Proposal of New DAC setting

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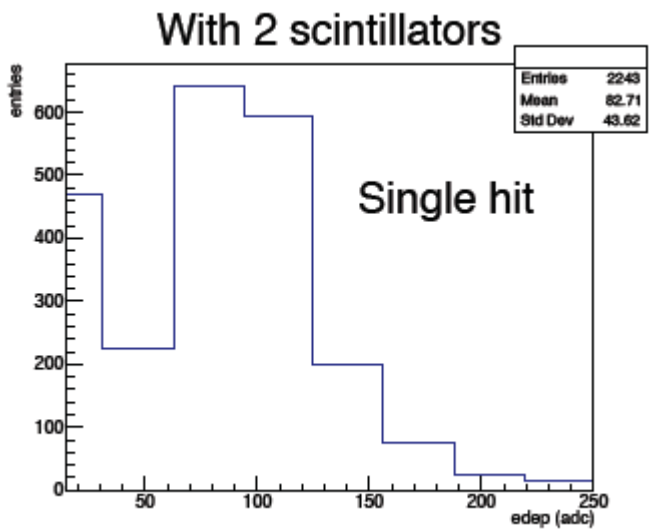
Introduction

- We realized there are different DAC settings used at the test bench.
- We should use the common DAC setting for both QA and sPHENIX experiment.

- I would like to propose new DAC setting.

ChengWei's plot



15
20
60
90
120
155
188
220

HanSheng's DAC value

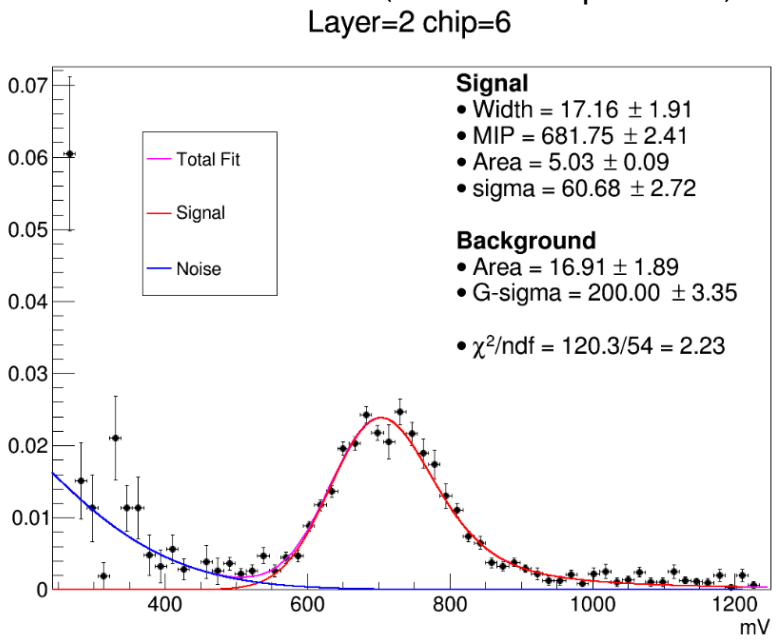
DAC0	15
DAC1	23
DAC2	60
DAC3	98
DAC4	135
DAC5	173
DAC6	210
DAC7	248

NWU

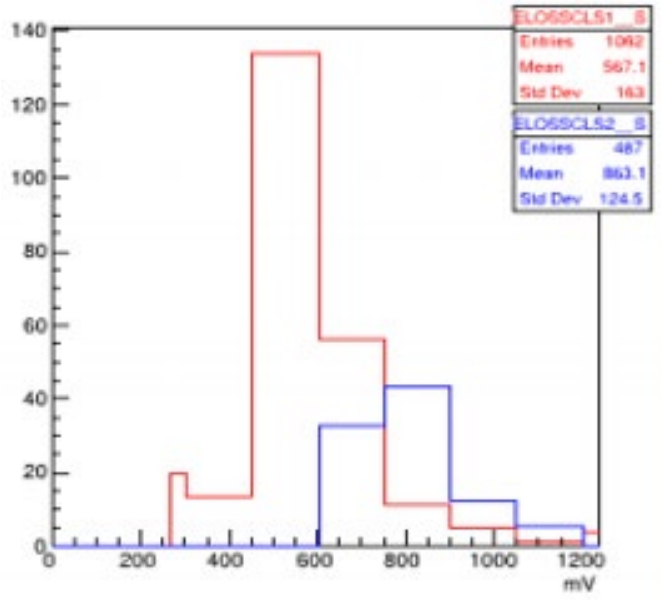
	設定値
DAC0	20
DAC1	23
DAC2	48
DAC3	98
DAC4	148
DAC5	172
DAC6	223
DAC7	248

MIP peak from the beam test and cosmic ray

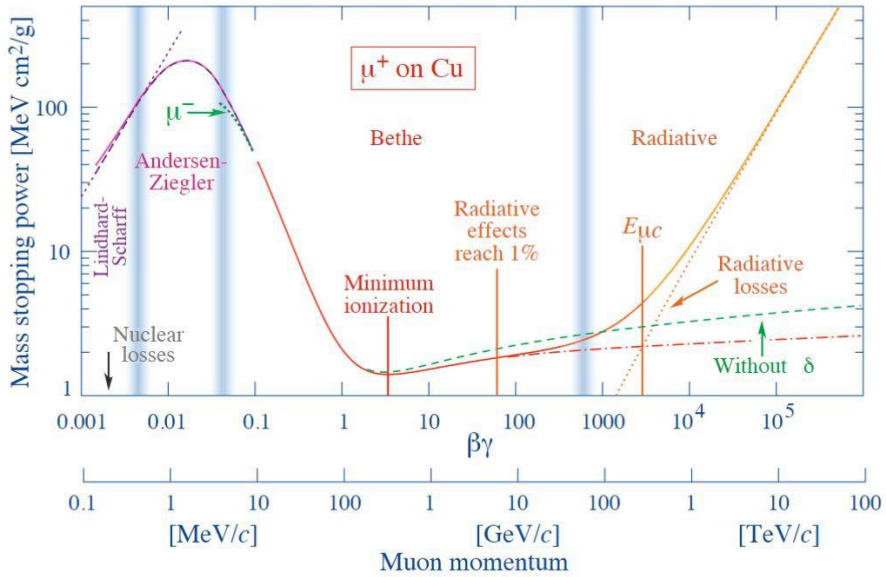
Beam test (120GeV proton)



Cosmic ray

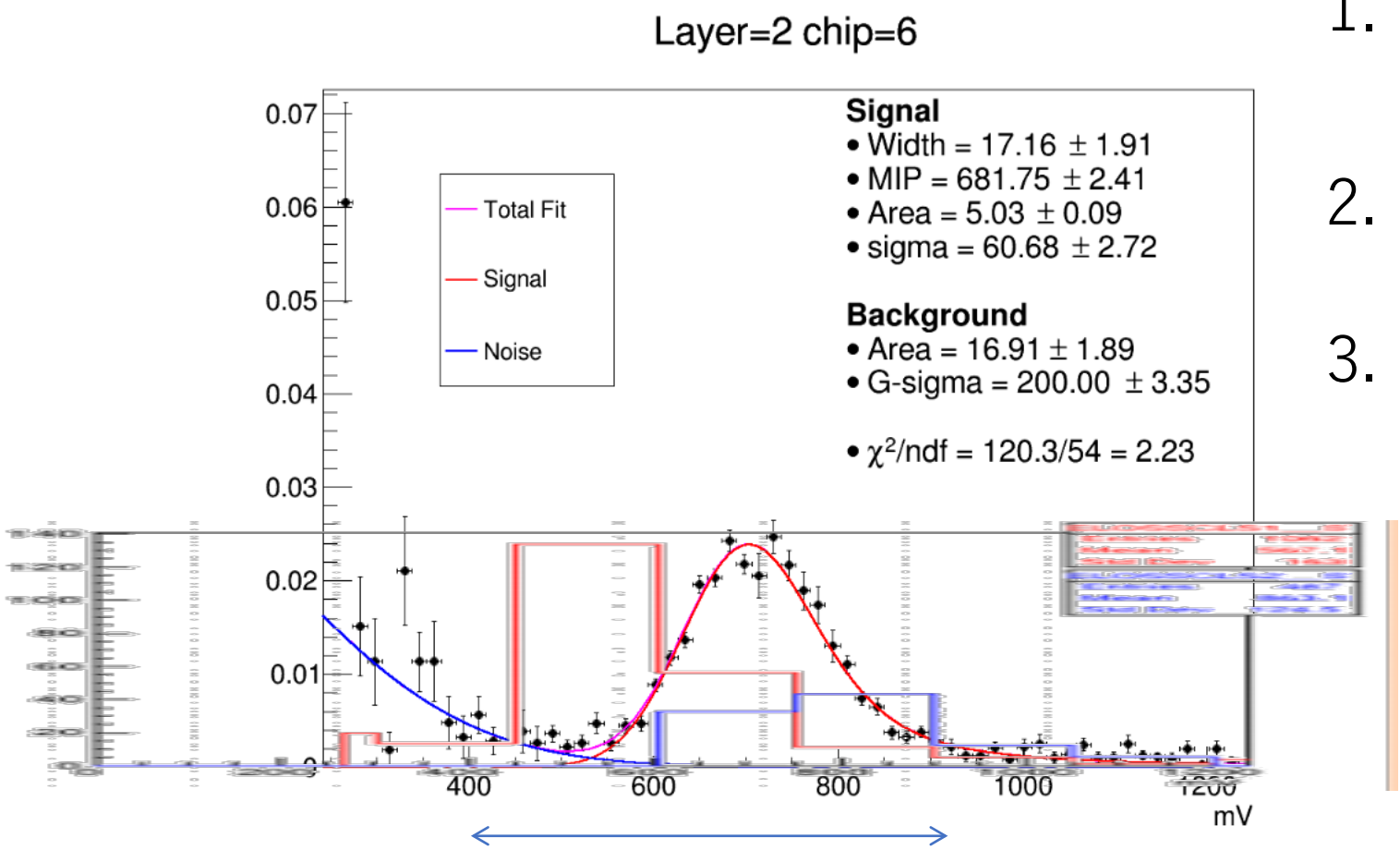


dE/dx in PDG



- Peak position at the beam test is slightly higher than that from cosmic ray. This can be understood by the relativistic rise for high energy particle.
  - 120 GeV proton beam at beam test

New DAC setting

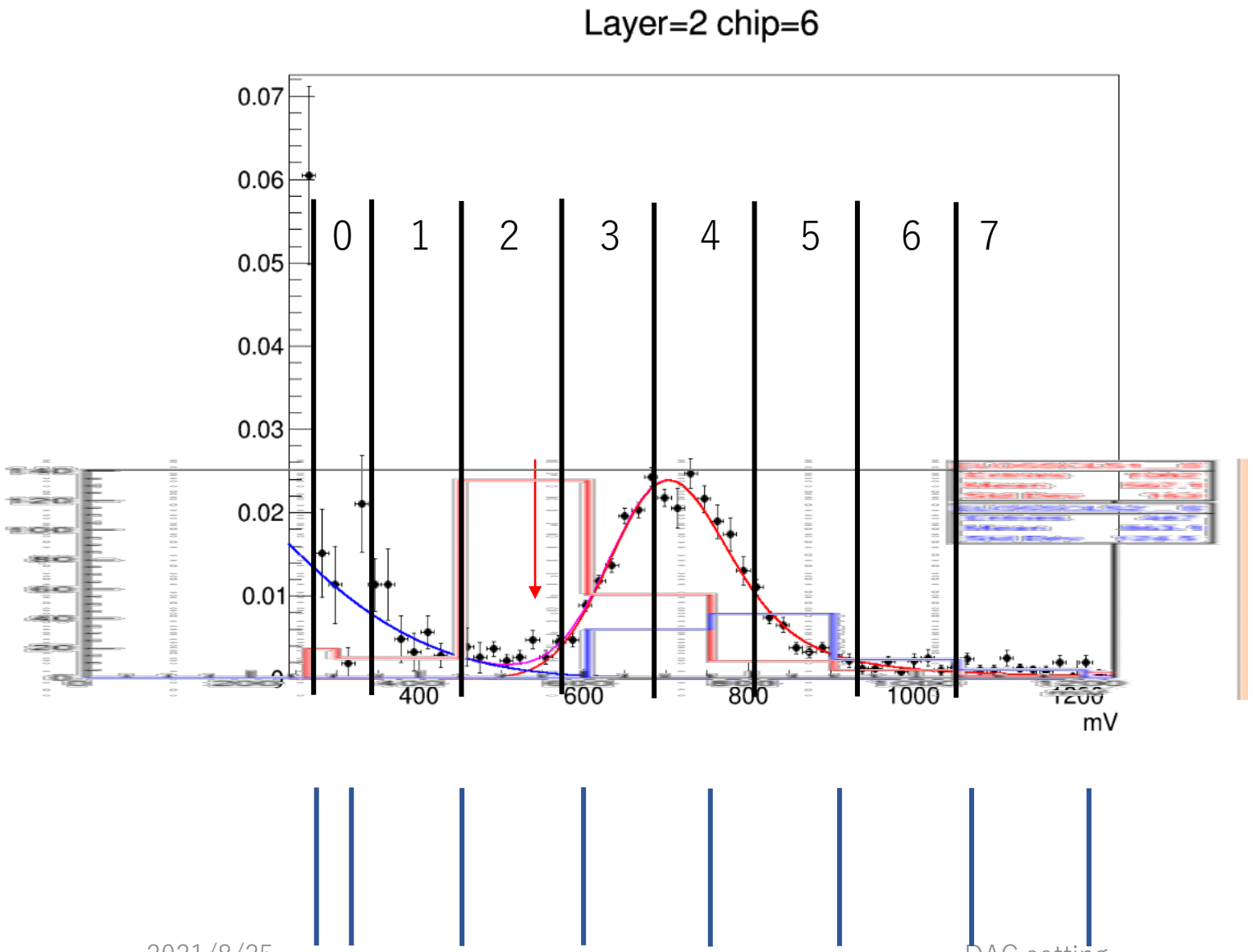


1. Cover MIP peak distribution
   - double MIP is less important
2. Smaller DAC0 but less noise
3. Symmetric bin width

	設定値	mV
DAC0	15	270
DAC1	30	330
DAC2	60	450
DAC3	90	570
DAC4	120	690
DAC5	150	810
DAC6	180	930
DAC7	210	1050

New DAC setting

MIP ~ 500mV = 300 + offset(200)
offset =200 is observed in the cosmic ray measurement



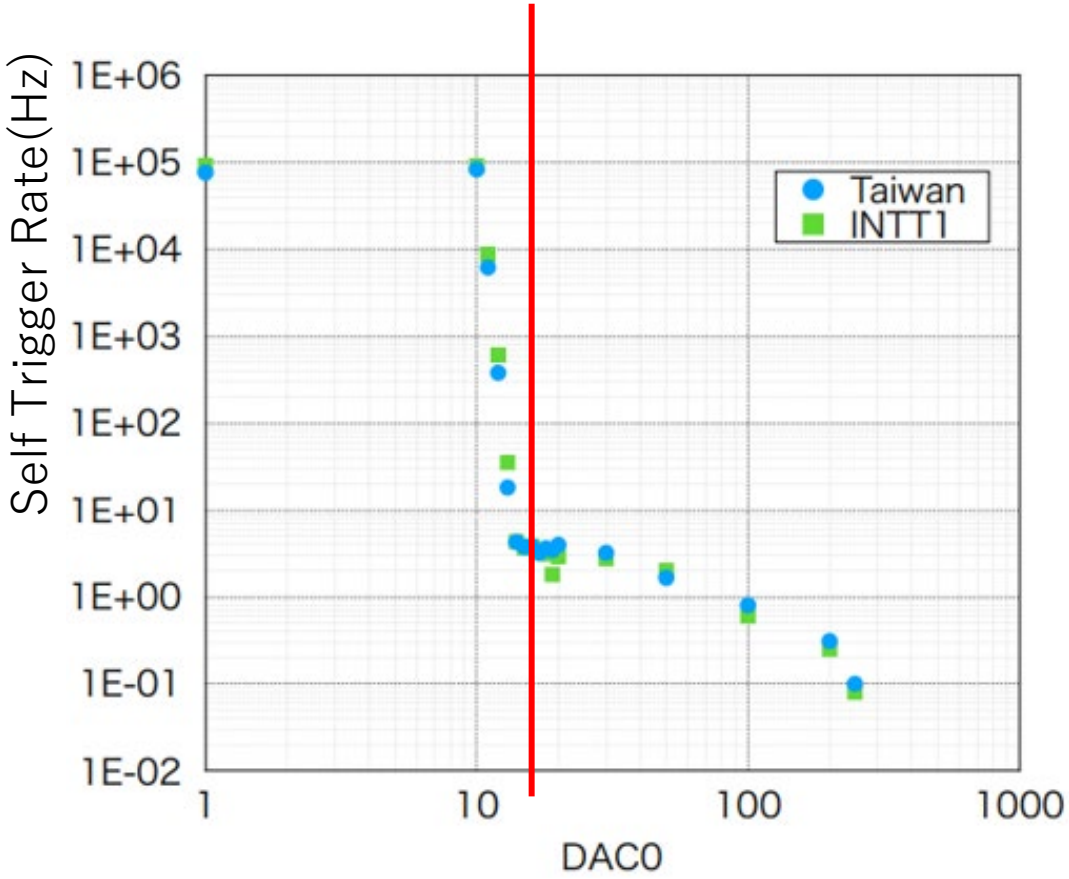
	設定値	mV	MIP
DAC0	15	270	0.23
DAC1	30	330	0.43
DAC2	60	450	0.83
DAC3	90	570	1.23
DAC4	120	690	1.63
DAC5	150	810	2.03
DAC6	180	930	2.43
DAC7	210	1050	2.83

DAC 設定値	対応電圧 [mV]
15	270mV
23	300mV
60	450mV
98	600mV
135	750mV
173	900mV
210	1050mV
248	1200mV

Self trigger rate vs DAC0 setting

Genki's slide (2021/02/19)

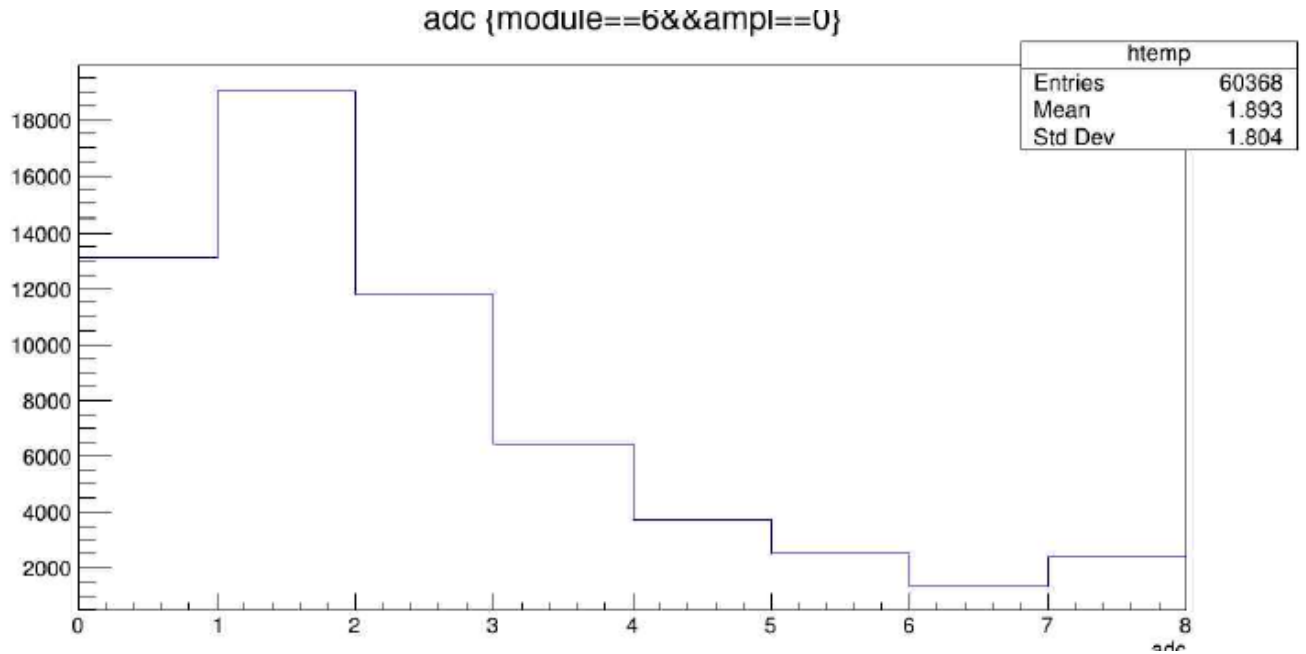
DAC0	LVL1_ACCEPT_SELF_TRIG	Sec.	Rate	Rate
1	1.85E+06	20	92500.00	500.00
10	1.83E+06	20	91500.00	500.00
11	1.76E+05	20	8800.00	200.00
12	1.22E+04	20	610.00	381.45
13	711	20	35.55	18.30
14	86	20	4.30	4.25
15	73	20	3.65	3.75
16	76	20	3.80	3.75
17	65	20	3.25	3.20
18	62	20	3.10	3.60
19	36	20	1.80	3.45
20	58	20	2.90	3.95
30	55	20	2.75	3.20
50	40	20	2.00	1.65
100	12	20	0.60	0.80
200	5	20	0.25	0.31
248	3	40	0.08	0.10



- Self trigger rate is consistent at NWU and Taiwan
- DAC0=15 is good enough to reject noise

Summary

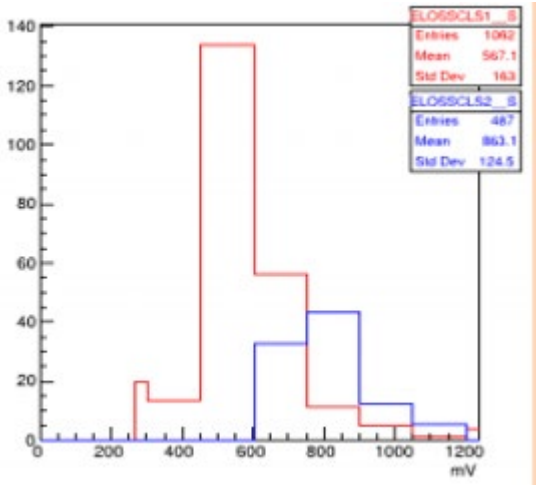
- New DAC value proposed
- Source measurement is (re-)performed with new DAC setting



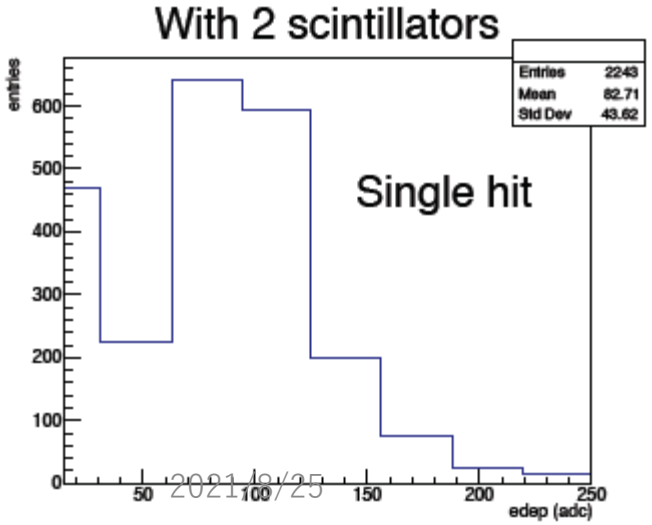
backup

MIP peak from the beam test and cosmic

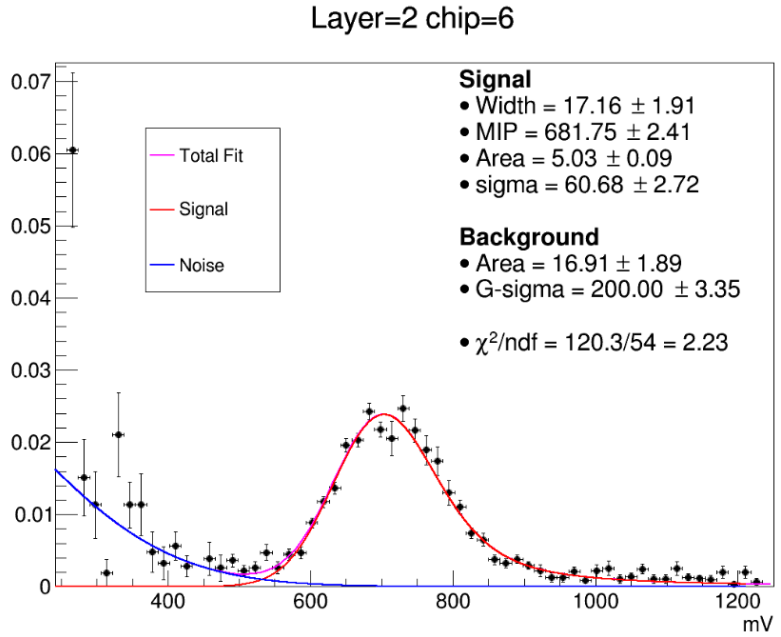
Cosmic ray



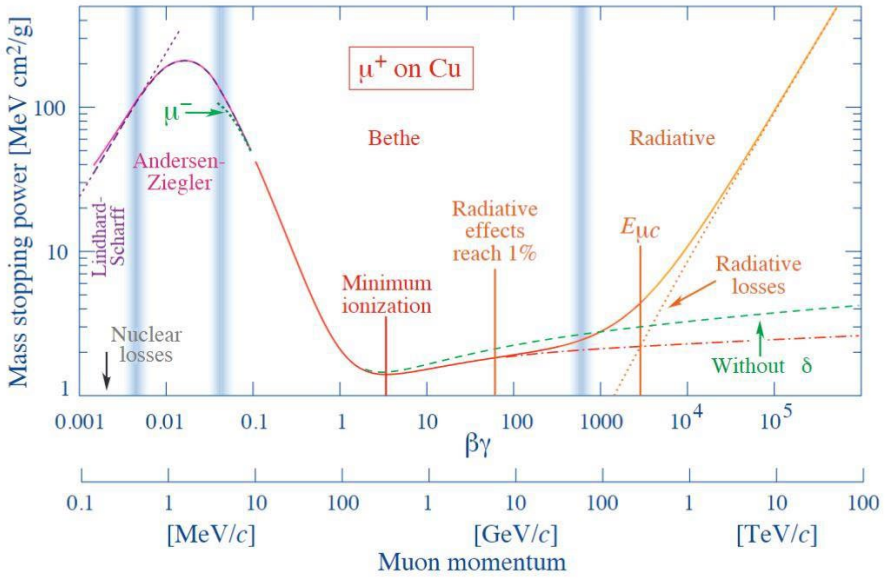
ChengWei's plot



Beam test (120GeV proton)



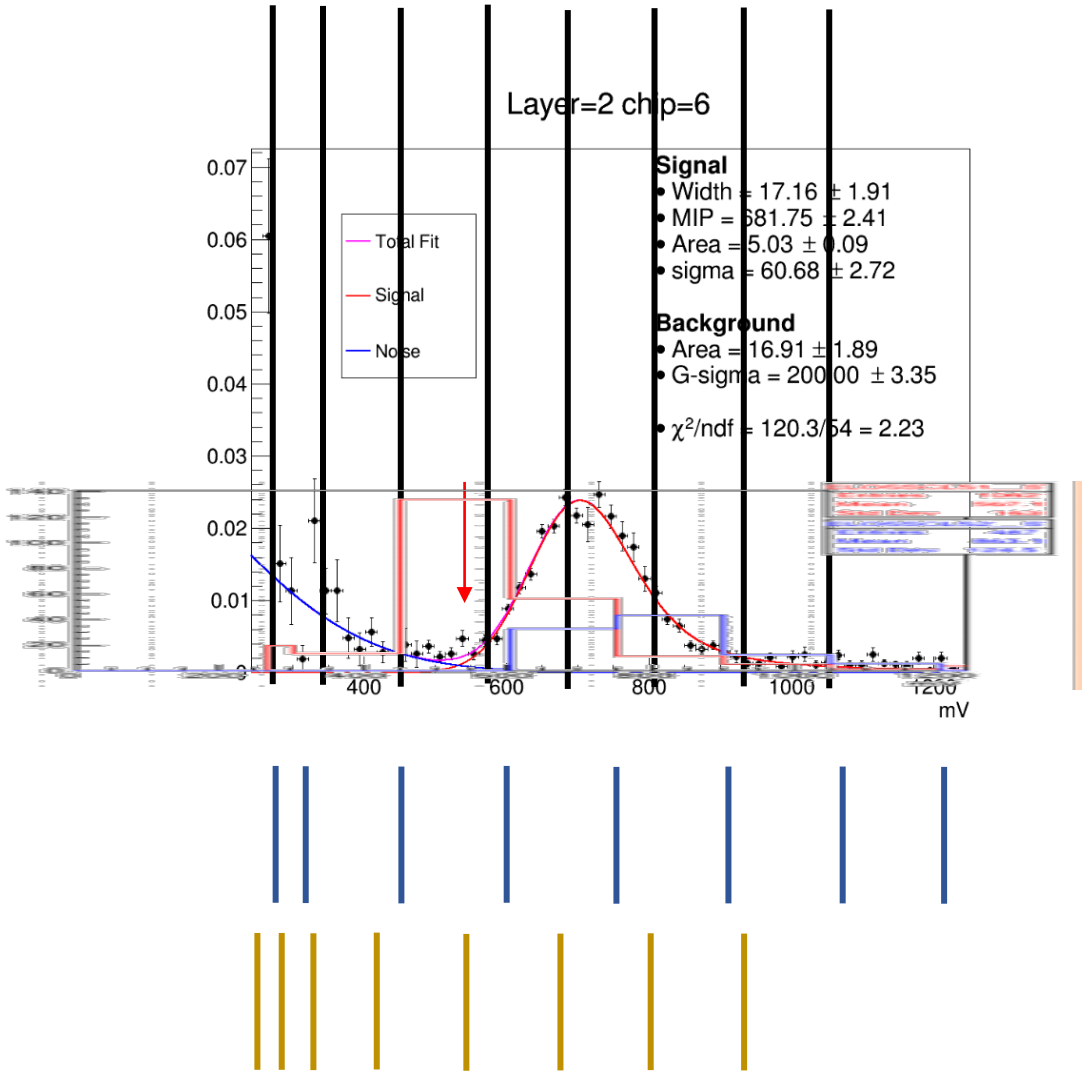
dE/dx in PDG



- Peak position at the beam test is higher than that from cosmic ray. This can be understood by the relativistic rise for high energy particle.
  - 120 GeV proton beam at beam test

- V = 210 + 4*DAC -> DAC=100 -> V=600mV

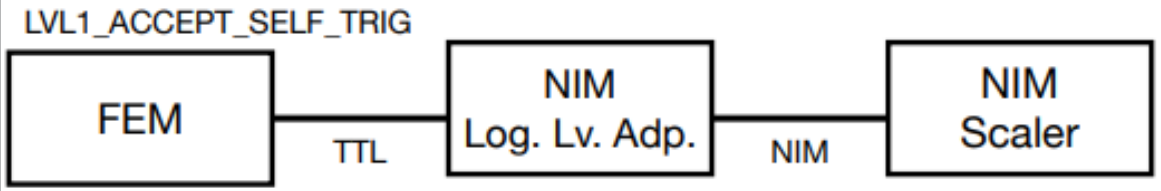
MIPピークとDAC位置



	設定値	電圧mV
DAC0	15	270
DAC1	30	330
DAC2	60	450
DAC3	90	570
DAC4	120	690
DAC5	150	810
DAC6	180	930
DAC7	210	1050

DAC 設定値	対応電圧 [mV]	FPHX 初期値
15	270mV	8
23	300mV	16
60	450mV	32
98	600mV	48
135	750mV	80
173	900mV	112
210	1050mV	144
248	1200mV	176

DAC0 を変えたときのセルフトリガーレート



DAC0	LVL1_ACCEPT_SELF_TRIG	時間	レート	レート
1	1.85E+06	20	92500.00	6500.00
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