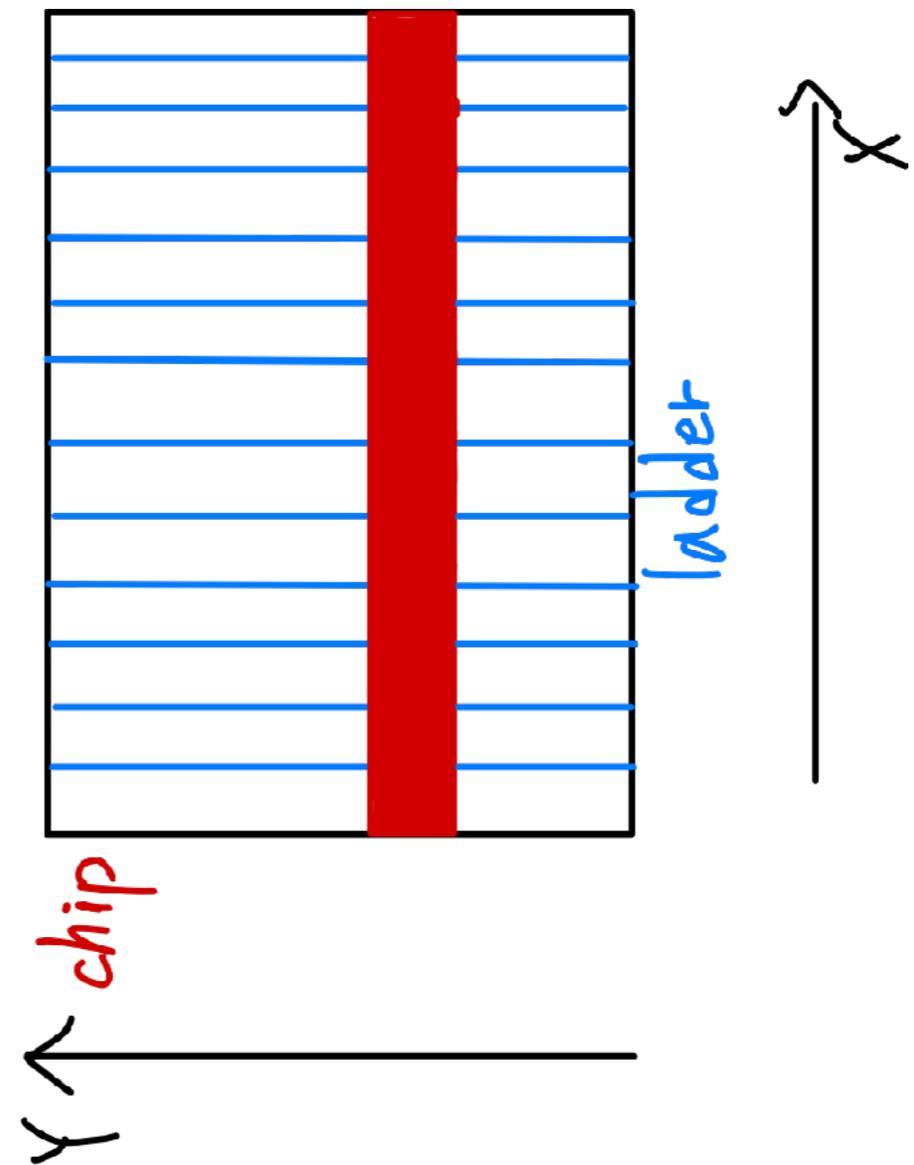
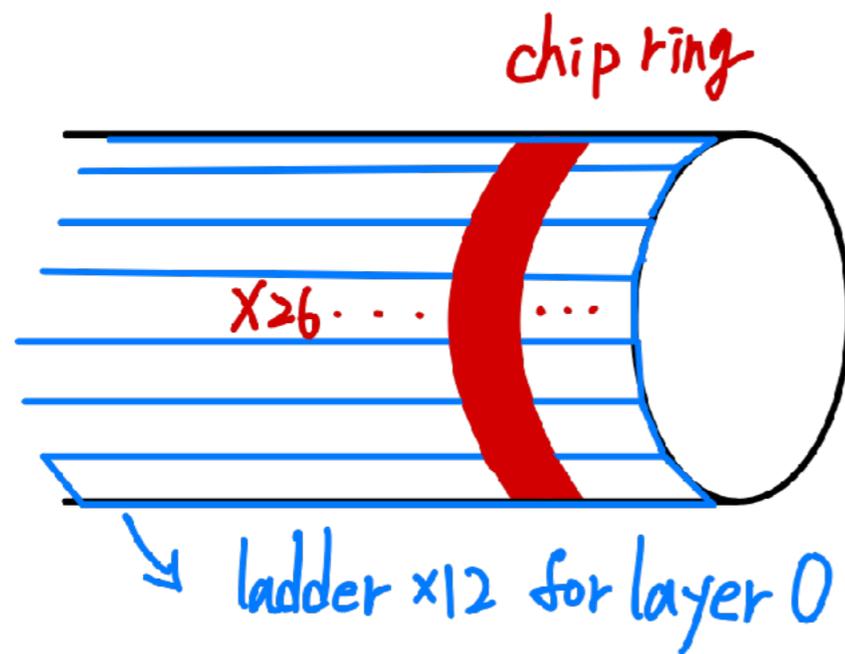
- Toy data set for testing :
  - **layer, ladder, N/S, chip, channel** : uniform random
  - **adc** : landau dist., high  $\eta$  angle chip has higher MPV.
    - The particle penetration length increases as angle increases.



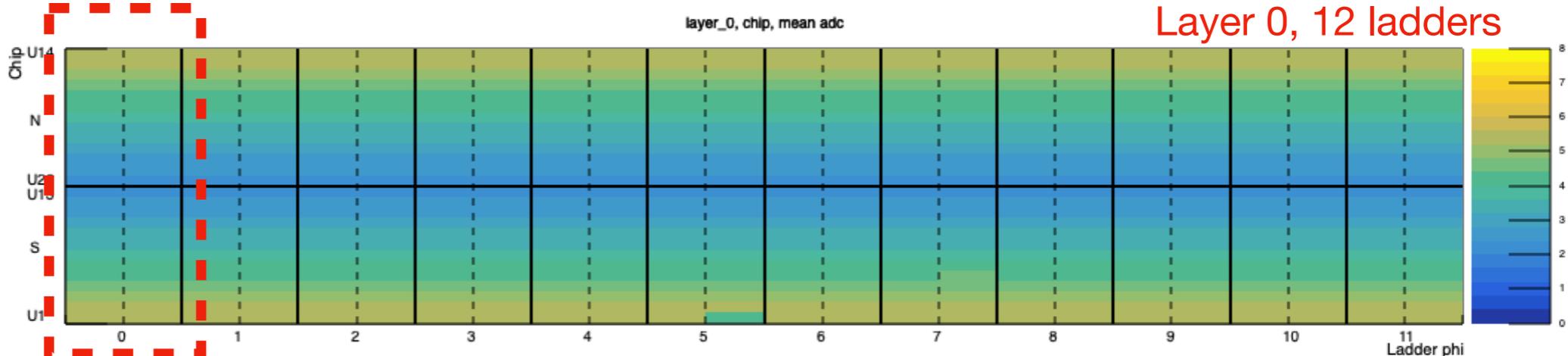
- **Noise mimic** :
  - layer 0, ladder 5, south side, chip 14, channel 0 : 10k adc 0 hits.

# // Online monitoring - adc part

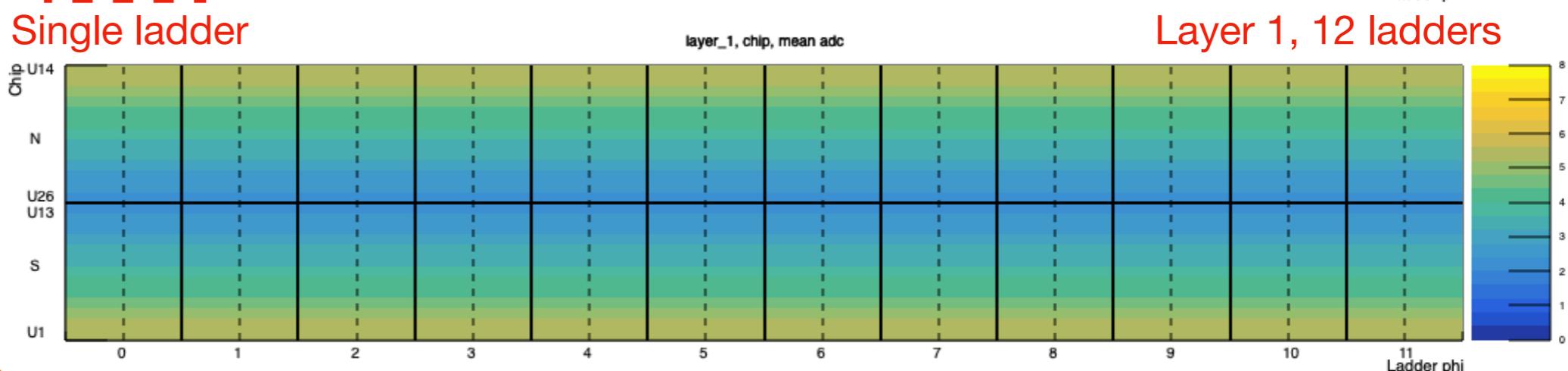
## Concept



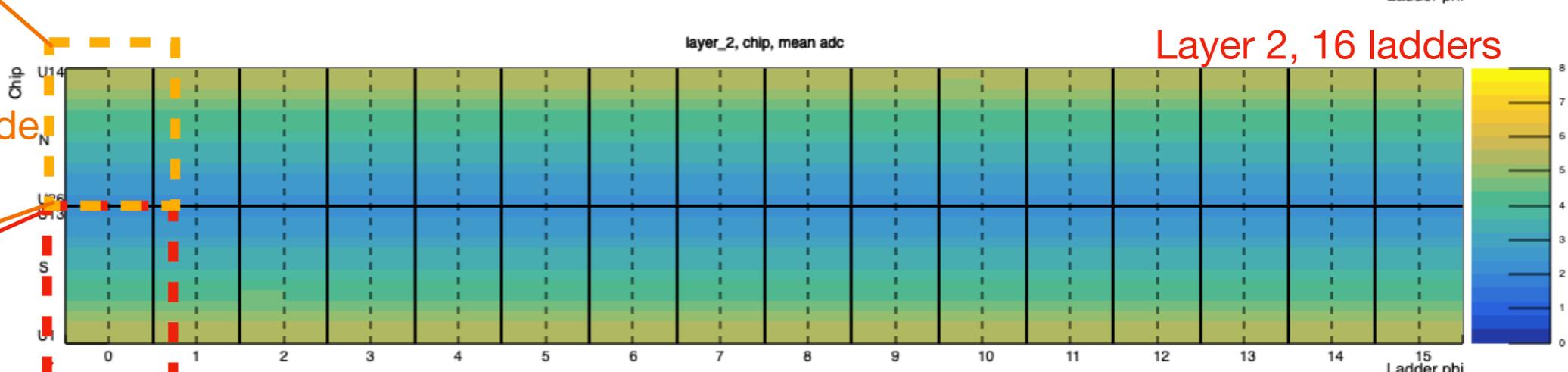
Draw\_adc\_overall (0)



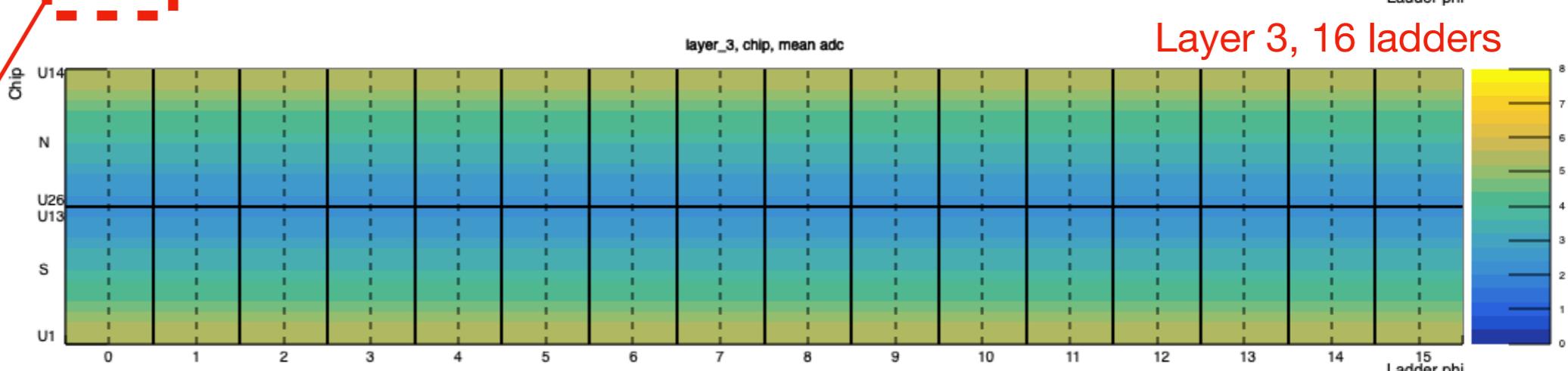
Layer 0, 12 ladders



Layer 1, 12 ladders



Layer 2, 16 ladders



Layer 3, 16 ladders

Overall - adc value  
(avg value from stats box)  
No fitting currently, to  
avoid the bad fitting

Each bin :  
chip summary info.

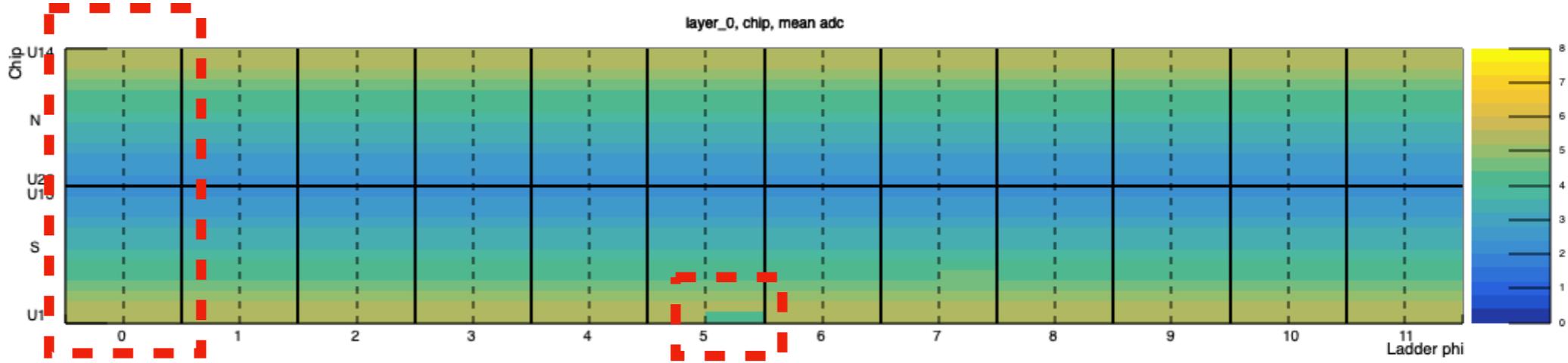
U14	U1
U15	U2
U16	U3
U17	U4
U18	U5
U19	U6
U20	U7
U21	U8
U22	U9
U23	U10
U24	U11
U25	U12
U26	U13

North side

U13	U26
U12	U25
U11	U24
U10	U23
U9	U22
U8	U21
U7	U20
U6	U19
U5	U18
U4	U17
U3	U16
U2	U15
U1	U14

South side

Draw\_adc\_overall (0)



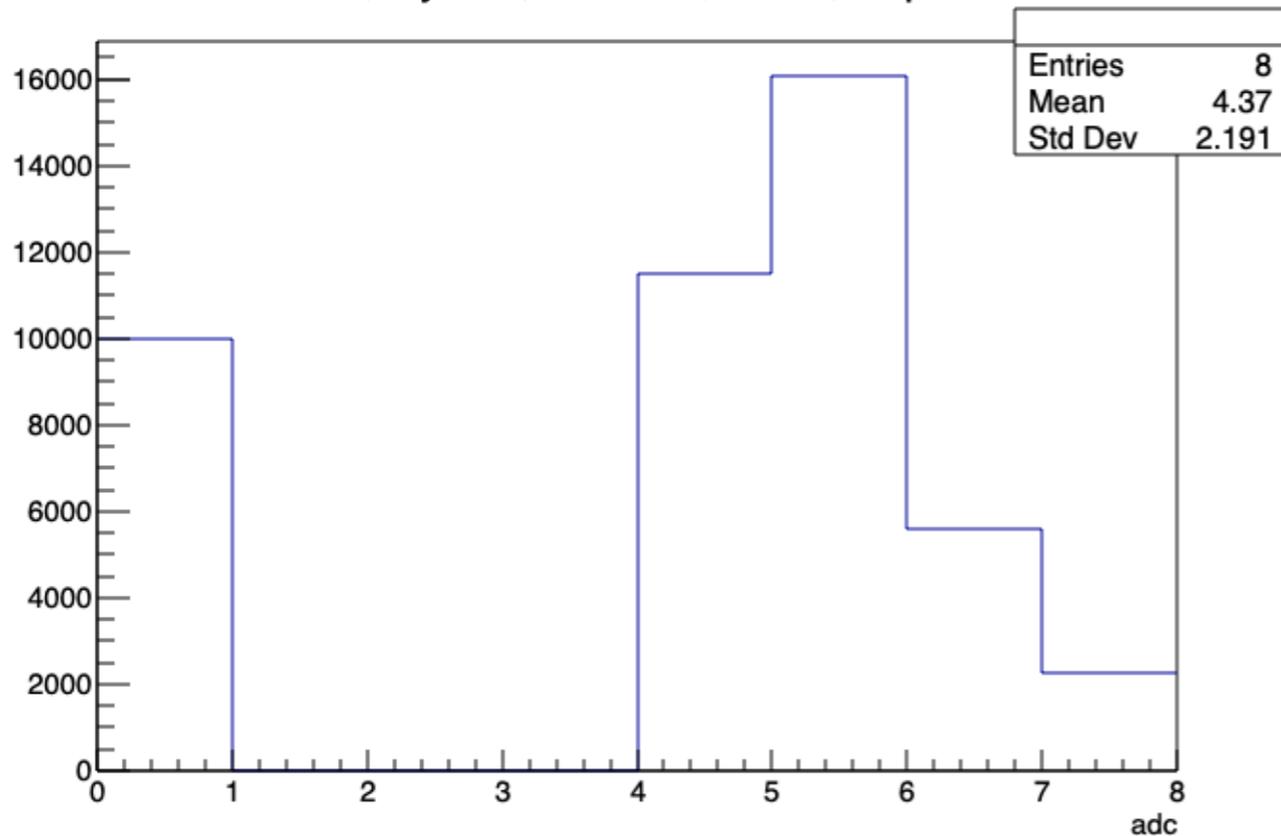
Overall - adc value  
(avg value from stats box)  
No fitting currently, to  
avoid the bad fitting

layer 0, ladder 5, south side, chip 14, channel 0 : 10k adc 0 hits.

Draw\_adc\_detail(1)

Chip level

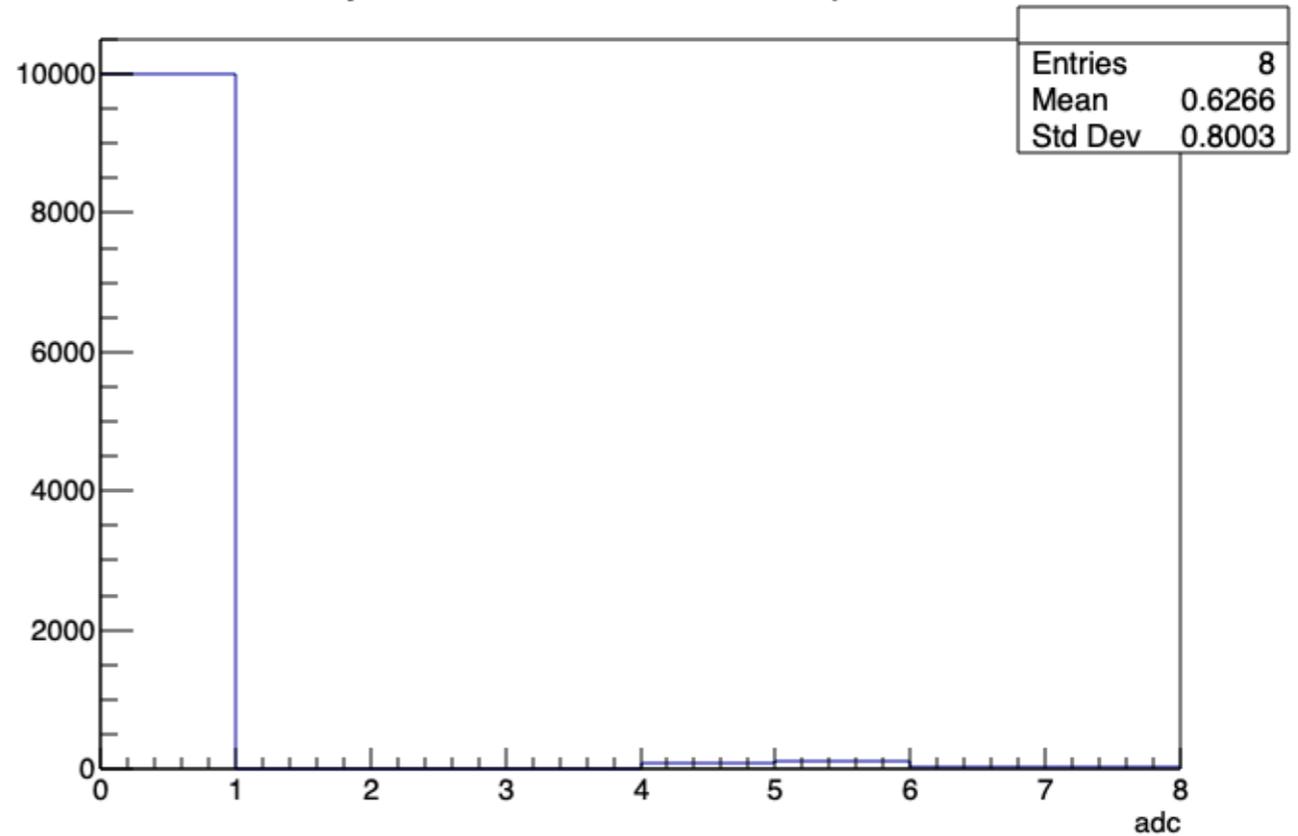
ADC, layer\_0, ladder\_5, South, chip\_14



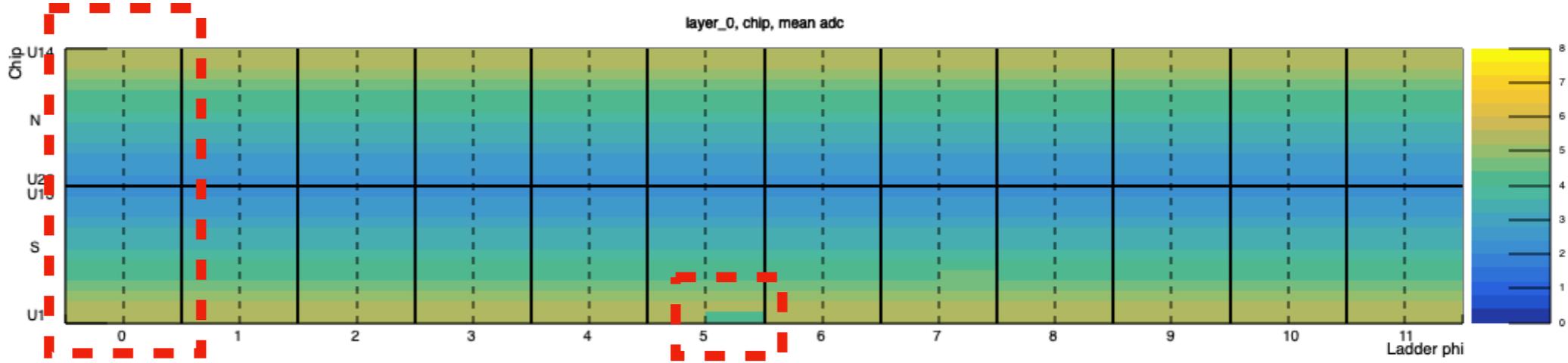
Draw\_adc\_detail(0)

Channel level

ADC, layer\_0, ladder\_5, South, chip\_14, chan\_0



Draw\_adc\_overall (0)

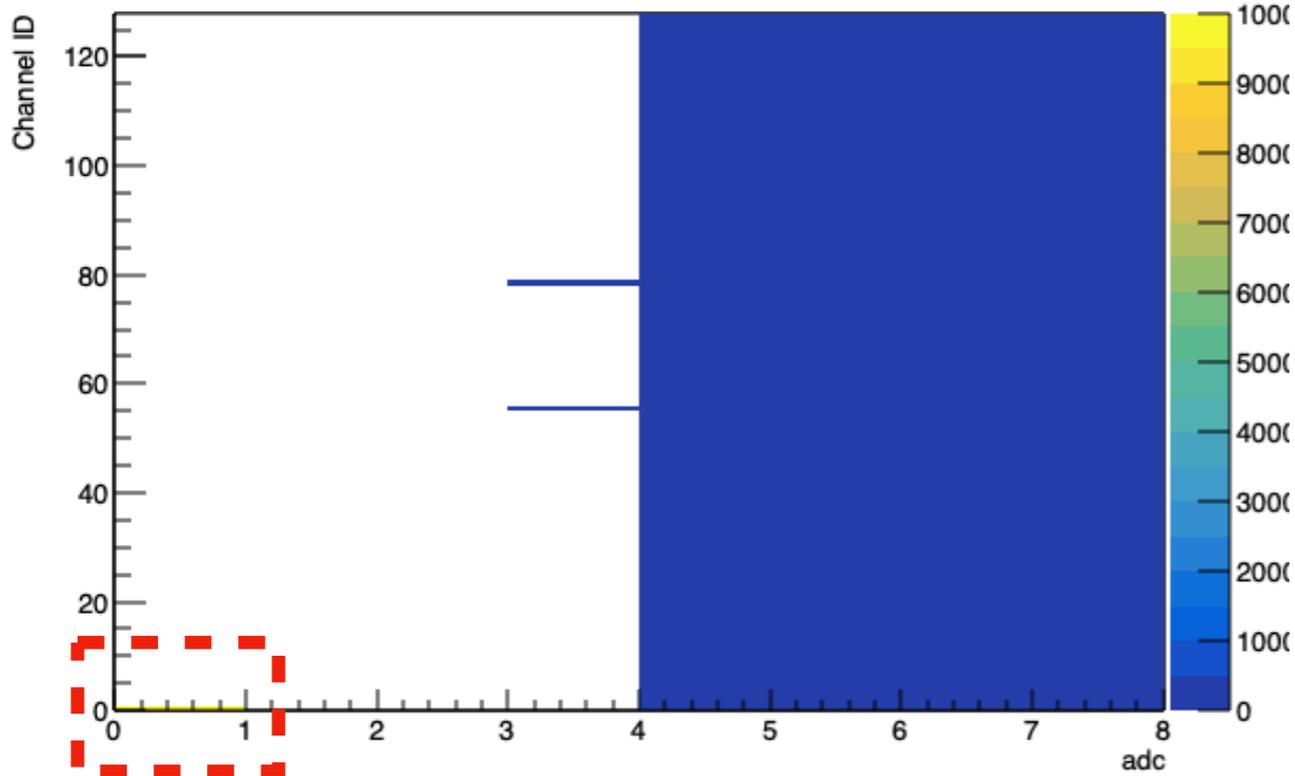


Single ladder

layer 0, ladder 5, south side, chip 14, channel 0 : 10k adc 0 hits.

Draw\_adc\_detail(2)  
Chip level, 2D

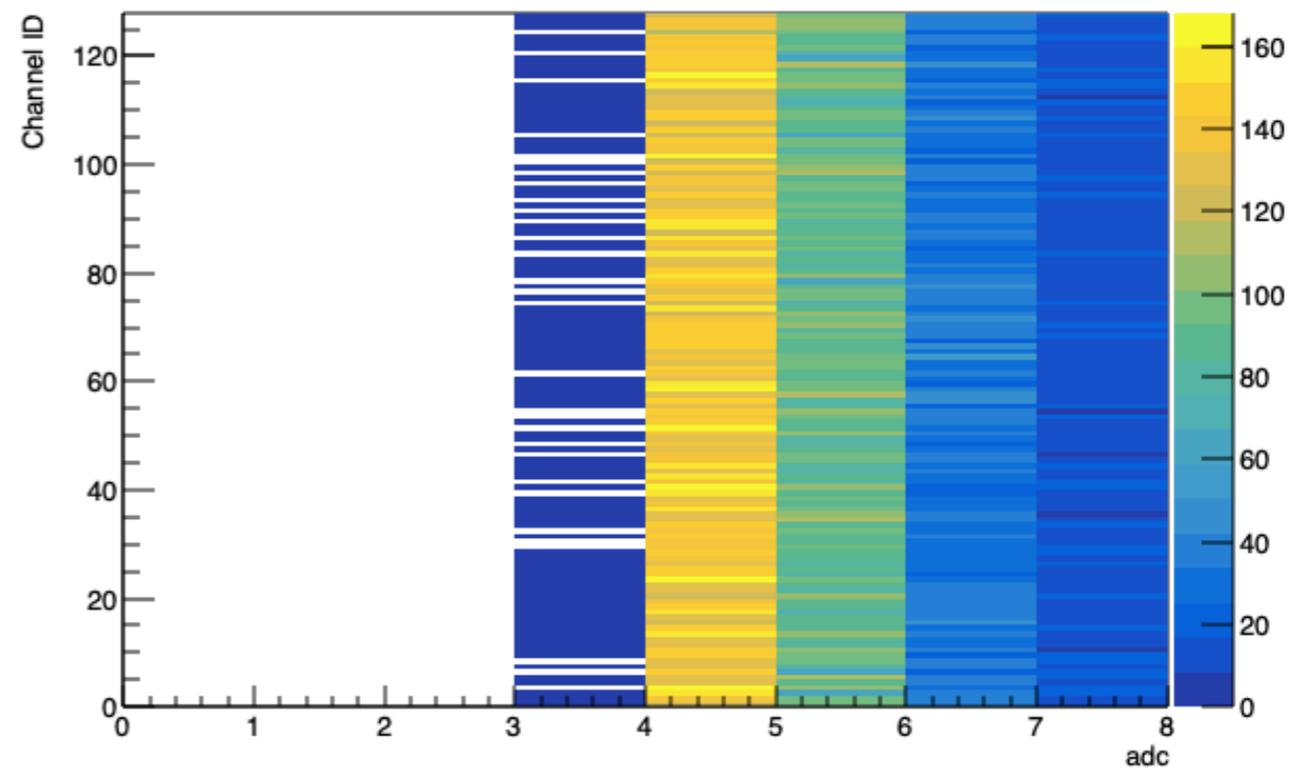
ADC, layer\_0, ladder\_5, South, chip\_14



Noise entries

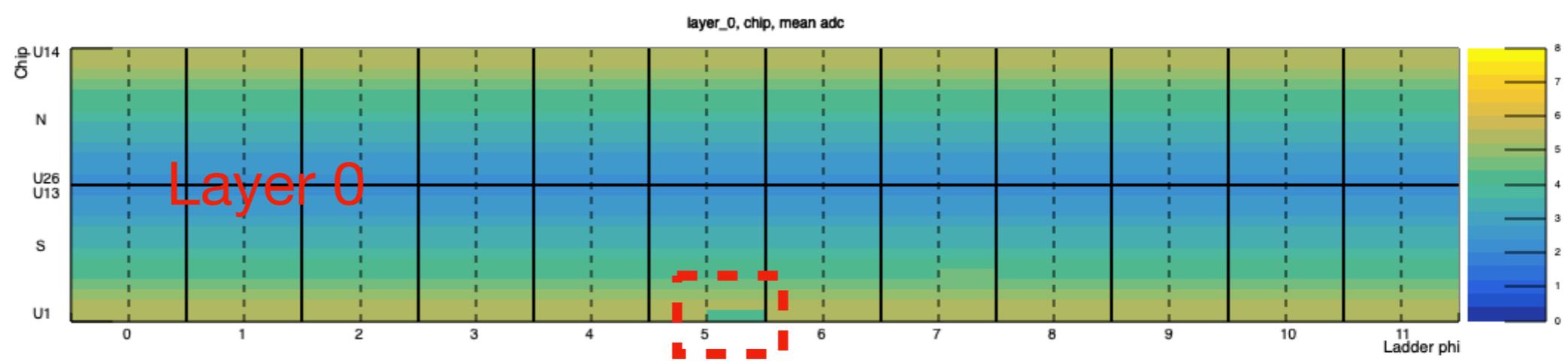
Chip level, 2D, normal case

ADC, layer\_0, ladder\_5, South, chip\_15



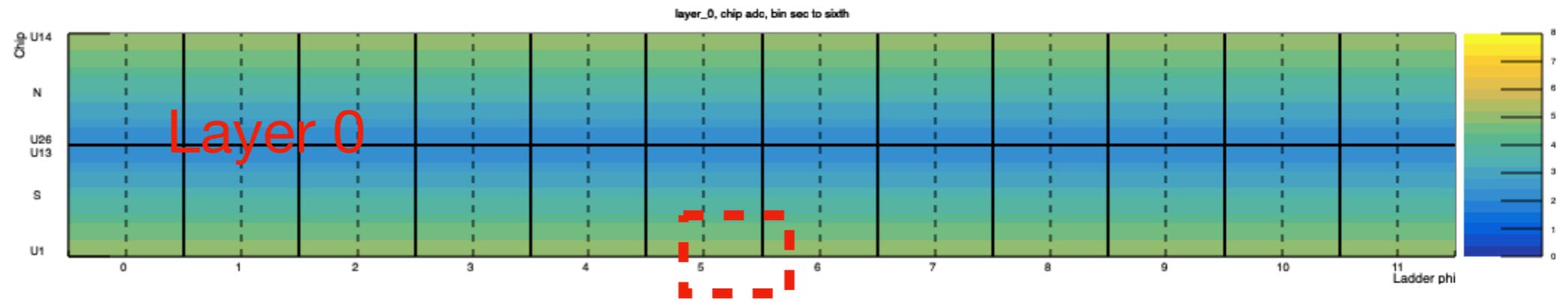
### Draw\_adc\_overall (0)

Overall - adc value  
(avg value from stats box)



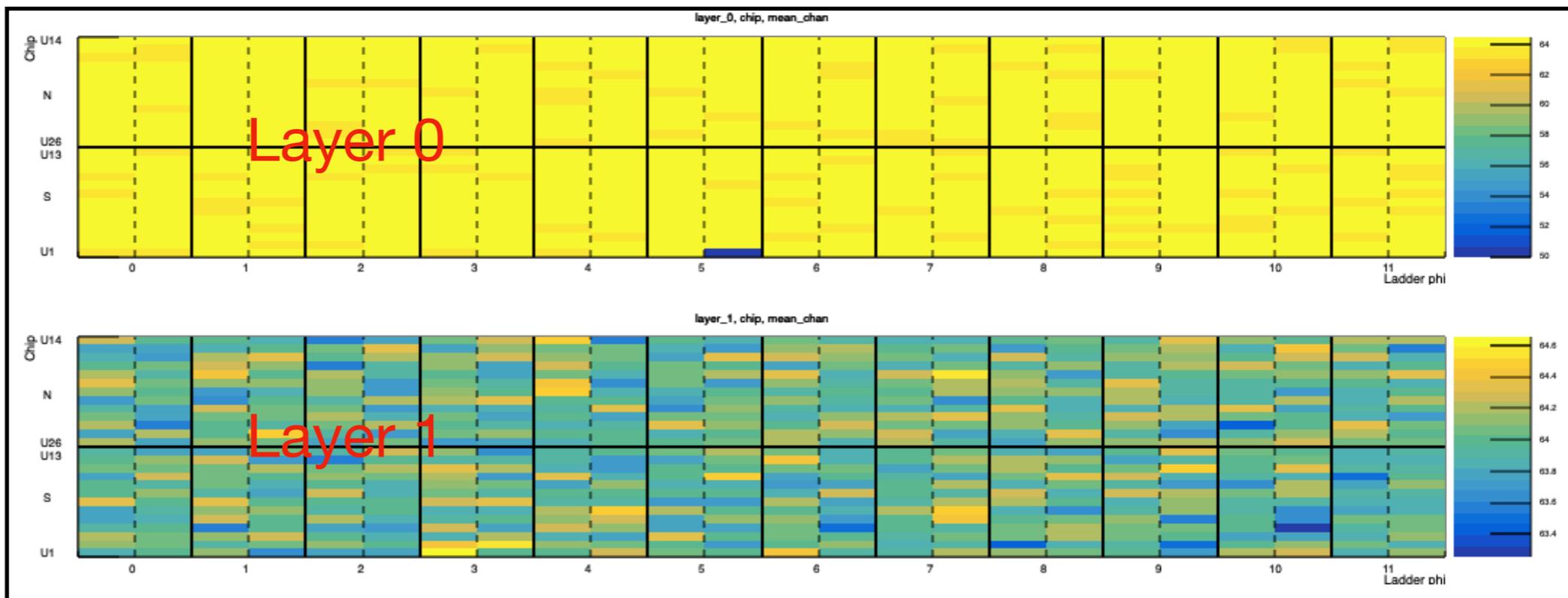
### Draw\_adc\_overall (5)

Overall - adc value  
(energy weighted method)  
(bin 2nd ~ bin 6th)



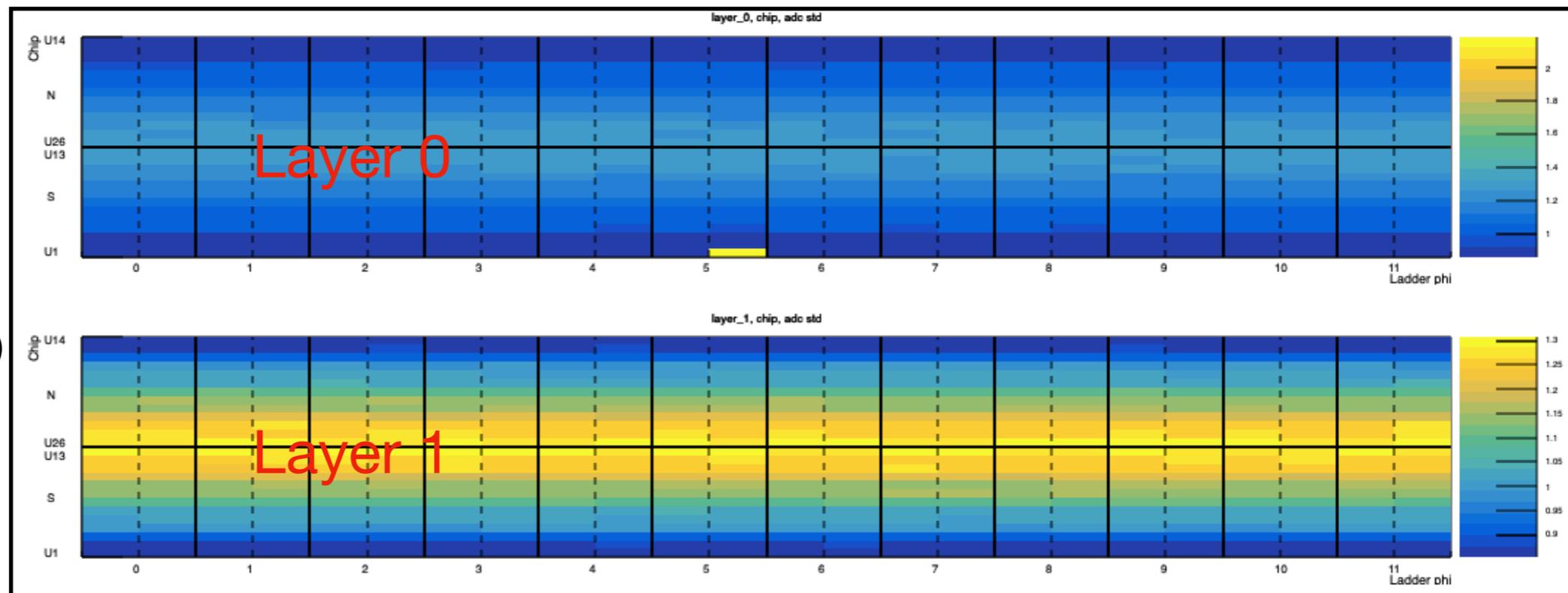
### Draw\_adc\_overall (1)

Overall - mean chan  
(avg value from stats box)



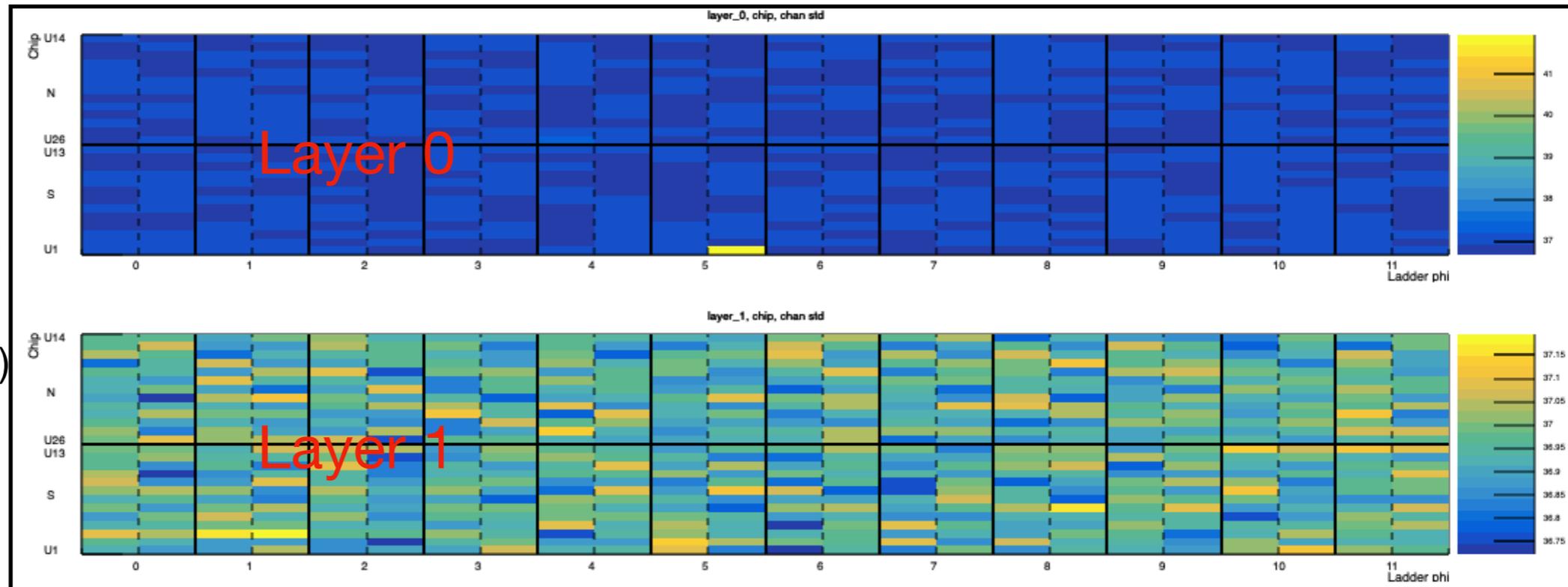
Draw\_adc\_overall (2)

Overall - adc stddev  
(avg value from stats box)



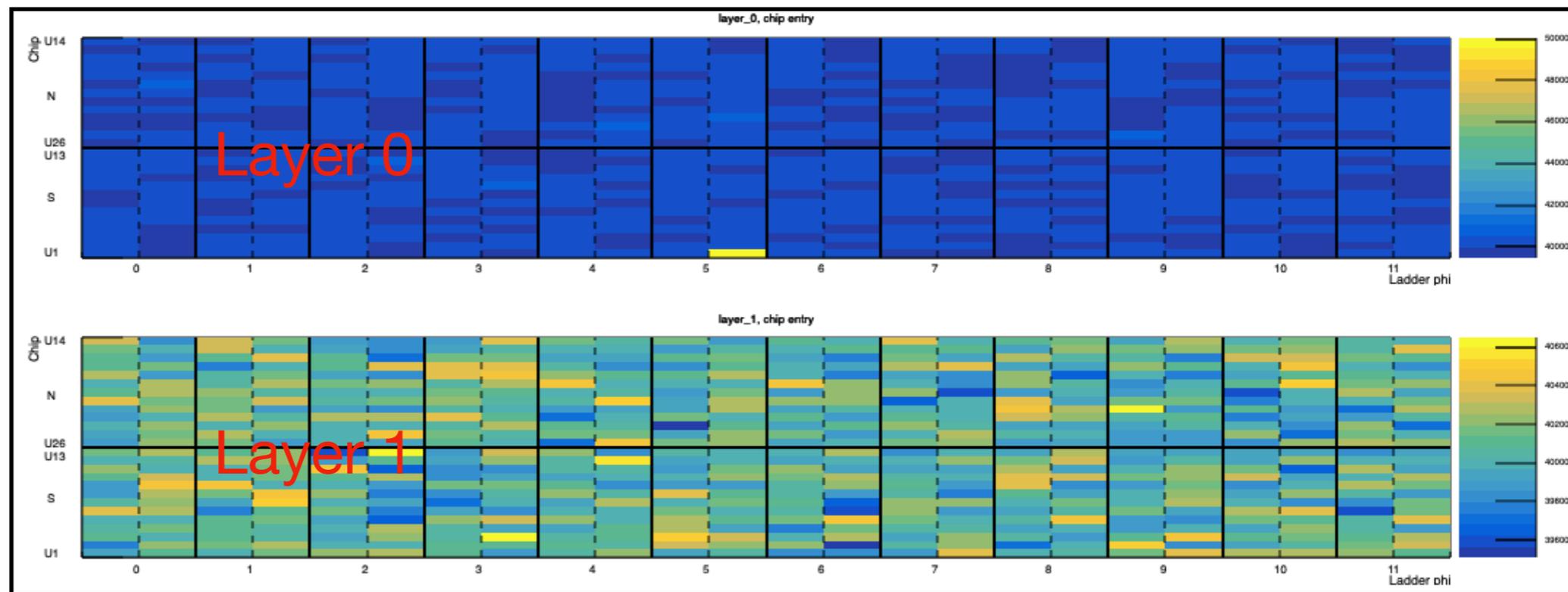
Draw\_adc\_overall (3)

Overall - chan stddev  
(avg value from stats box)



## Draw\_adc\_overall (6)

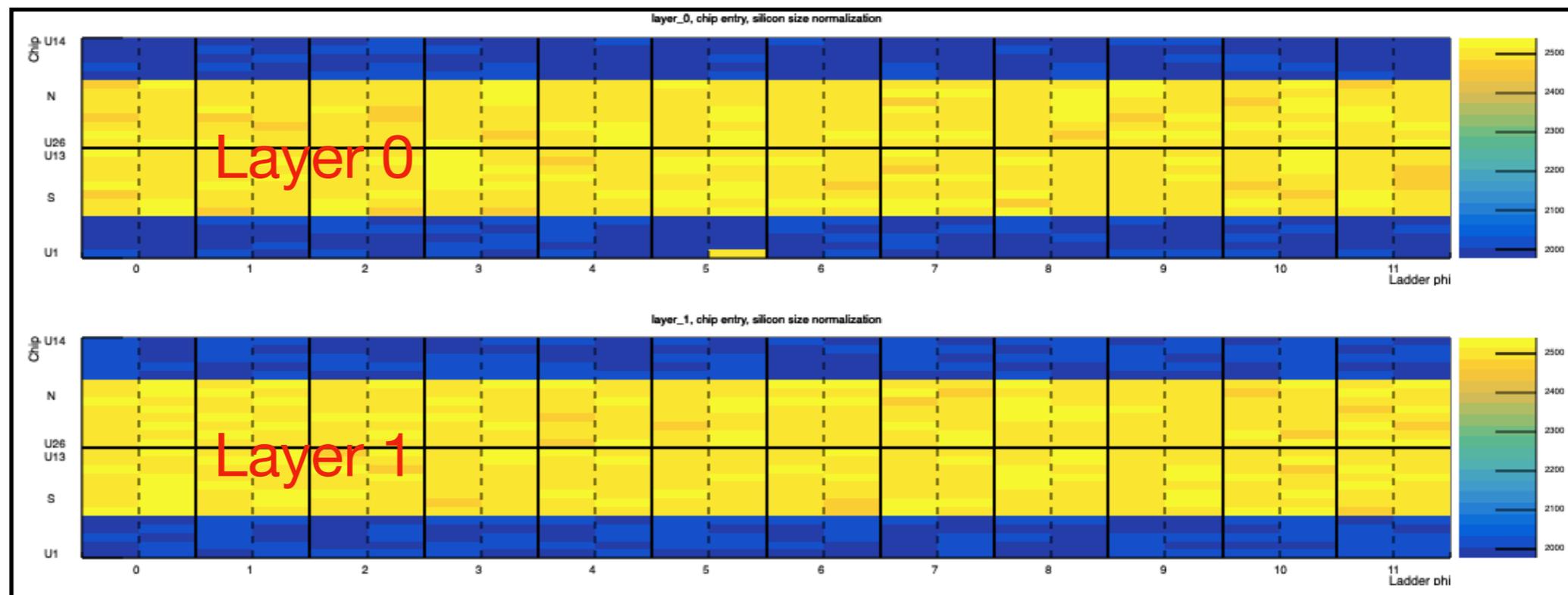
Overall - chip entry  
(avg value from stats box)



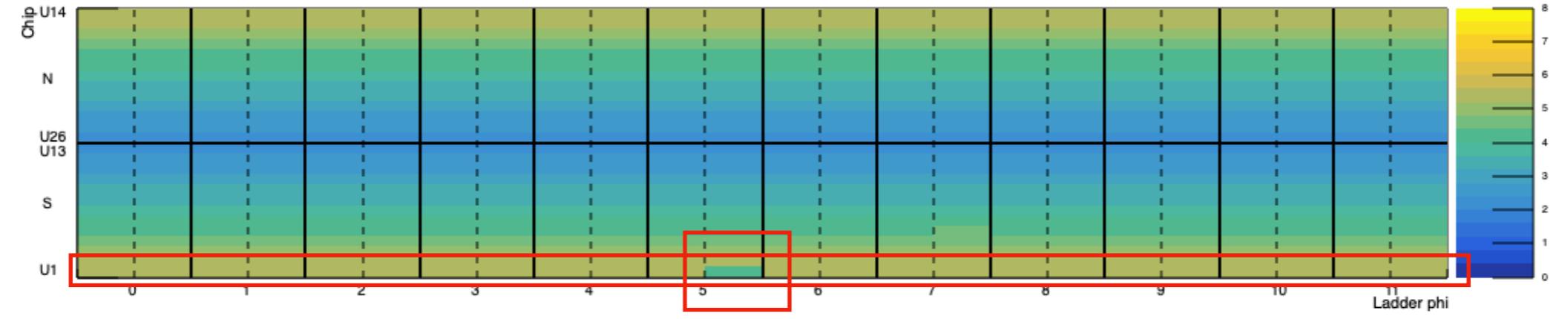
## Draw\_adc\_overall (7)

Overall - chip entry normalized  
(avg value from stats box)

Due to the difference of strip  
length of type A and B

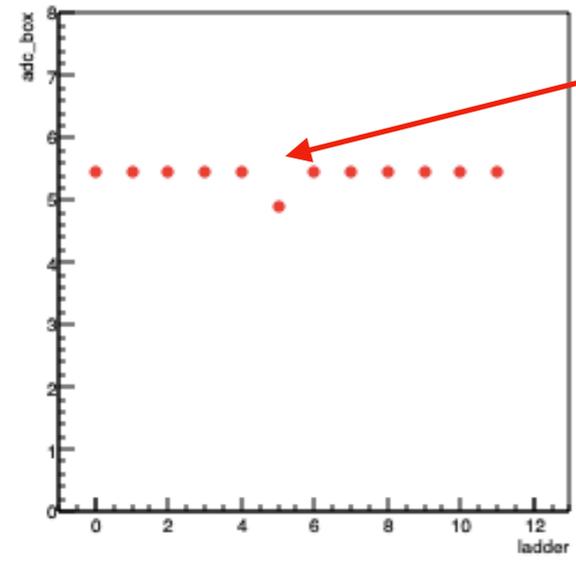


layer\_0, chip, mean adc

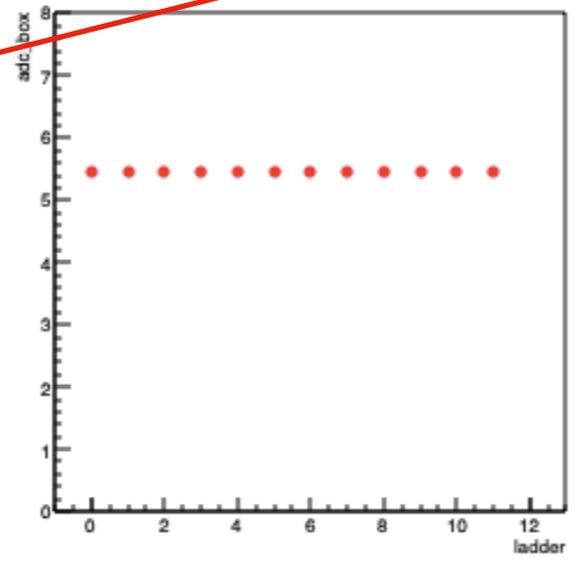


adc

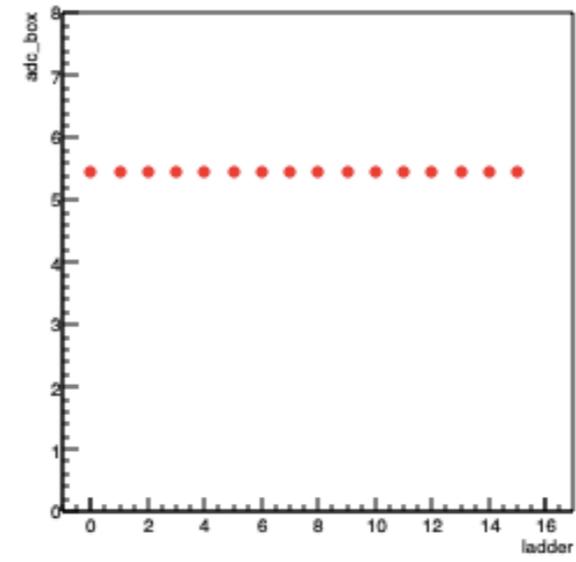
layer 0, ladder vs adc\_box, option : 0



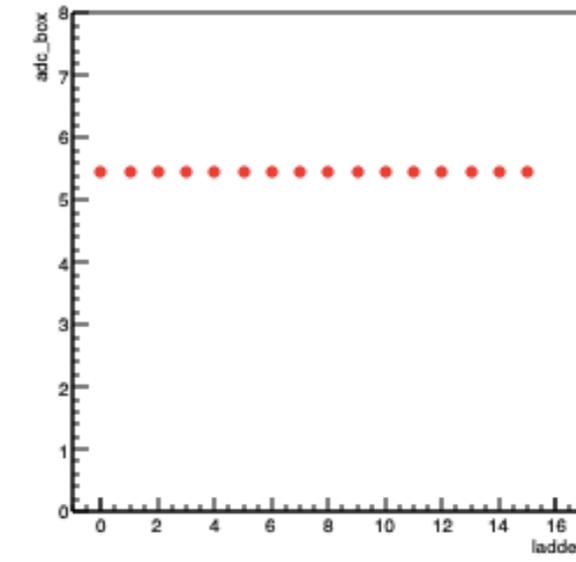
layer 1, ladder vs adc\_box, option : 0



layer 2, ladder vs adc\_box, option : 0

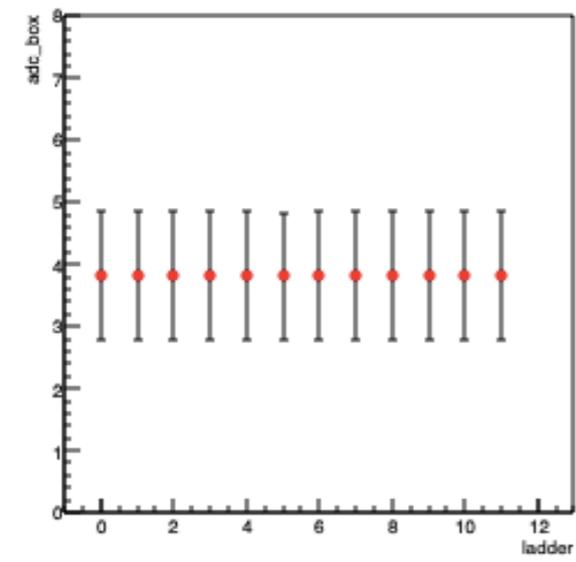


layer 3, ladder vs adc\_box, option : 0

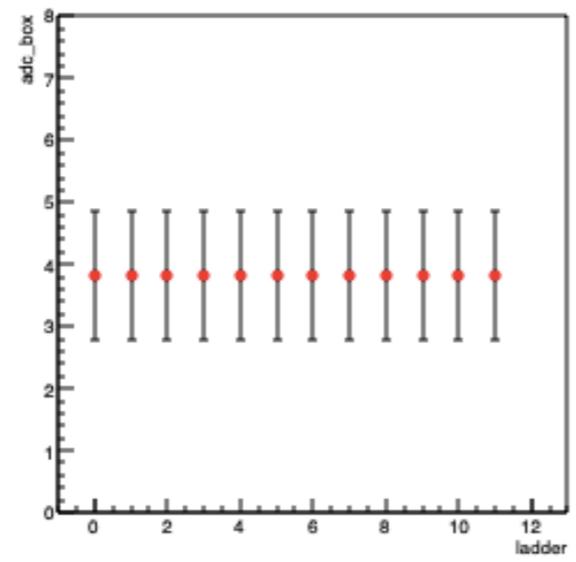


All chip ring combined

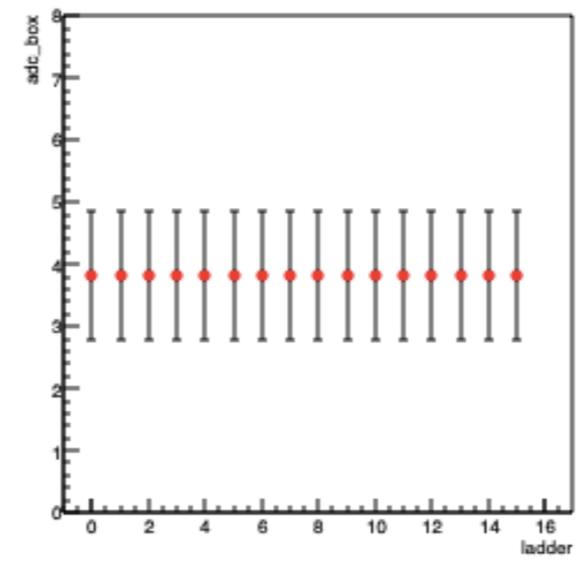
layer 0, ladder vs adc\_box



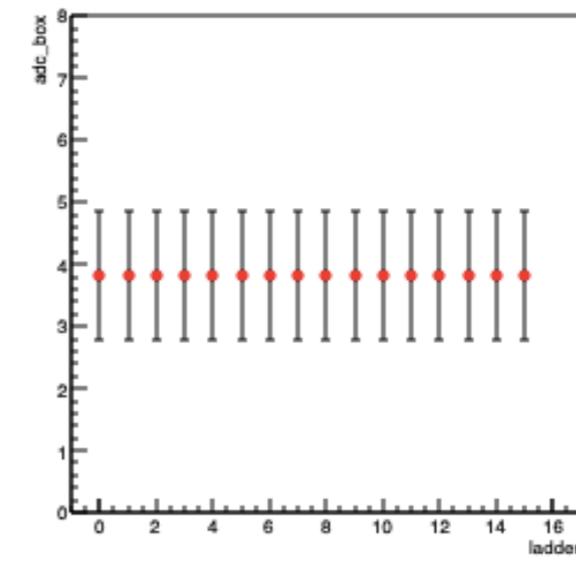
layer 1, ladder vs adc\_box



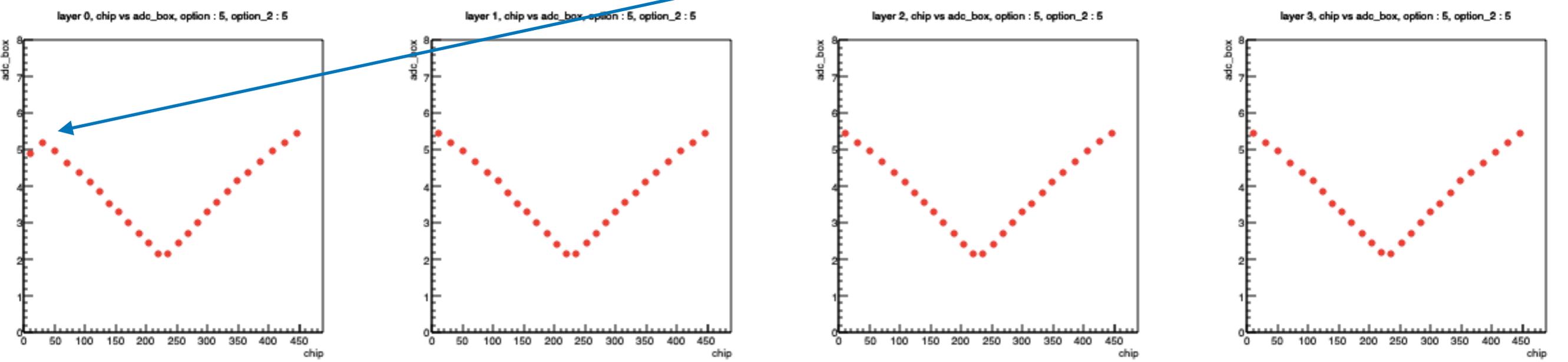
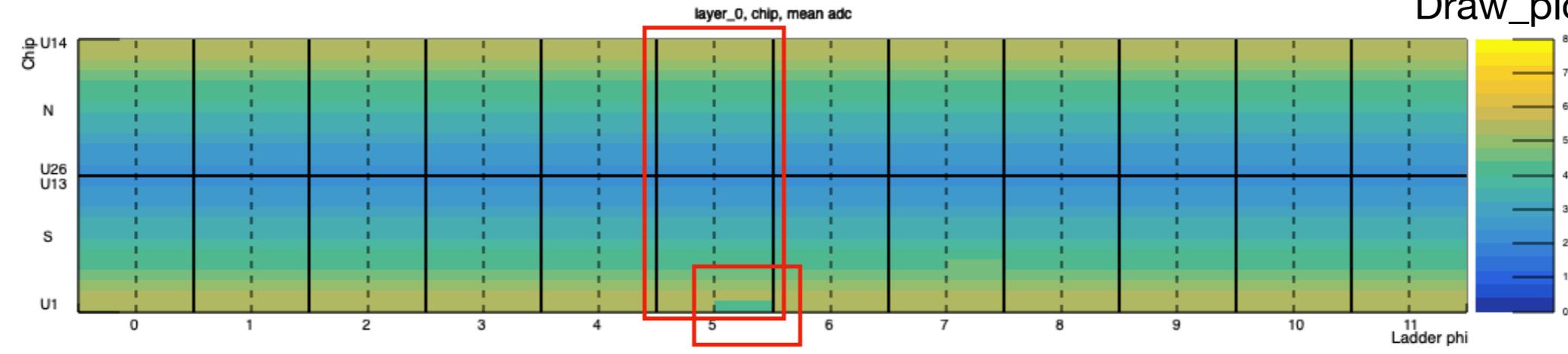
layer 2, ladder vs adc\_box



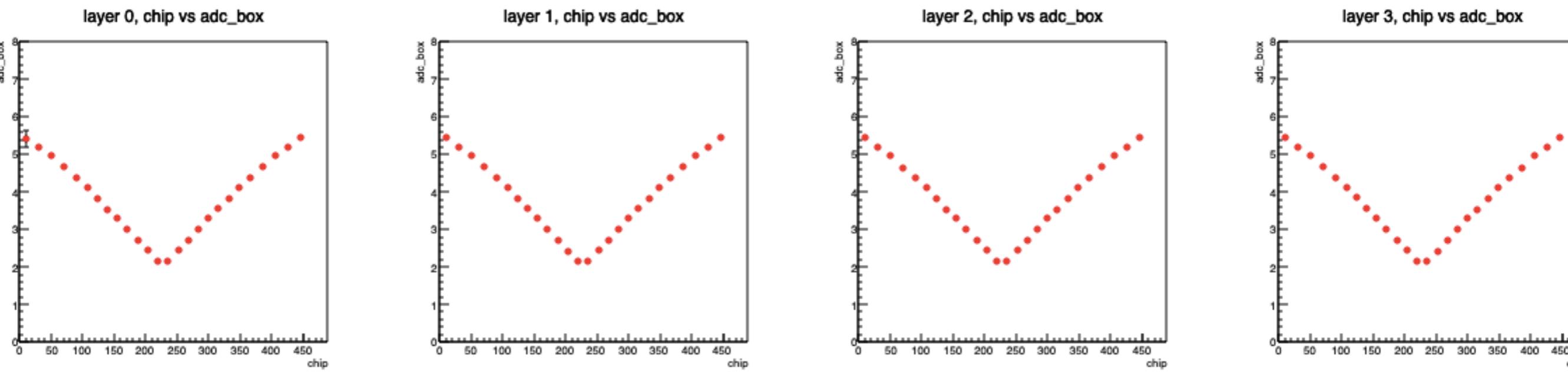
layer 3, ladder vs adc\_box



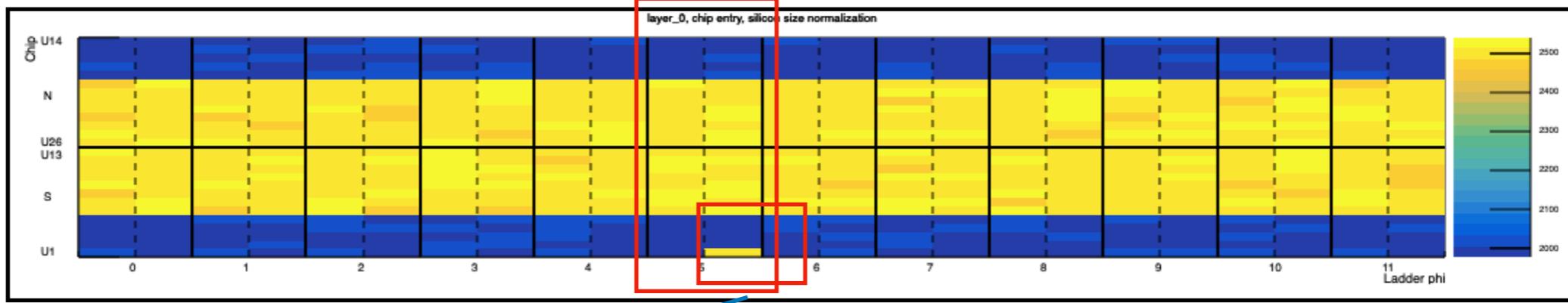
adc



All chip ring combined



N hit

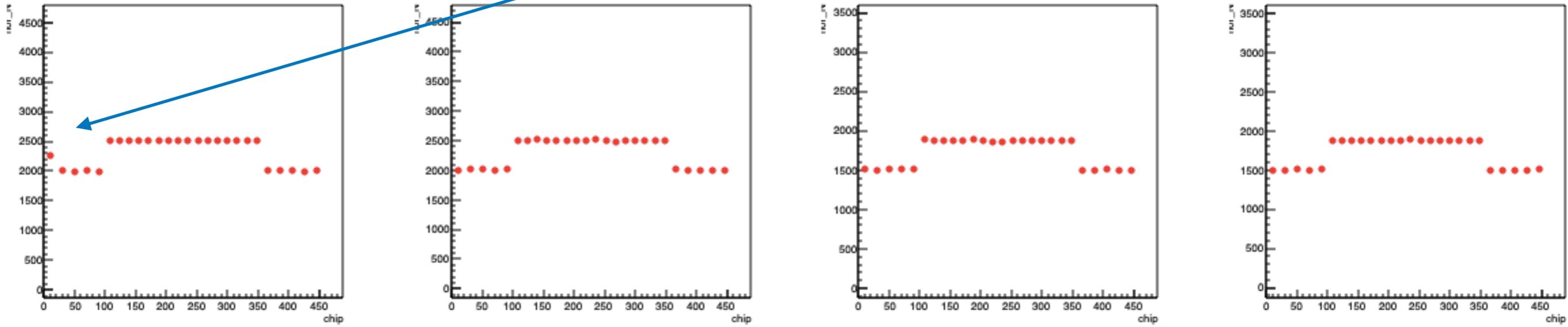


layer 0, chip vs nor\_N, option : 5, option\_2 : 5

layer 1, chip vs nor\_N, option : 5, option\_2 : 5

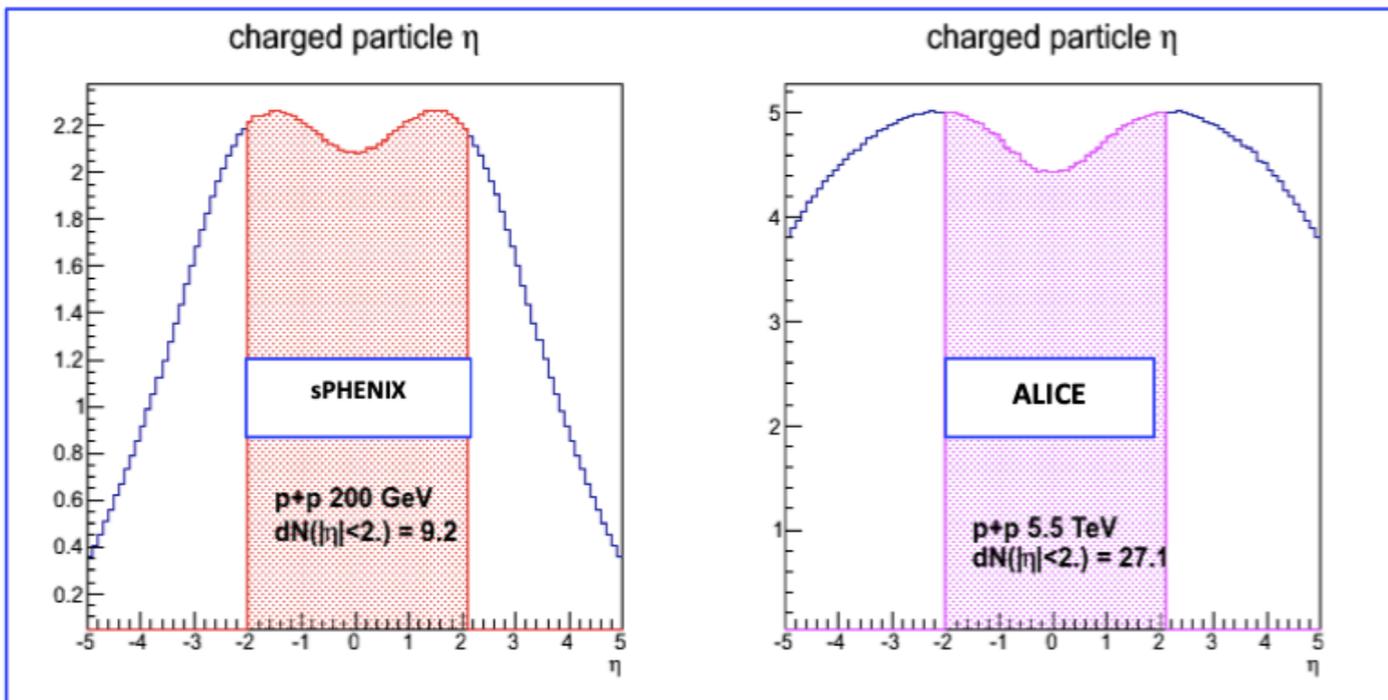
layer 2, chip vs nor\_N, option : 5, option\_2 : 5

layer 3, chip vs nor\_N, option : 5, option\_2 : 5



charged particle  $\eta$

charged particle  $\eta$



Something we should see with data

Plots from MVTX

# // To do

- Hit cluster part
  - Will be implemented once the data structure is understood.
  - An additional function of input adc setting map from INTT GUI end.
- Edep long-term monitoring (radiation damage)
  - Will be implemented once the data structure is understood.
- adc classification ?
  - The edep is not uniform.
  - The adc setting could be different.
- Hit efficiency ?
  - It seems to be not possible to do it in standalone.
    - Maybe require the information from MVTX and TPC.

**Back up**

# // Toy dataset for testing

```
cout<<"start filling, adc"<<endl;
rng -> SetSeed(100);
for (int i = 0; i < 100000000; i++)
{
    if (i%100000 == 0) cout<<"I am running " << i/100000 <<endl;
    int rng_layer = int(rng -> Uniform(0,4));
    int rng_ladder = int(rng -> Uniform(0,LADDER_PHI[rng_layer]));
    int rng_NS = int(rng -> Uniform(0,2));
    int rng_chip = int(rng -> Uniform(1,27));
    int rng_chan = int(rng -> Uniform(0,128));
    int rng_adc = rng -> Landau(5 - 0.3*((rng_chip-1)%13),0.3);

    ADC_chip2D_hist[rng_layer][rng_ladder][rng_NS][rng_chip-1] -> Fill(rng_adc,rng_chan);
}

for (int i = 0; i < 10000; i++)
{
    ADC_chip2D_hist[0][5][0][14-1] -> Fill(0.,0.);
}
cout<<"end filling, adc"<<endl;
```