



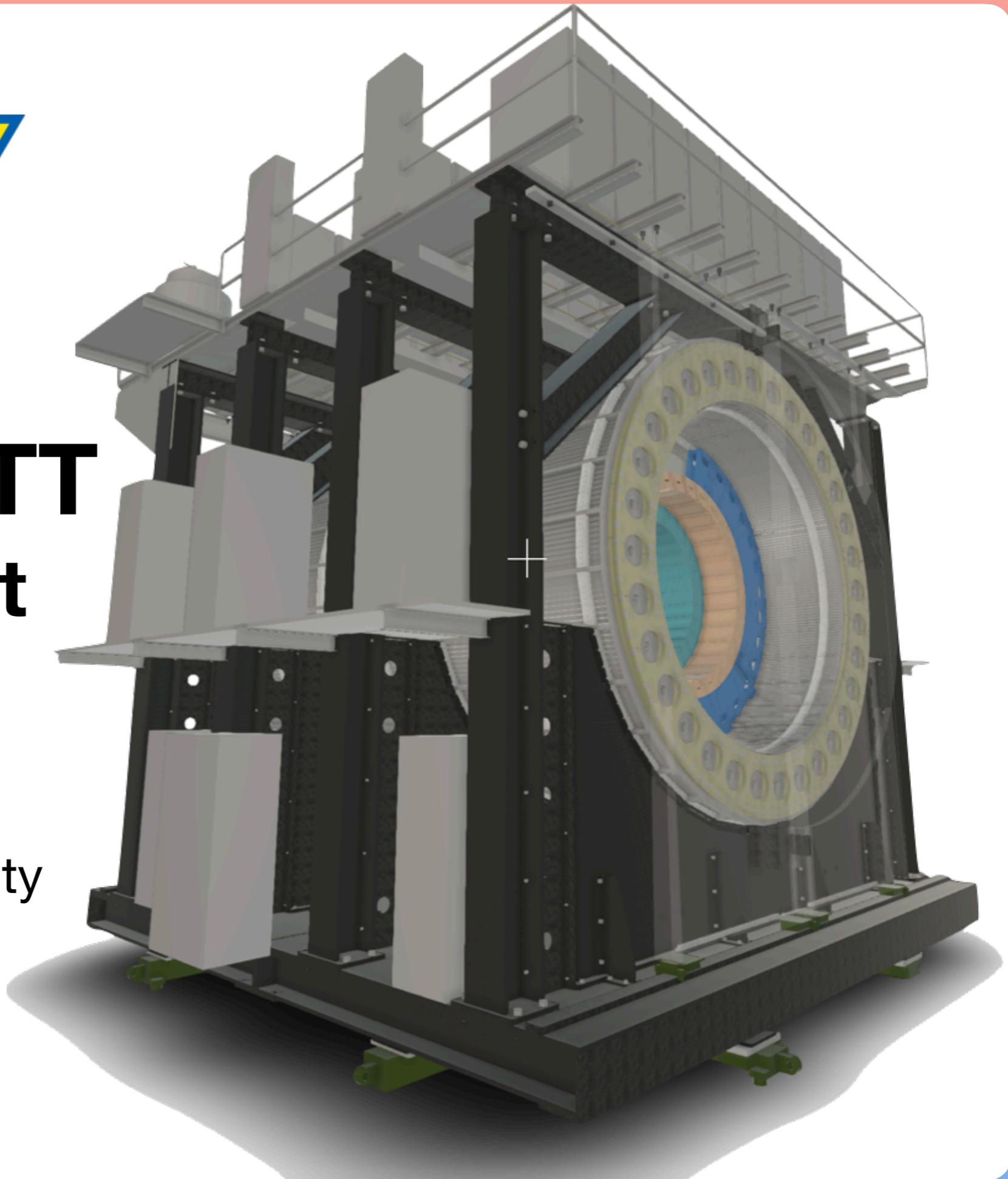
SPHENIX INTT

- Weekly Report

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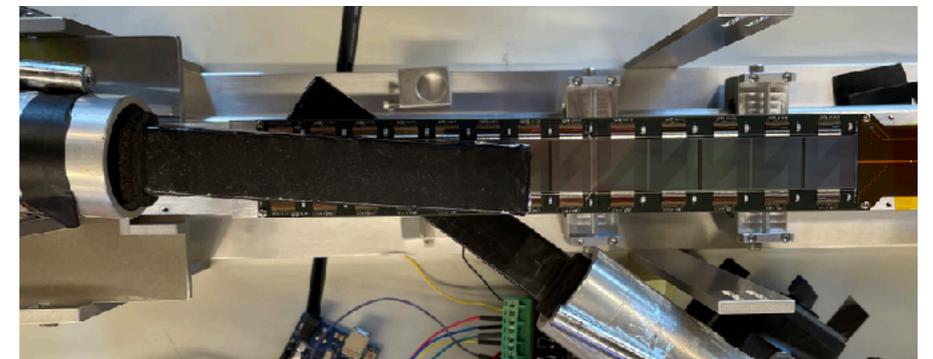
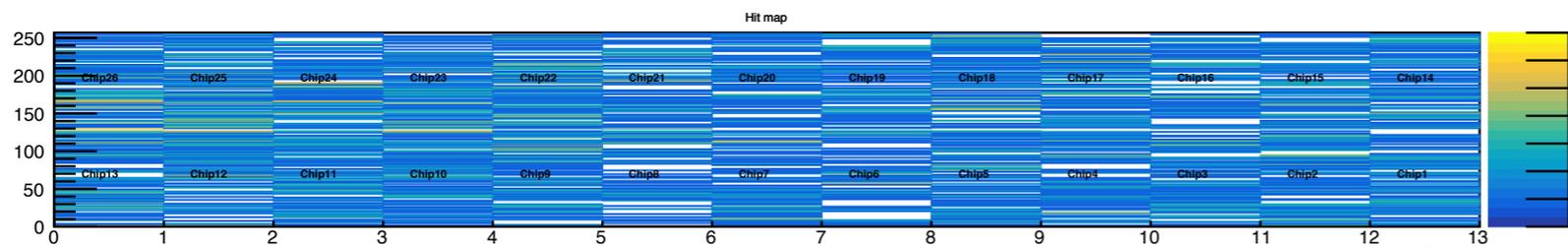
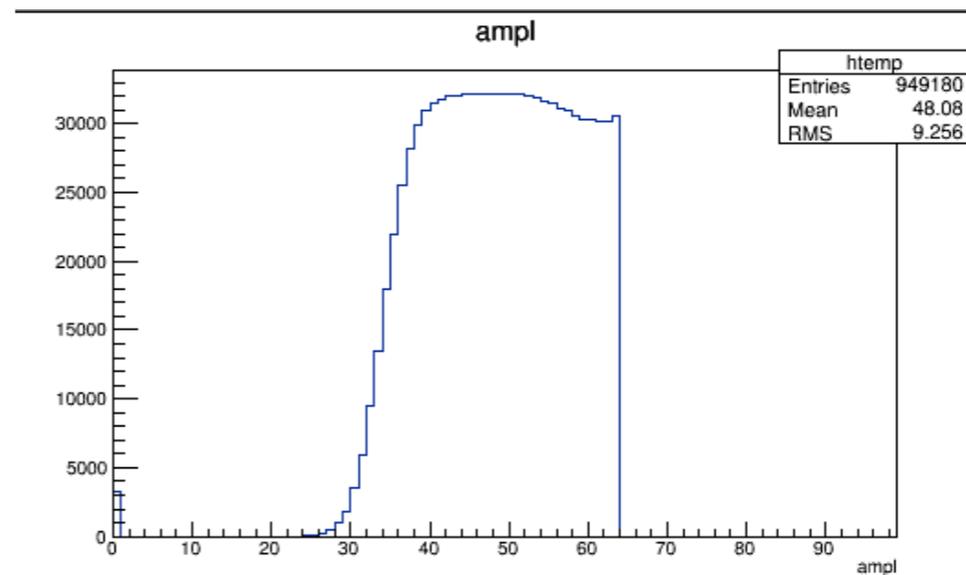
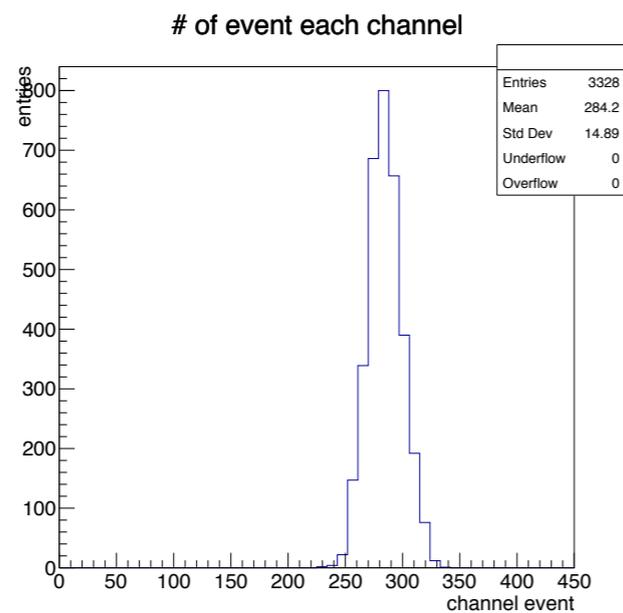
2021/8/24



Test ROC 3 from NWU



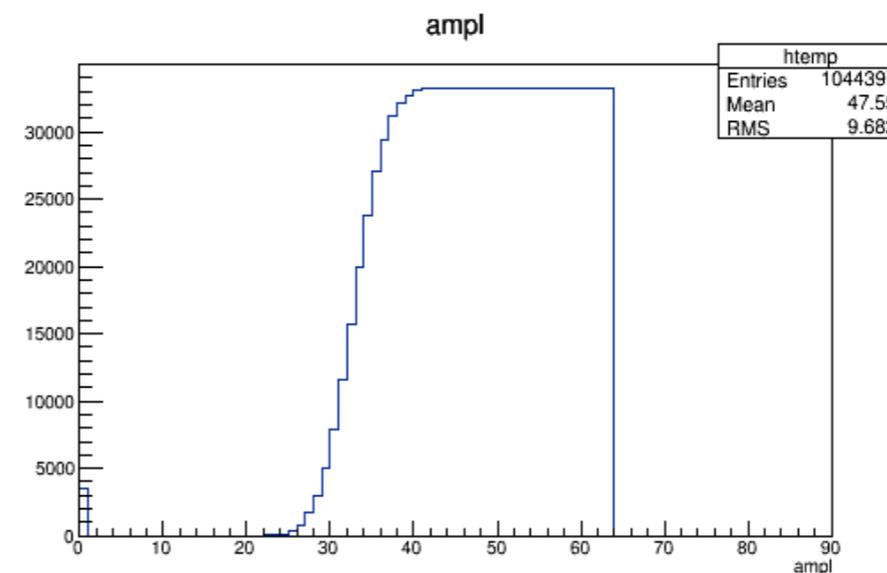
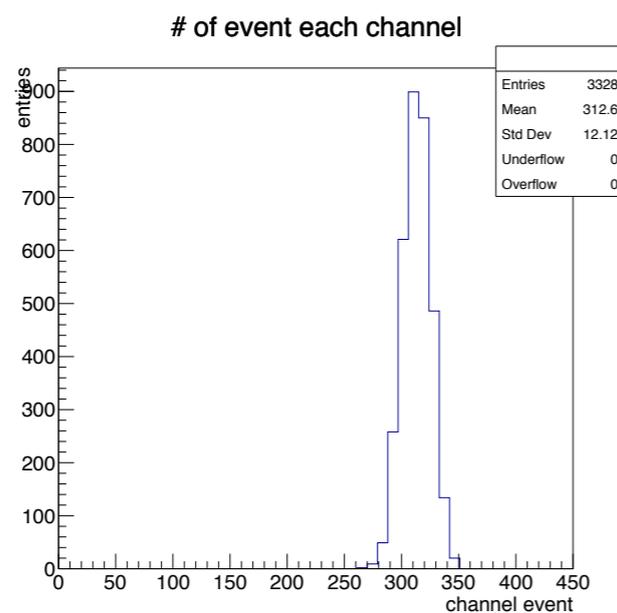
- ROC3 was arrived from NWU. C-1 and C-3 have been tested.
- C-1 (P420 421) with large CC:
 - OK for calibration test, but the entry is less (mean ~ 280)
 - Bad in cosmic test (very weird results)



Test ROC 3 from NWU



- C-3 (P220 221) with large CC
 - Good for calibration test, normal entry (mean : 312.6)
 - Got nothing in cosmic test



- Plan :
 - C-3 of ROC3 for calibration test
 - C-1 of ROC1 for cosmic / source test

Second Testbench preparation



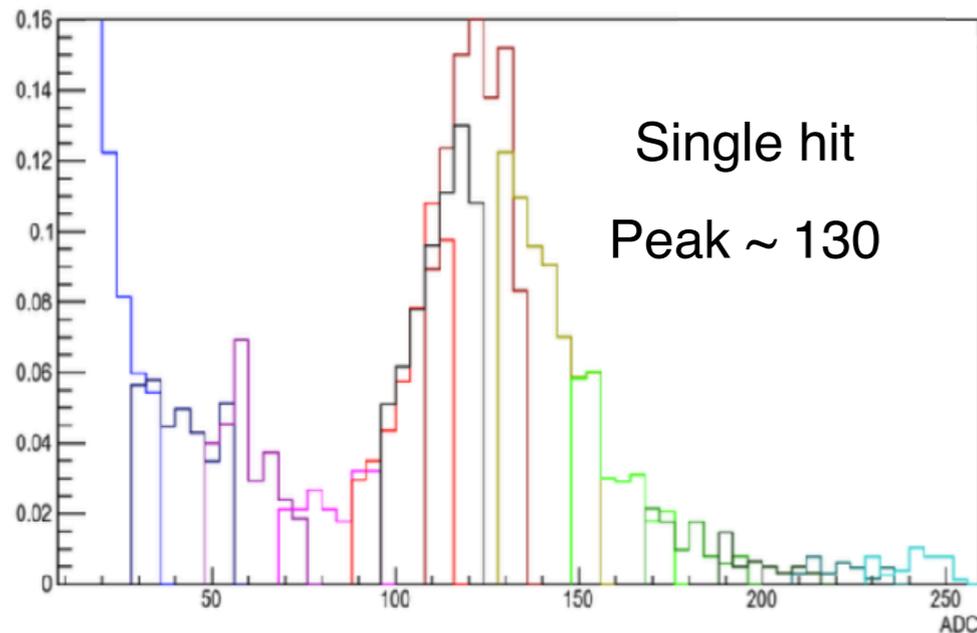
Item	required amount	status	where	note
ROC	1	1	in NTU	Tested to be bad
FEM board	1	2	in NTU	Tested to be good
FEM-IB	1	share		Only one FEM-IB in TW
clock distribution board	1	1	in NTU	Tested to be good
VME crate	1	2	in NTU	
PCIE board	1	share		PCle-6536B Board
cooling fan	4	4	in NTU	
win 7 PC	1	share		
Wifi module	1	share		
monitor, keyboard & mouse	1	1	in NCU	
NIM crate	1	1	in NTU	
cable				
ROC power cable	1	0		
chip power cable	1	2	in NTU	
2 pins optical fibers	3	3	in NTU	
10 m data cable	1	2	in NTU	
BCLK cable (clock)	1	2	in NTU	
PCIE cable	1	purchased		SHC68-C68-D4 cable.
PCIE adapter	1	purchased		NI653x cable adapter
USB cable (FEM-IB to PC)	1	1	in NTU	
clock distribution board power cable	1	0		
100V bias power cable	1	1	in NTU	
Power supply				
cooling fan power (12 V)	2	2	in NTU	
5.8V	2	1	in NTU	
4.2V (chip power)	1	1	in NTU	
5V	1	1	in NTU	
5V, 15A	1	purchased		30 A power supply (GW instek, SPS-1230)
100V	1	1	in NTU	

Almost done

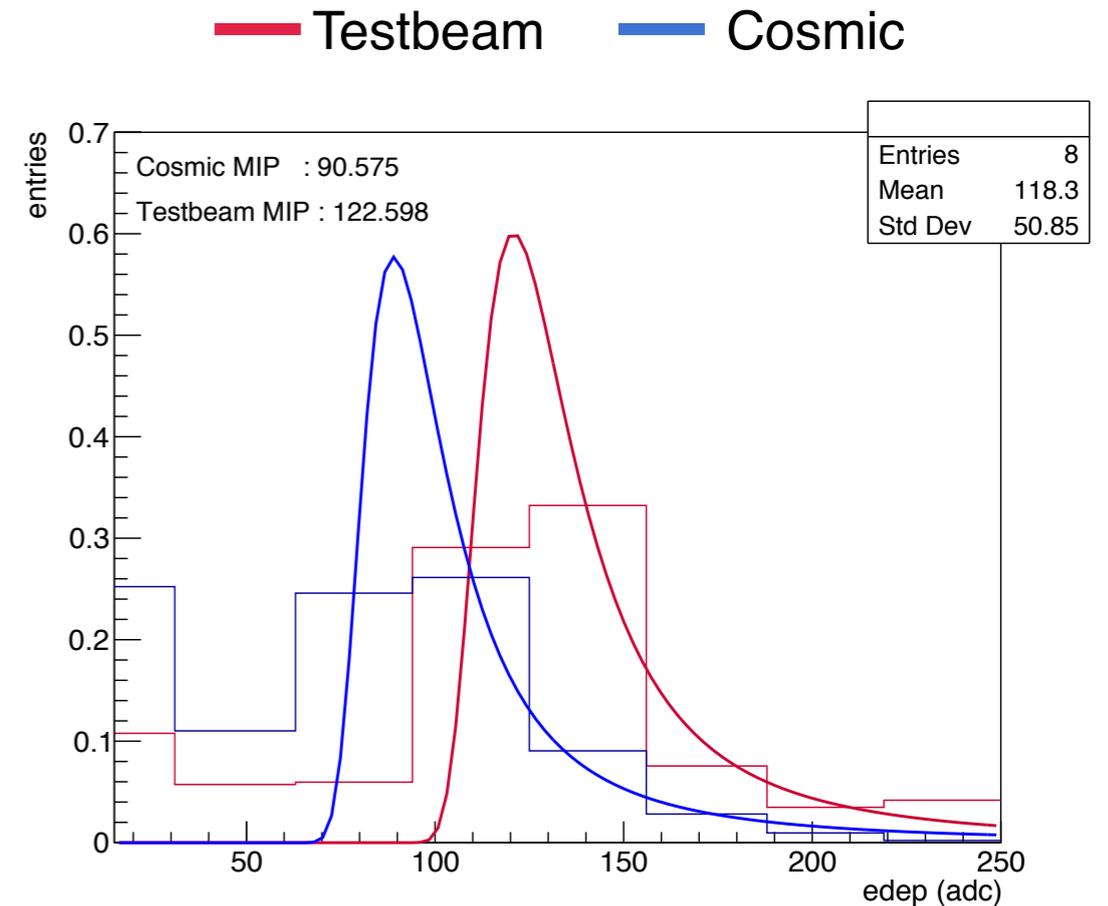
Cosmic test, comparison



DAC Scan result from last TestBeam



DAC 0	15
DAC 1	31
DAC 2	63
DAC 3	94
DAC 4	125
DAC 5	156
DAC 6	188
DAC 7	219



Conversion function :

$$\text{mV} = \text{DAC} * 4 + 210$$

$$\text{mV} = \frac{E_{\text{dep}} * 10^6 [\text{eV}] * 1.6 * 10^{-4} [\text{fC}] * G}{3.6 \text{eV}} + O$$

G : 100 [mV/fC], O : 280 [mV]

- Cosmic :
 - 90.575 ADC = 572.3 mV = 0.0657 MeV
- TestBeam2019 :
 - 122.598 ADC = 700.4 mV = 0.0945 MeV
- Difference : 0.0288 MeV

Cosmic test, comparison

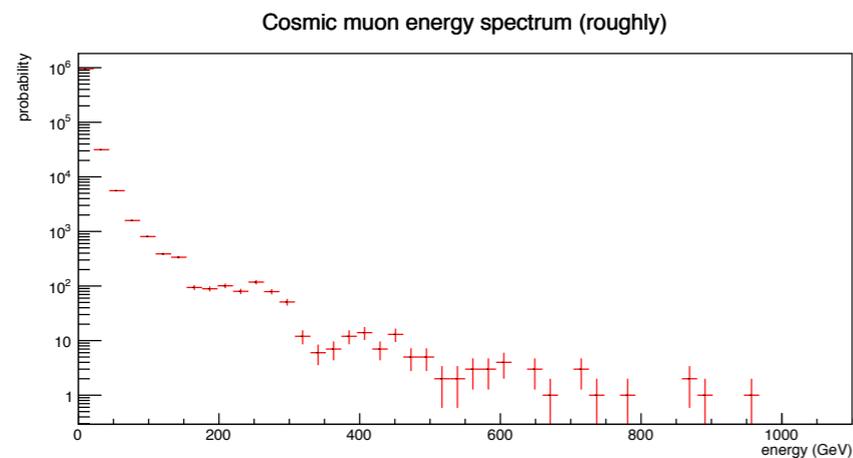


G4 simulation

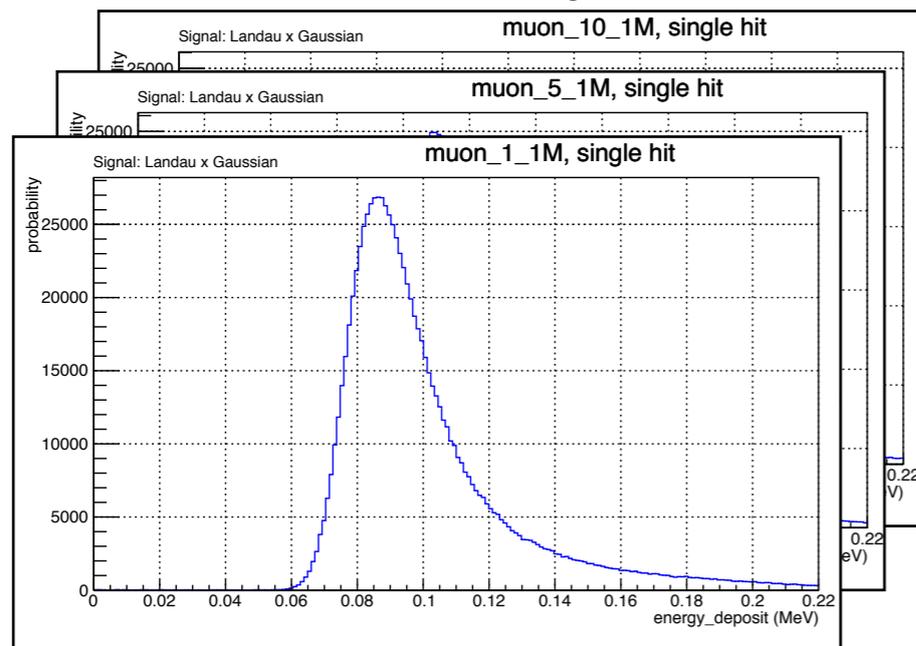
Beam information :

Test Beam : 120 GeV proton

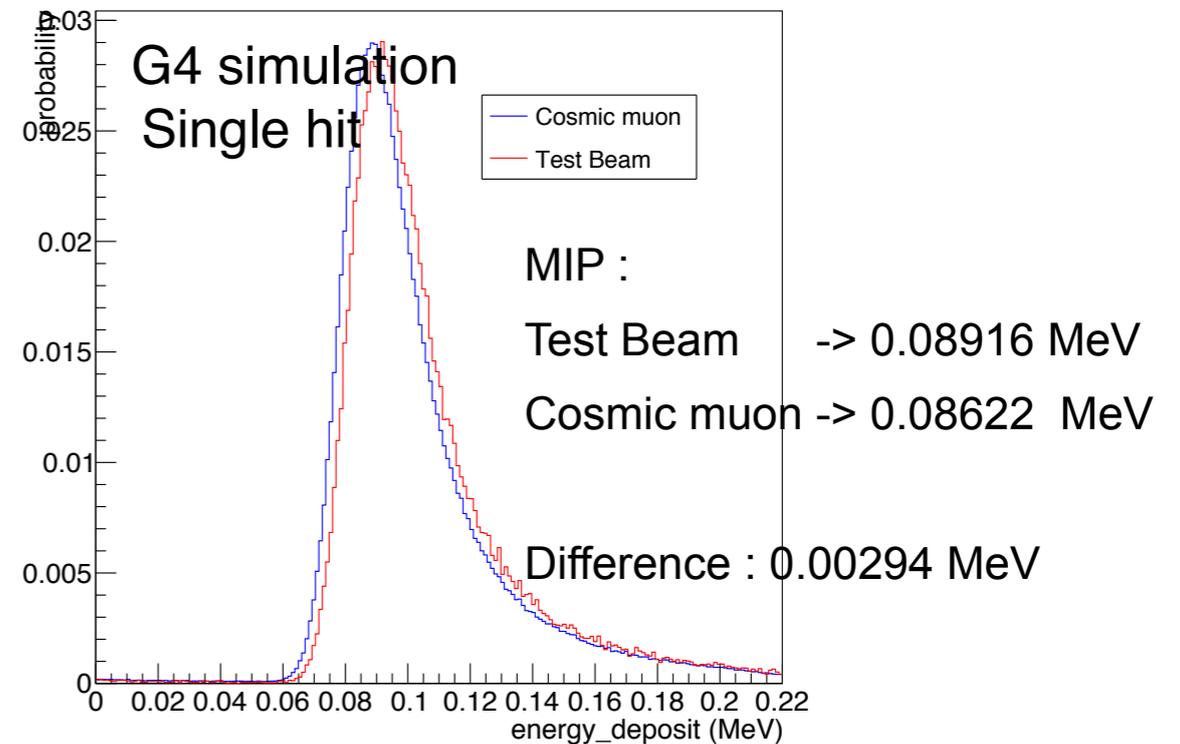
cosmic muon : roughly energy spectrum



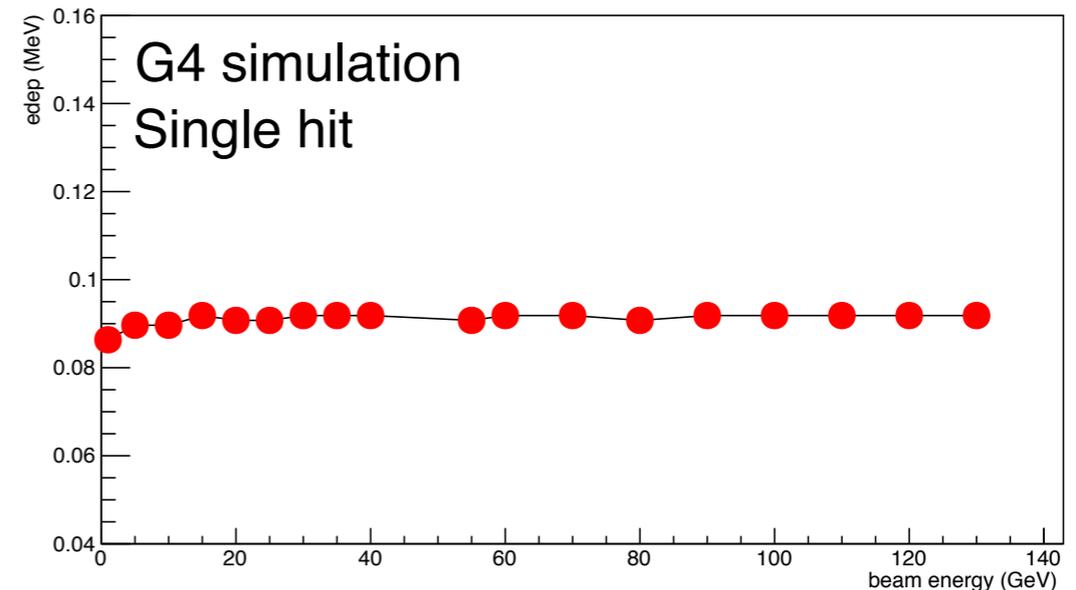
•
• 1 to 130 GeV
•



energy deposit, cosmic muon TC energy spectrum



Muon edep scan, 1 GeV to 130 GeV

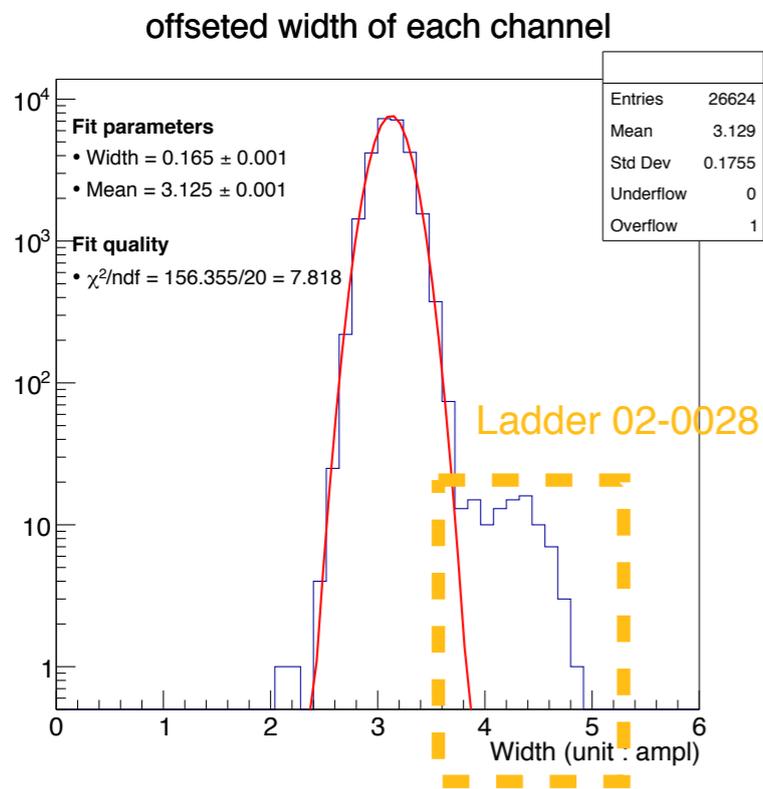


Ladder summary (4 ladders)

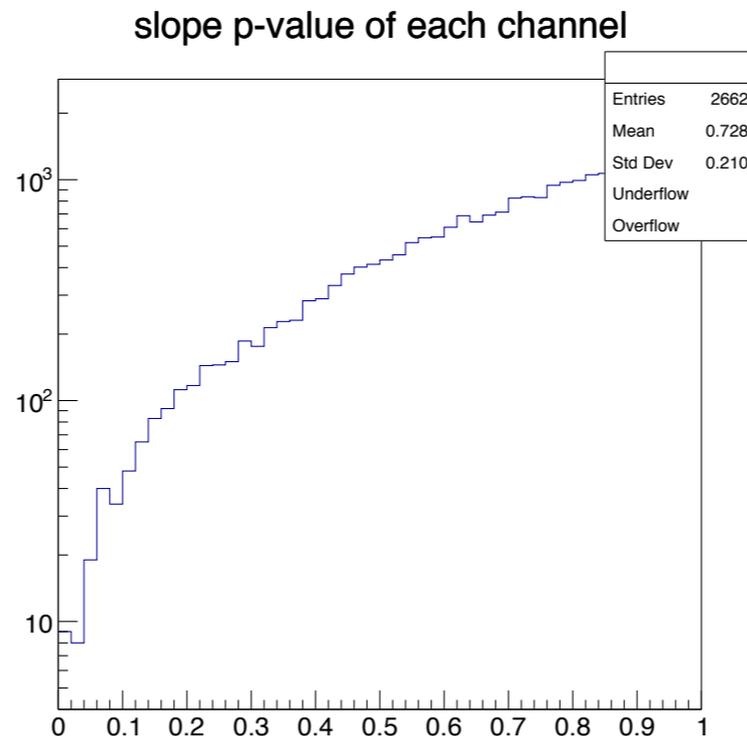


- 7 criteria are used so far, cut value is based on majority of distribution.

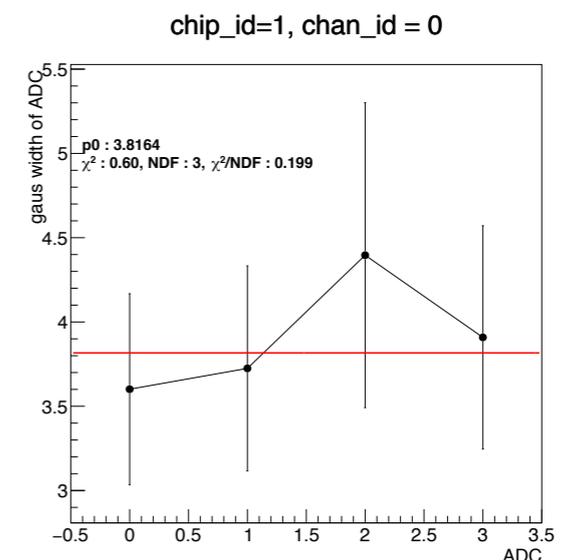
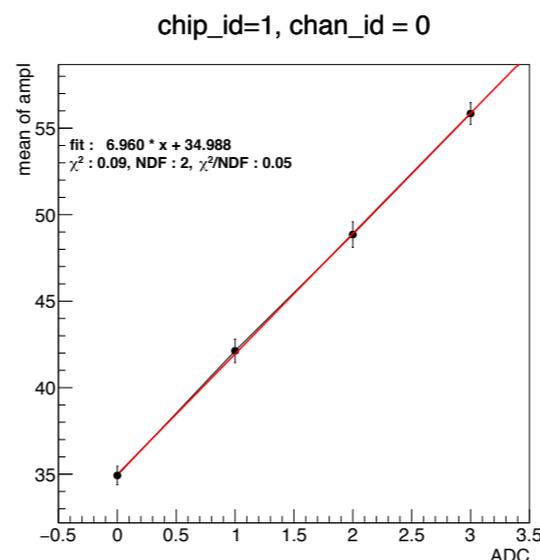
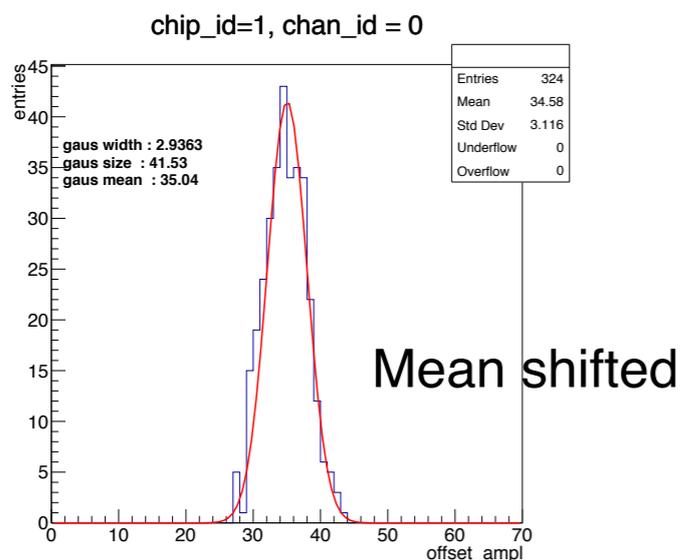
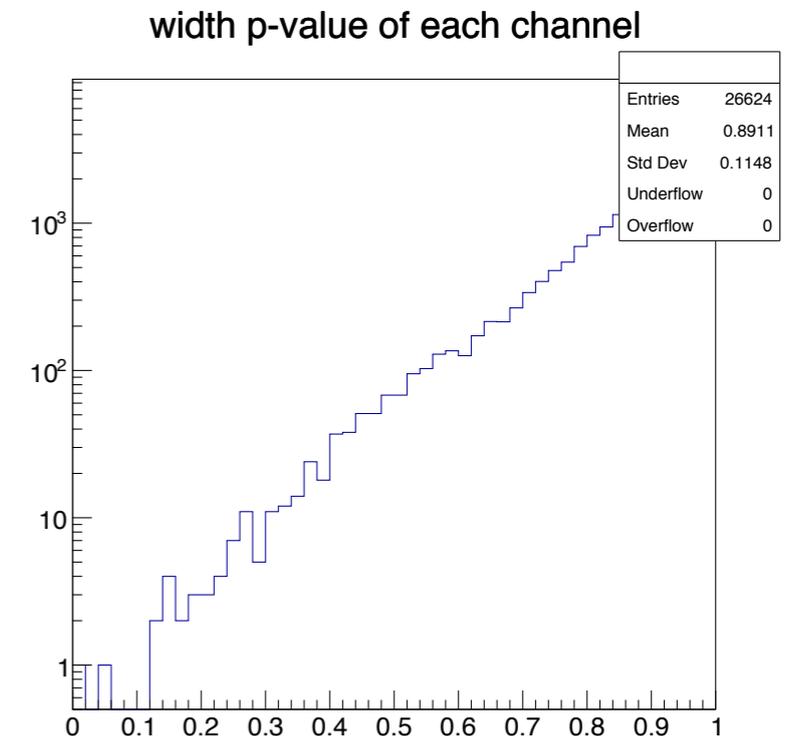
1. Noise study



2. Linearity study



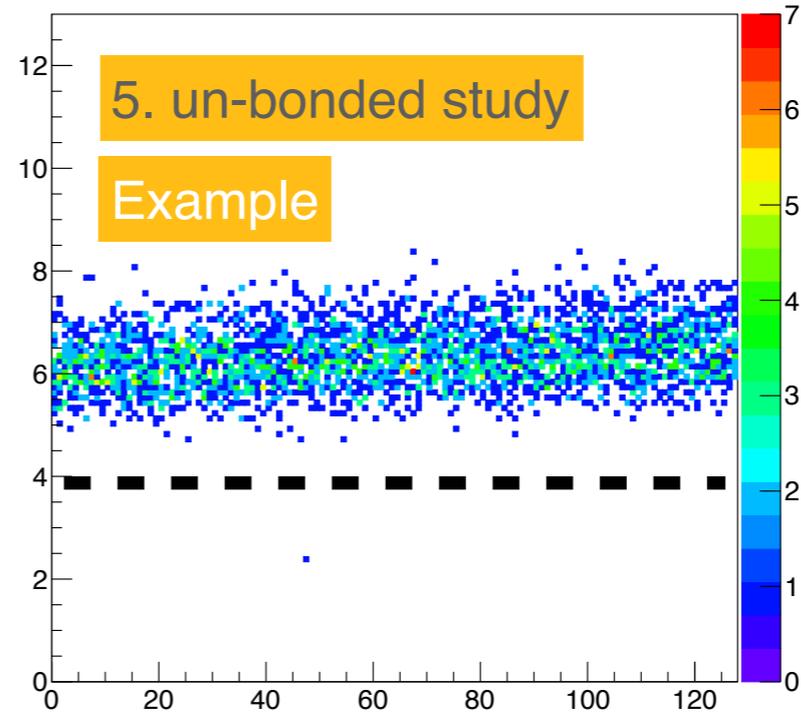
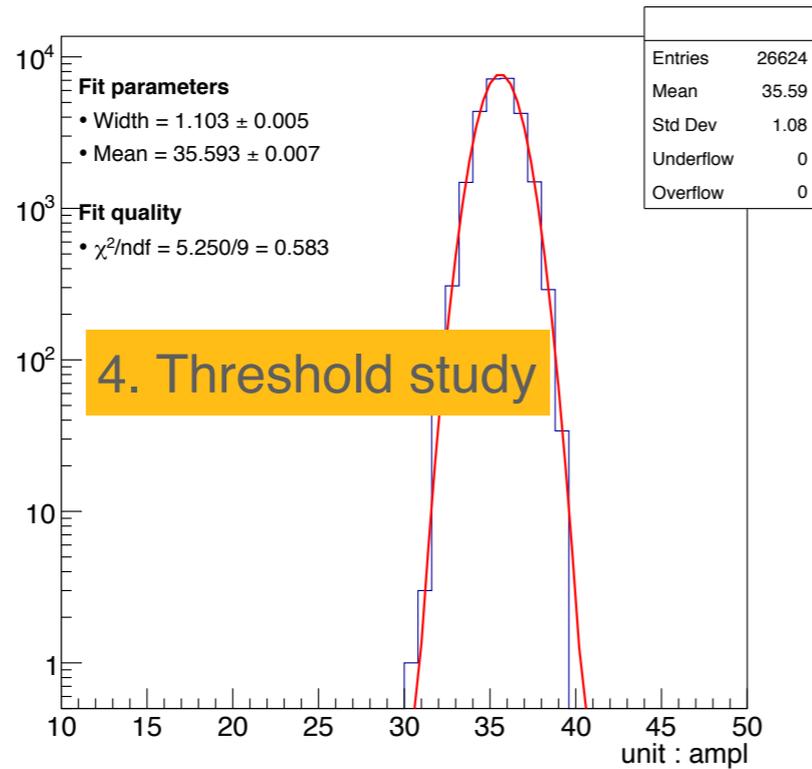
3. Width consistence study



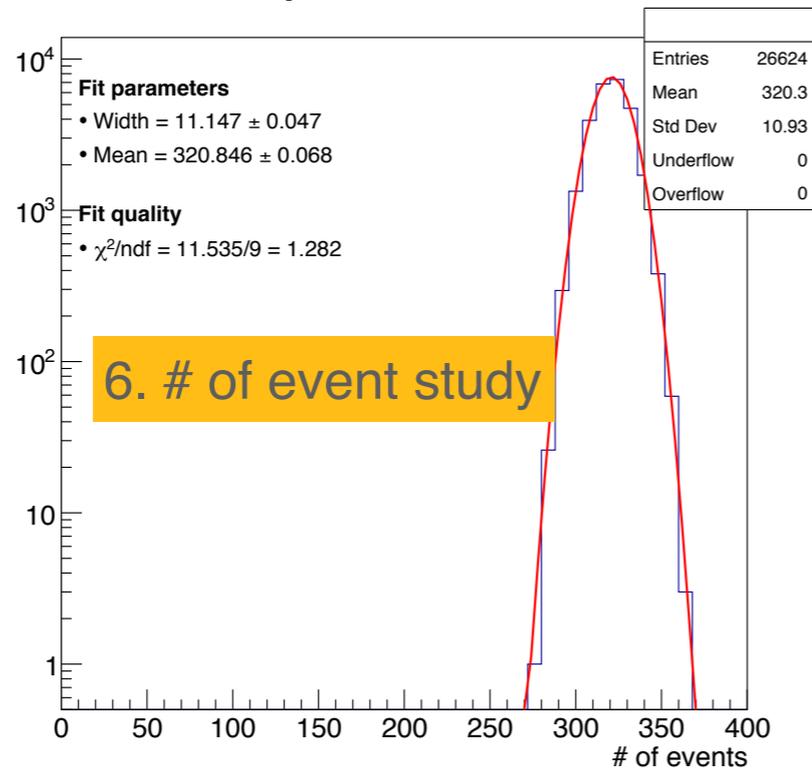
Ladder summary (4 ladders)



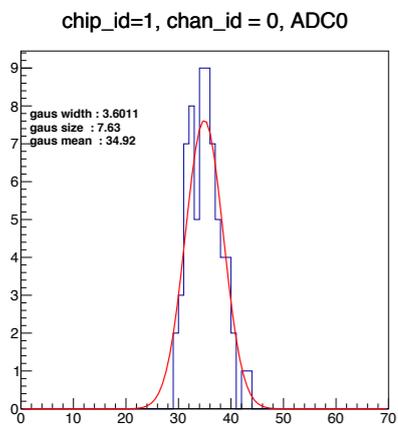
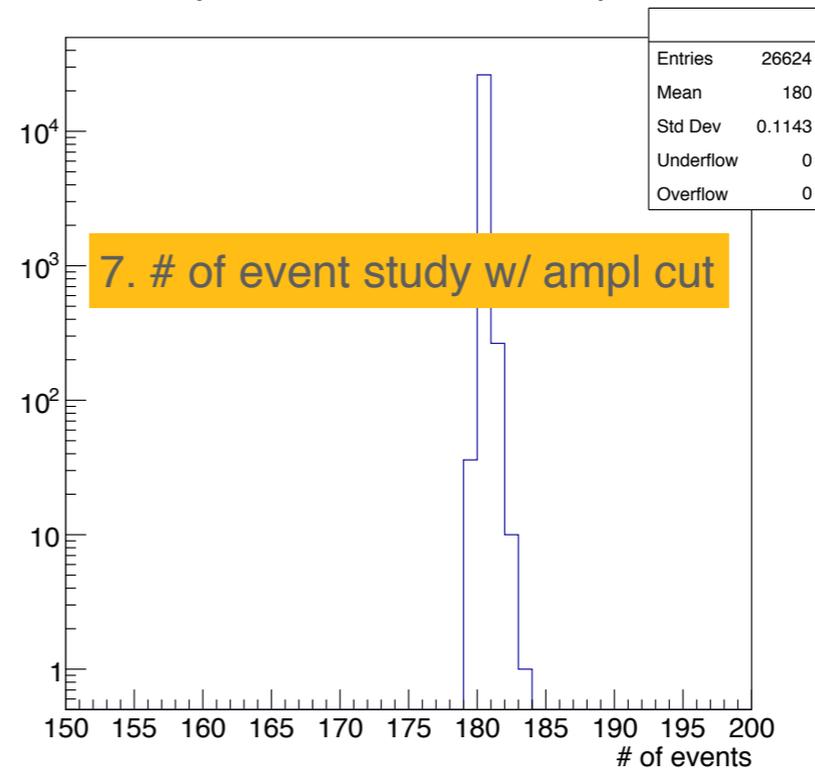
mean of adc0 distribution of each channel



entry of each channel



entry of each channel w/ ampl cut



Channel classification update



- Old macro :
 - 10 calibration runs for each half-ladder.
 - 2 criteria only.
- New macro :
 - 1 best calibration run for each half-ladder.
 - 7 criteria were applied so far.
 - Binary method to record the information

7 criteria -> 1111 111

Good channel : 1111 111

Bad in "Noise" : 1111 110

Bad in "Linearity" : 1011 111

Bad in "Noise" and "Entry" : 1111 100

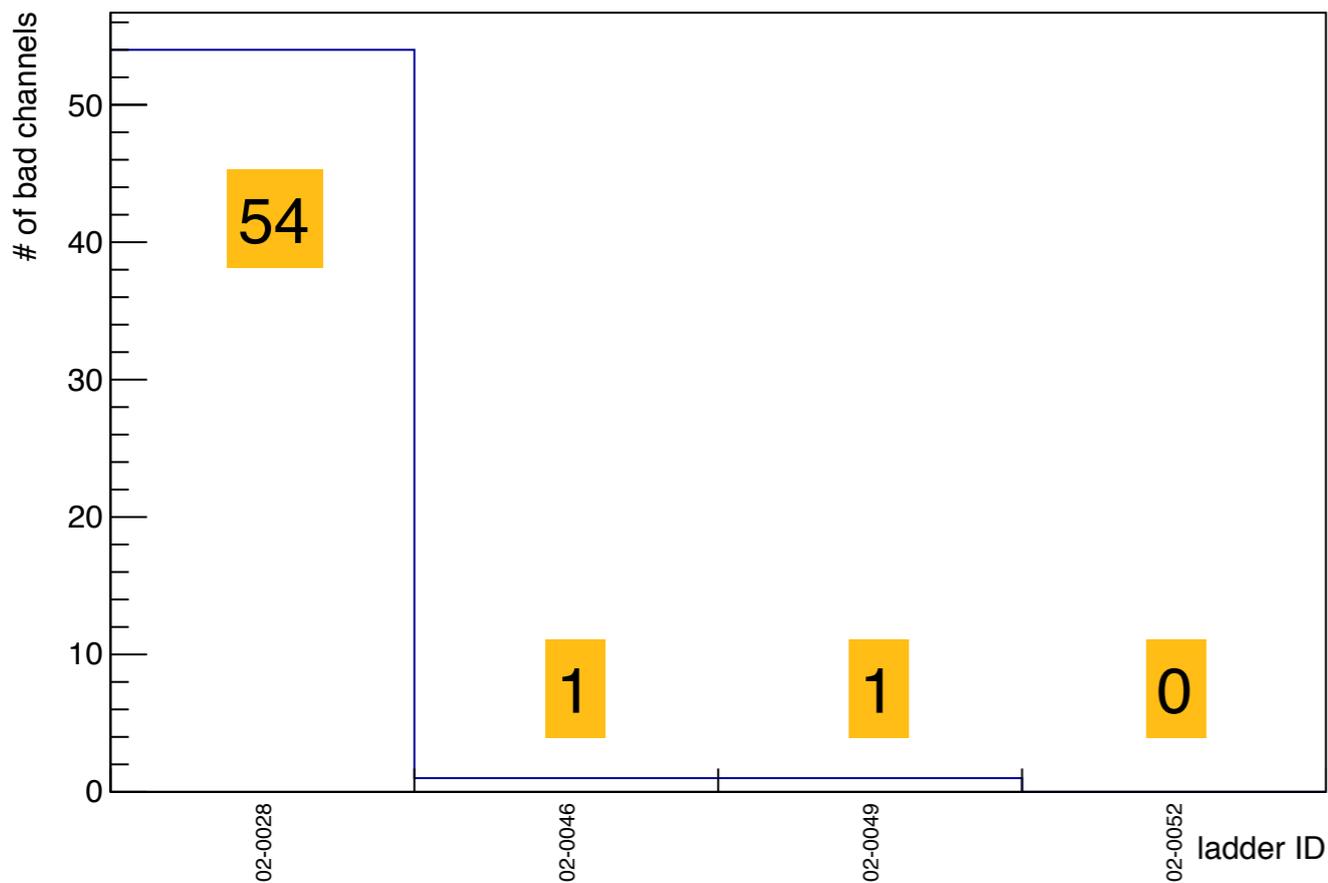
If (channel decode != 1111 111) -> bad channel

Criteria	ID
Noise	1
Linearity	100 000
Width consistence	1000 000
Threshold adc 0	1000
un-bonded	10 000
Entry	10
Entry with ampl cut	100

Ladder summary (4 ladders)



ladder bad channel summary



Criteria value

Noise	$2.2 < \text{width} < 4.2$
Linearity	$p\text{-value} < 5 \text{ sigma}$
Width consistence	$p\text{-value} < 5 \text{ sigma}$
Threshold adc 0	$28 < \text{ampl} < 40$
un-bonded	$\text{width} > 4$
Entry	$280 < \text{entry} < 400$
Entry with ampl cut	$170 < \text{entry} < 200$

This new macro is flexible to change “# of criteria” & cut value.

Cut value finder



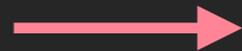
The cut value can be found by running the “cut finder code”

The cut being used now

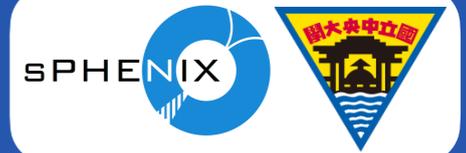
```
////////////////////////////////////  
///// cut finding result /////  
///// 5-sigma cut /////  
////////////////////////////////////  
✓ 1. offseted width : 2.29972 to 3.94959  
✓ 2. entry : 265.11 to 376.583  
✓ 3. entry ampl cut : 170 to 200 (P.S. No fitting)  
✓ 4. mean adc 0 : 30.076 to 41.1099  
5. threshold position : 26.2654 to 37.9863  
✓ 6. width rchi2 p-value: 5-sigma -> 0.0000006 (P.S. No fitting)  
✓ 7. slope rchi2 p-value: 5-sigma -> 0.0000006 (P.S. No fitting)
```

Width is too narrow

Not use so far



Summary

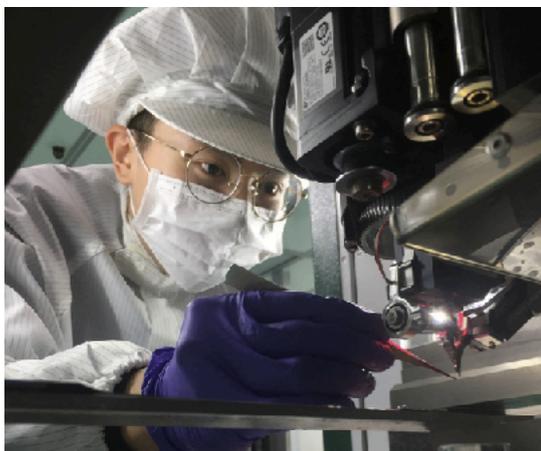


- Second Testbench :
 - ROC3 is good for calibration test
 - The preparation is almost done.
- Cosmic test :
 - According to G4, the muon energy deposit on thin silicon sensor seems to be consistent as muon energy increase.
 - The reason of MIP difference between cosmic data and Testbeam data is still unknown.
- Channel classification :
 - New classification macro is finished, 7 criteria are being used now.
- To do :
 - Assemble 10 more ladders before 9/15.
 - Ship 1 ladder to NWU.

Back up



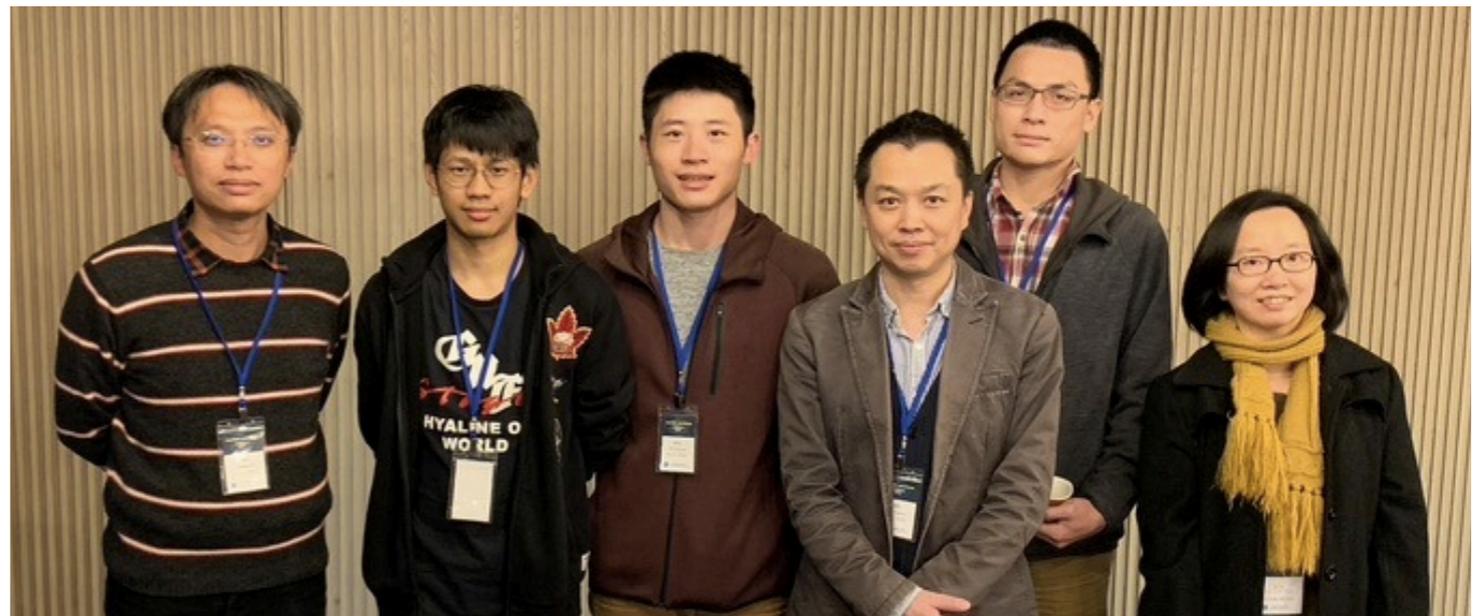
Taiwan INTT team



Ou-Wei Cheng



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Chia-Ming Kuo

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