B2GM TRG meeting 230531

Status on ECLTRG energy calibration

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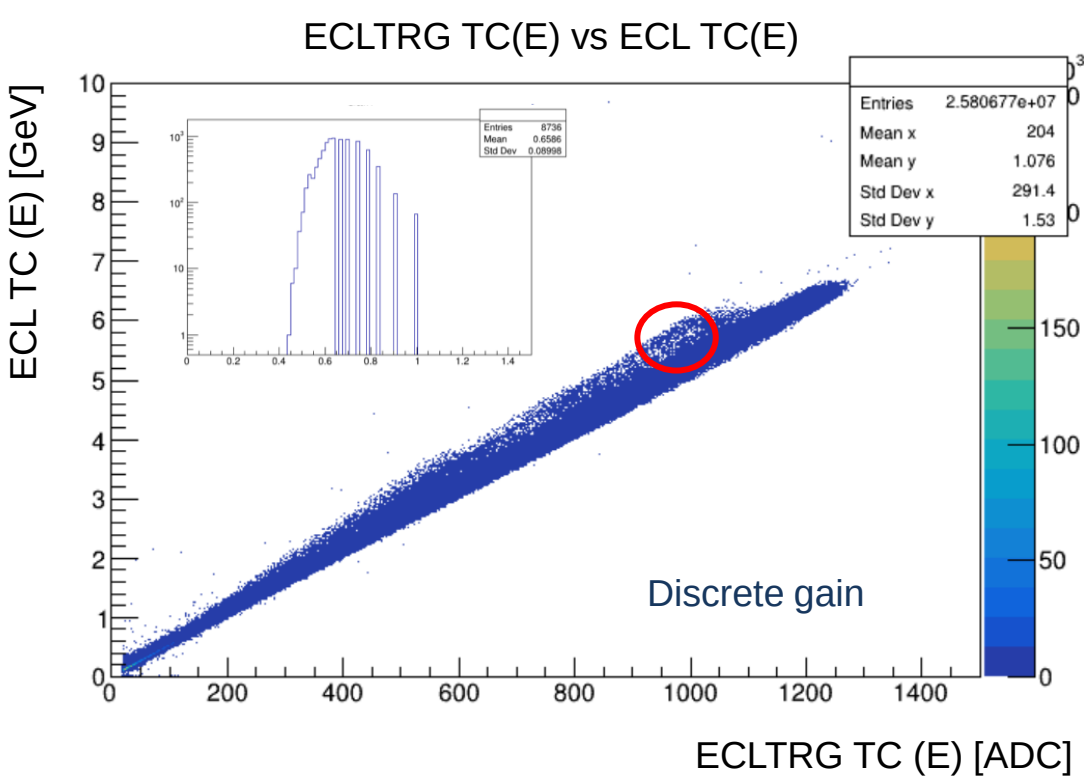
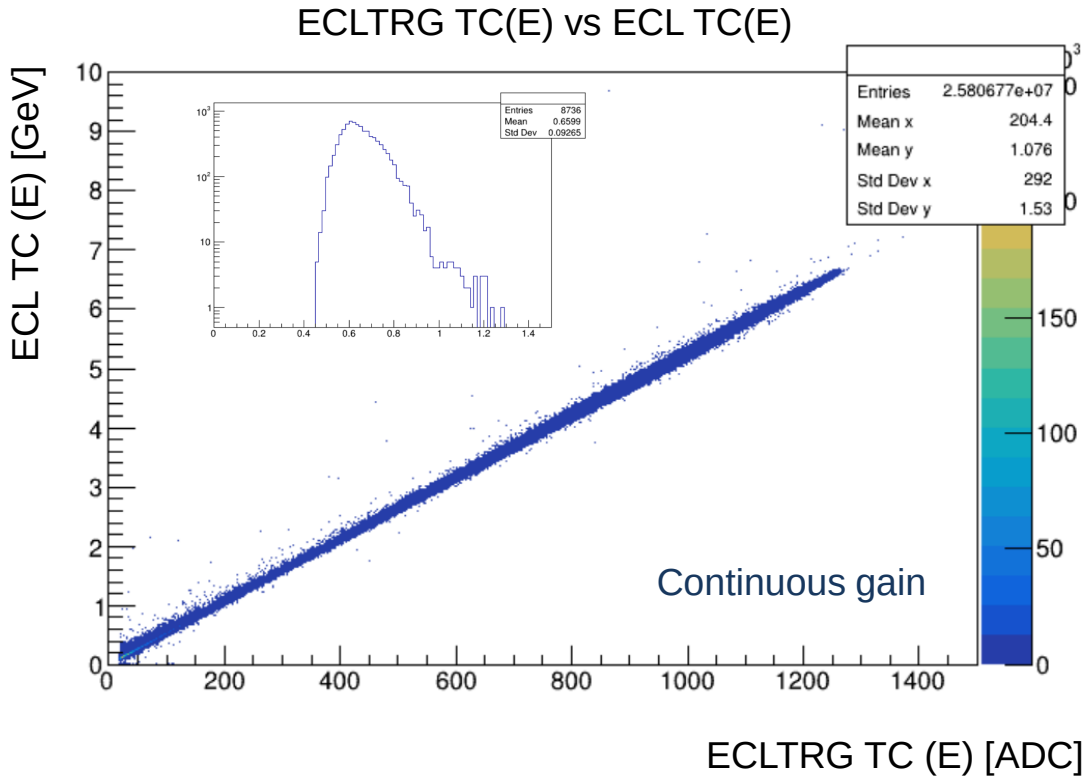
Continuous gain vs discrete gain

Our purpose for proper calibration :

It is to reduce the high attenuator gain ‘exceeding 1’ by doubling the gain of the jumper.





Jumper settings change complete

Channels to change jumper settings

Coefficient 63, 62 (for continuous gain >=0.9)

- **Total channel's number(#) : 144** /8736

(# of channels for continuous gain >=1 : 46)

- SDSP board # : 117 (BR 62 + FW 24 + BW 31)
- 1 Board jumper setting operation : ~15 minutes
- Estimated time of the work : ~ 30h

Schedule

From 5/24 to 5/30

Alex, Yuriy, Nakazawa-san and Unno-san

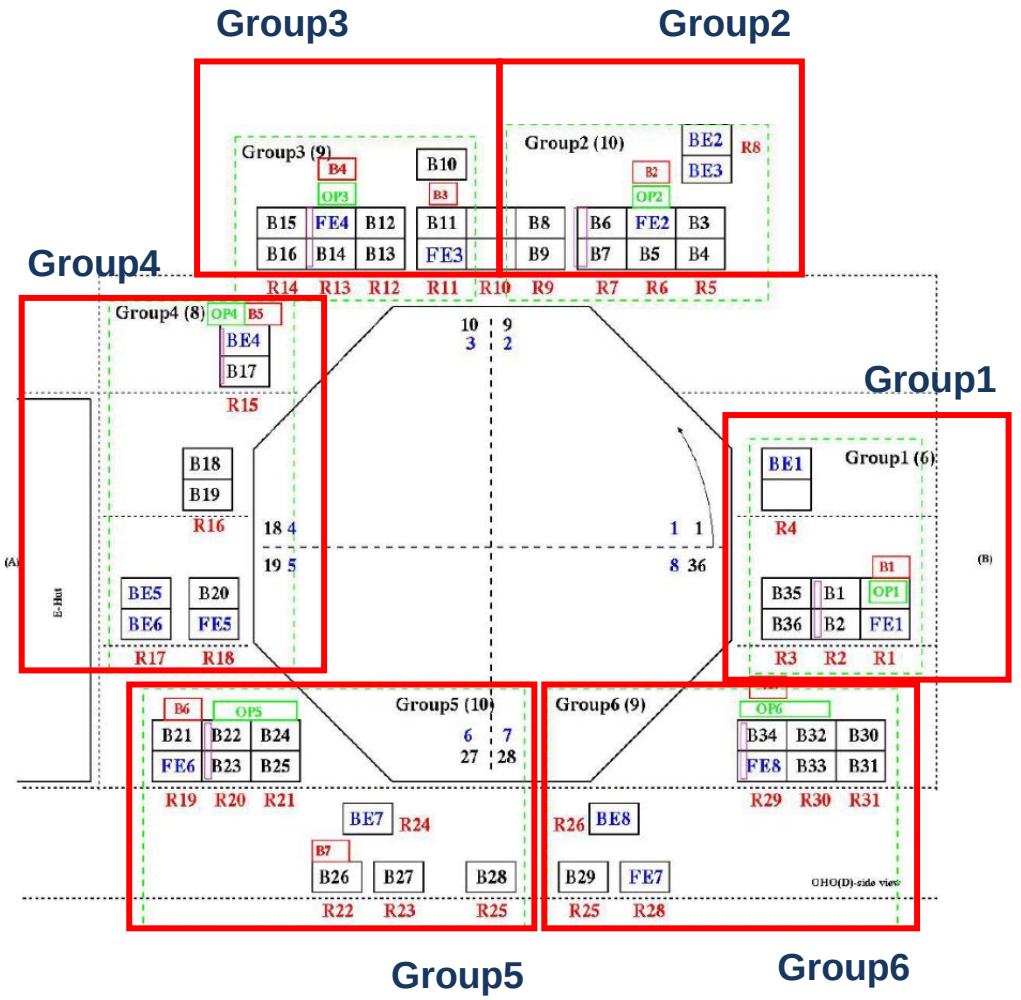
have completed the jumper work and SDSP replacement.

Thank you for your hard work!!

Changed jumper setting channels in barrel

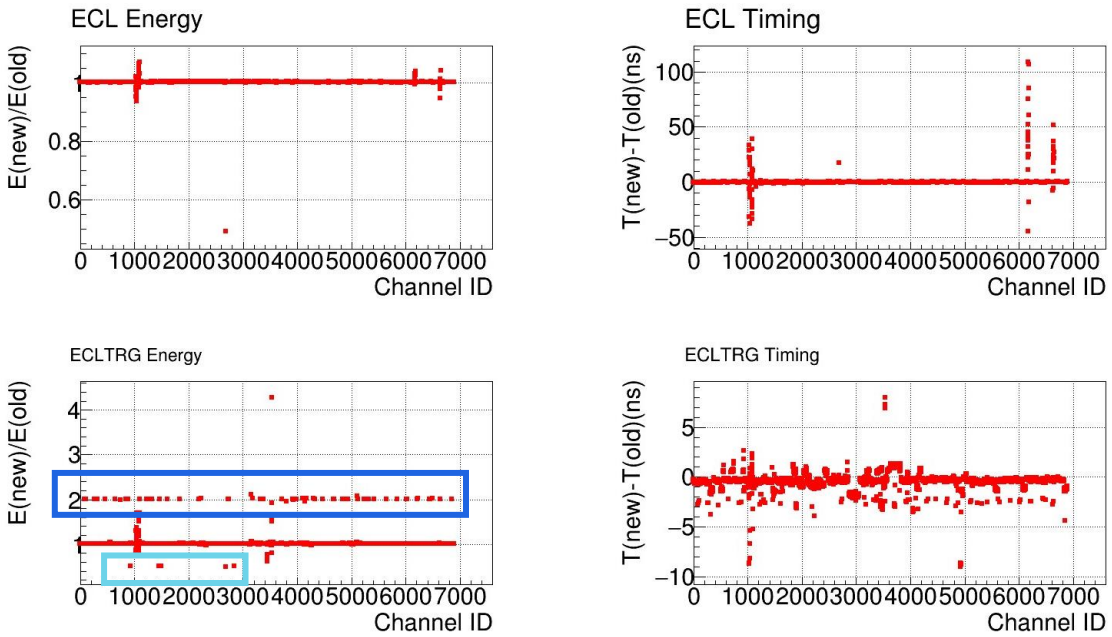
	TCID	CellID	Crate	SDSP	ch	Ratio
Group1	86	4034	1	6	5	1.994
	87	4753	1	7	2	1.99
	88	5473	1	8	3	1.995
	98	4182	2	6	6	1.992
	98	4039	2	6	9	1.996
	101	6054	2	9	7	1.996
Group2	110	4042	3	6	5	1.998
	122	4477	4	6	4	1.996
	128	7646	4	12	4	1.98
	134	4049	5	6	1	1.99
	136	5347	5	8	10	1.992
	139	7074	5	11	6	0.5
	139	7075	5	11	10	0.5
	146	4053	6	6	1	0.788
	146	4197	6	6	2	1.279
	146	4054	6	6	5	1.281
	146	4055	6	6	9	1.256
	146	4056	6	6	13	1.35
	146	4200	6	6	14	1.684
	149	6072	6	9	15	1.677
	150	6503	6	10	10	1.991
	158	4057	7	6	1	1.996
	160	5497	7	8	3	1.993
	162	6652	7	10	15	1.996
	164	7514	7	12	3	1.996
	172	5360	8	8	14	0.501
	172	5504	8	8	15	1.996
	174	6800	8	10	16	0.502
	182	4067	9	6	9	2
Group3	196	5367	10	8	10	1.997
	218	4511	12	6	12	1.992
	221	6093	12	9	3	2.006
	230	4514	13	6	8	0.997
	252	3370	15	4	8	2
	252	3371	15	4	12	1.994
	259	7113	15	11	2	0.503
	259	7114	15	11	6	0.5

	TCID	CellID	Crate	SDSP	ch	Ratio
Group4	279	4817	17	7	2	2.094
	280	5537	17	8	3	2.016
	289	3671	18	5	10	2
	292	5254	18	8	5	1.99
	292	5544	18	8	15	1.993
	302	4538	19	6	8	1.91
	302	4539	19	6	12	4.262
	314	4541	20	6	4	1.999
	319	7423	20	11	12	1.944
Group5	326	4547	21	6	12	1.991
	327	4692	21	7	13	1.979
	328	5555	21	8	11	1.984
	329	6129	21	9	3	1.993
	330	6852	21	10	16	1.993
	338	4117	22	6	1	2.001
	340	5560	22	8	15	1.947
	342	6854	22	10	8	2.005
	350	4123	23	6	9	2.002
	352	5561	23	8	3	1.99
	360	3408	24	4	16	1.988
	372	3412	25	4	16	1.996
	374	4275	25	6	10	1.998
	384	3413	26	4	4	2
	386	4280	26	6	14	1.998
	390	6870	26	10	8	1.997
	400	5578	27	8	7	2.054
	401	5867	27	9	9	2
	408	3424	28	4	16	1.994
	414	6878	28	10	8	1.998
Group6	420	3425	29	4	4	1.996
	434	4440	30	6	15	1.995
	446	4156	31	6	13	1.994
	457	4014	32	5	8	1.988
	457	4015	32	5	12	1.997
	458	4160	32	6	13	1.997
	470	4161	33	6	1	1.995
	470	4164	33	6	13	2.001
	484	5606	34	8	7	1.996
	484	5608	34	8	15	1.995
	487	7479	34	11	12	2.006
Group1	496	5609	35	8	3	1.997
	496	5467	35	8	10	1.993
	509	6192	36	9	15	1.993



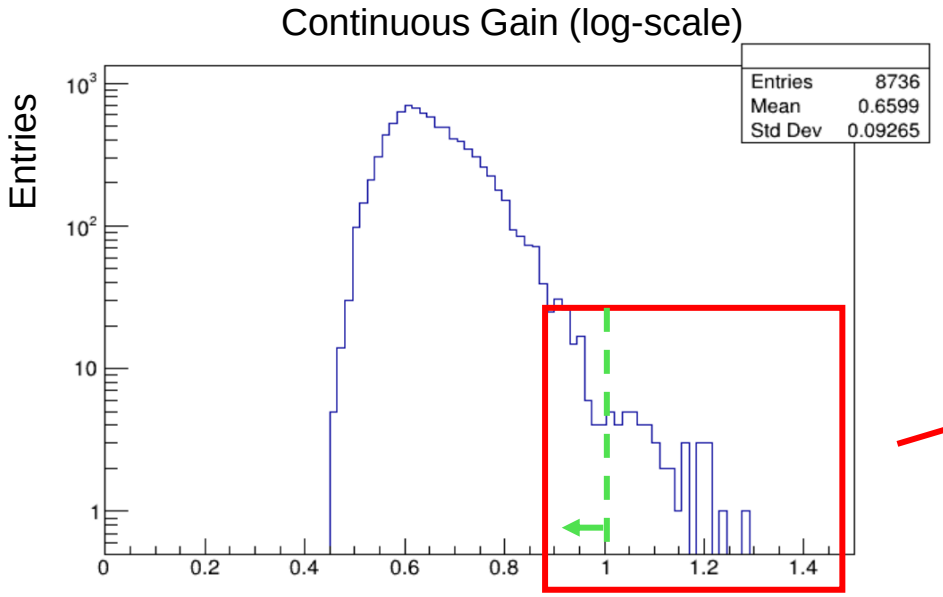
Summary

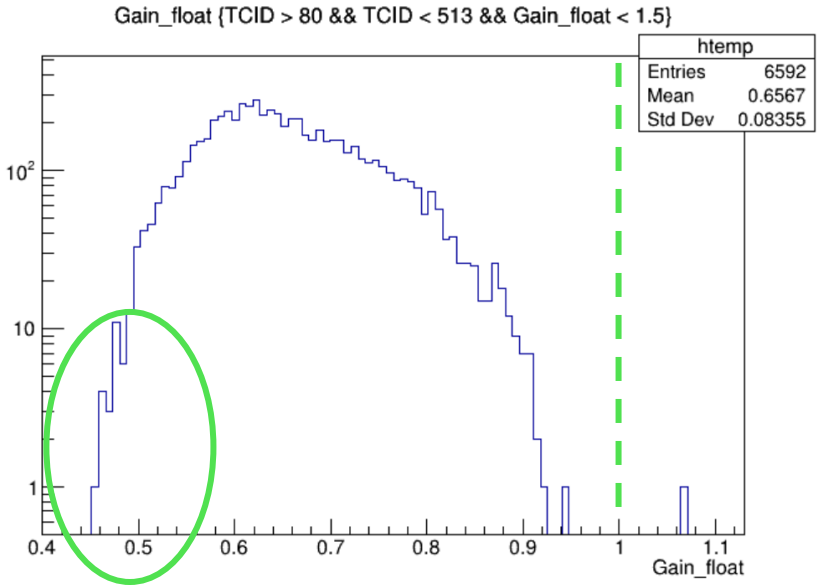
- The jumper settings for all channels with gain>=0.9 have been changed.
  (A total of 150 channels of jumpers are currently ‘ON’)
- Jumper settings have been returned for the 6 channels that changed jumpers as a test in the past year.
- There are channels that need further study:
  ex, The gain ratio for the ‘Cate 6 sdsp 6’ and ‘Cate 6 sdsp 9’ channels are too low.
  (There seems to be a hardware problem with the SDSP board.)

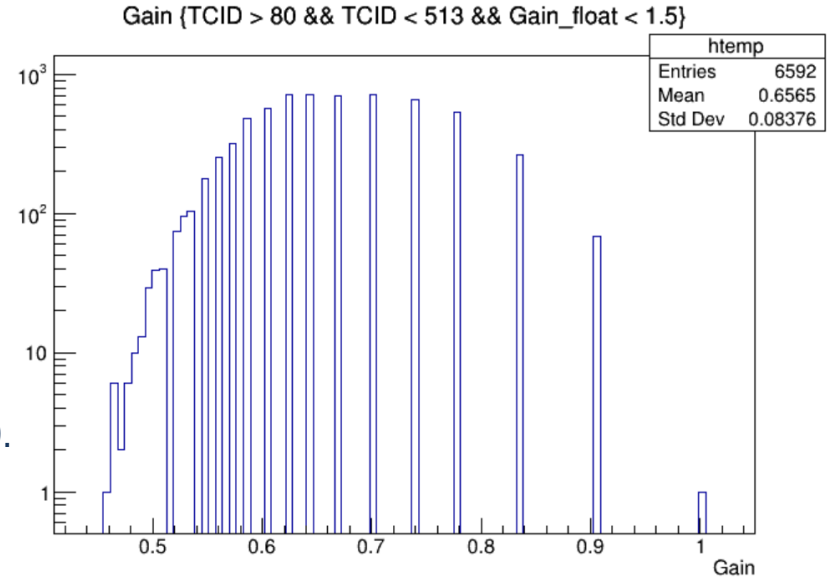


exp 27 run 3818 (after jumper change) vs exp 27 run 3657 (before jumper change)

Results of the jumper setting change



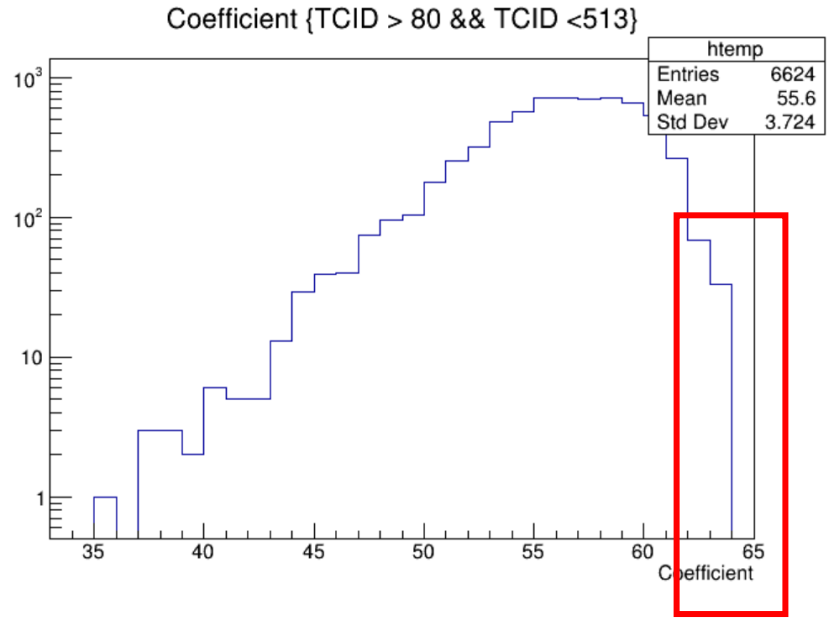




Reference data : Physics run exp24, 2/fb

- We took cosmic run 1hour with 3600k.
- As expected, the gain exceeding 1 disappeared and moved around 0.5.
- The channels, crate5 SDSP6ch12 had already turned on the jumper in 2018/09. but the gain is already over 1. so, this channel's jumper cannot be controlled.

Problematic channels



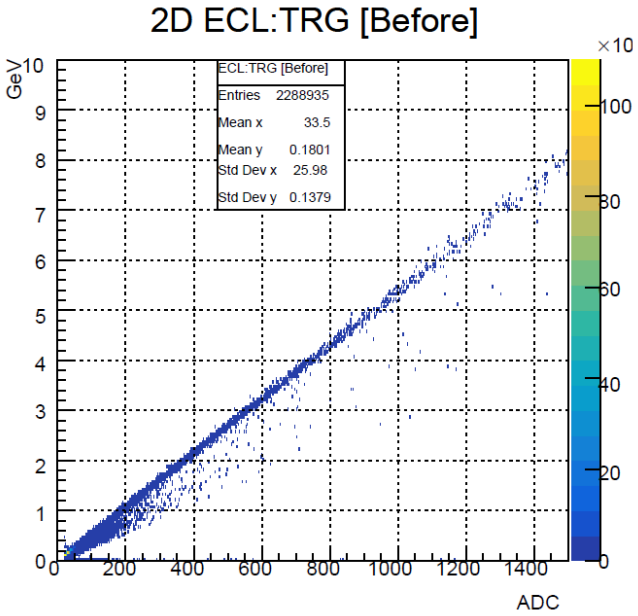
Channel list of the coefficient 63

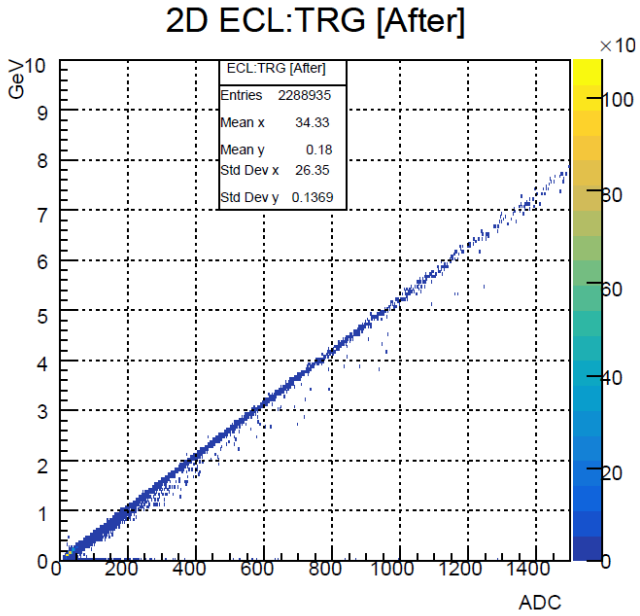
	TCID	CellID	Collector	ShaperID	Channel	Gain_float	Coefficient
1	134	4483	5	6	12	1.069205	63
2	146	4053	**6**	**6**	1	inf	63
3	146	4197	**6**	**6**	2	inf	63
4	146	4341	**6**	**6**	3	inf	63
5	146	4485	**6**	**6**	4	4417.091	63
6	146	4054	**6**	**6**	5	inf	63
7	146	4198	**6**	**6**	6	inf	63
8	146	4342	**6**	**6**	7	inf	63
9	146	4486	**6**	**6**	8	inf	63
10	146	4055	**6**	**6**	9	inf	63
11	146	4199	**6**	**6**	10	inf	63
12	146	4343	**6**	**6**	11	inf	63
13	146	4487	**6**	**6**	12	inf	63
14	146	4056	**6**	**6**	13	80.94726	63
15	146	4200	**6**	**6**	14	103.3302	63
16	146	4344	**6**	**6**	15	115.1593	63
17	146	4488	**6**	**6**	16	73.3781	63
18	149	5781	**6**	**9**	1	inf	63
19	149	5925	**6**	**9**	2	inf	63
20	149	6069	**6**	**9**	3	inf	63
21	149	6213	**6**	**9**	4	inf	63
22	149	5782	**6**	**9**	5	inf	63
23	149	5926	**6**	**9**	6	inf	63
24	149	6070	**6**	**9**	7	inf	63
25	149	6214	**6**	**9**	8	inf	63
26	149	5783	**6**	**9**	9	inf	63
27	149	5927	**6**	**9**	10	inf	63
28	149	6071	**6**	**9**	11	inf	63
29	149	6215	**6**	**9**	12	inf	63
30	149	5784	**6**	**9**	13	inf	63
31	149	5928	**6**	**9**	14	inf	63
32	149	6072	**6**	**9**	15	inf	63
33	149	6216	**6**	**9**	16	inf	63

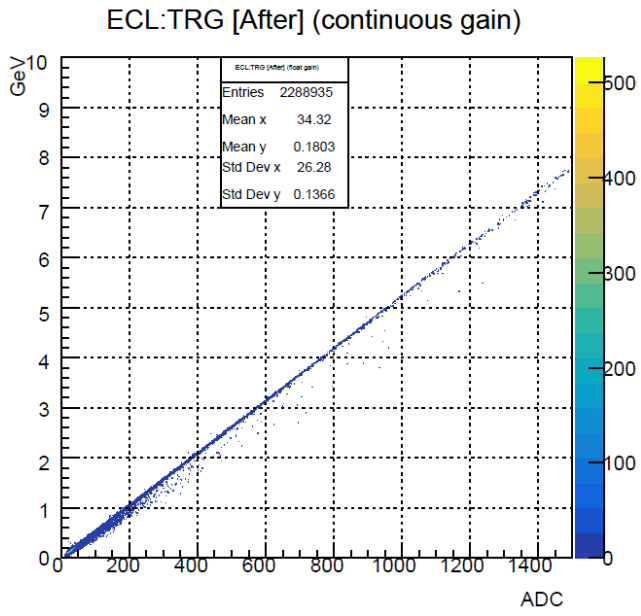
- As well as Cate5 SDSP6ch12,

  Cate6 SDSP6 and 9 boards do not give the proper data. The coefficients show 63.
- There seems to be a problem with the SDSP board so further investigation is needed.
- Except for it, only one channel currently has the continuous gain value greater than 1.

Calibration results

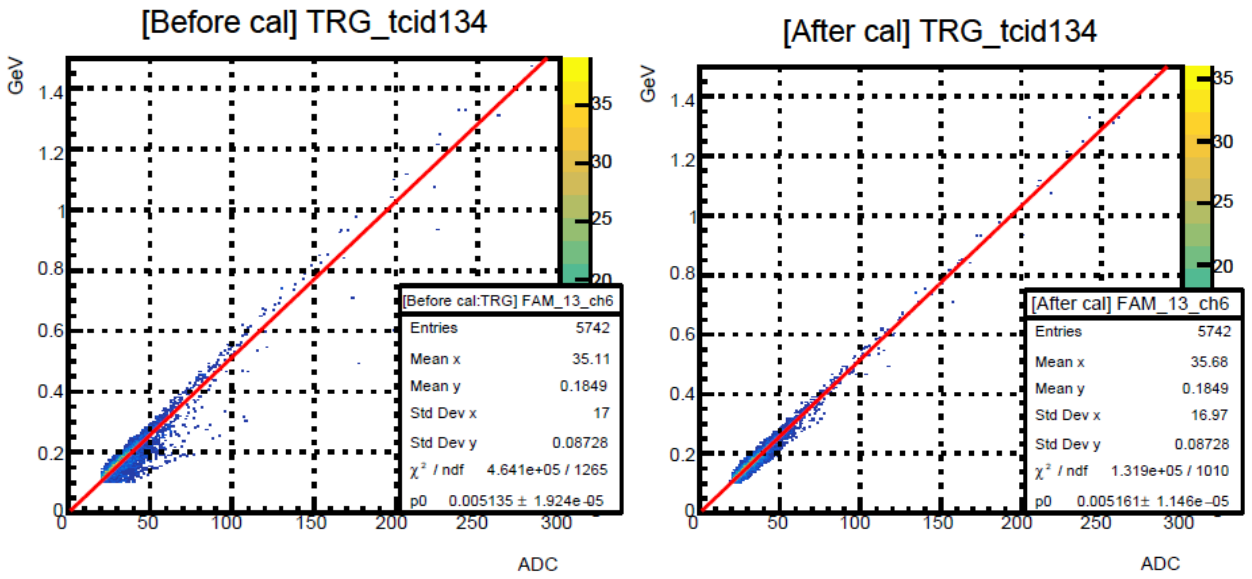


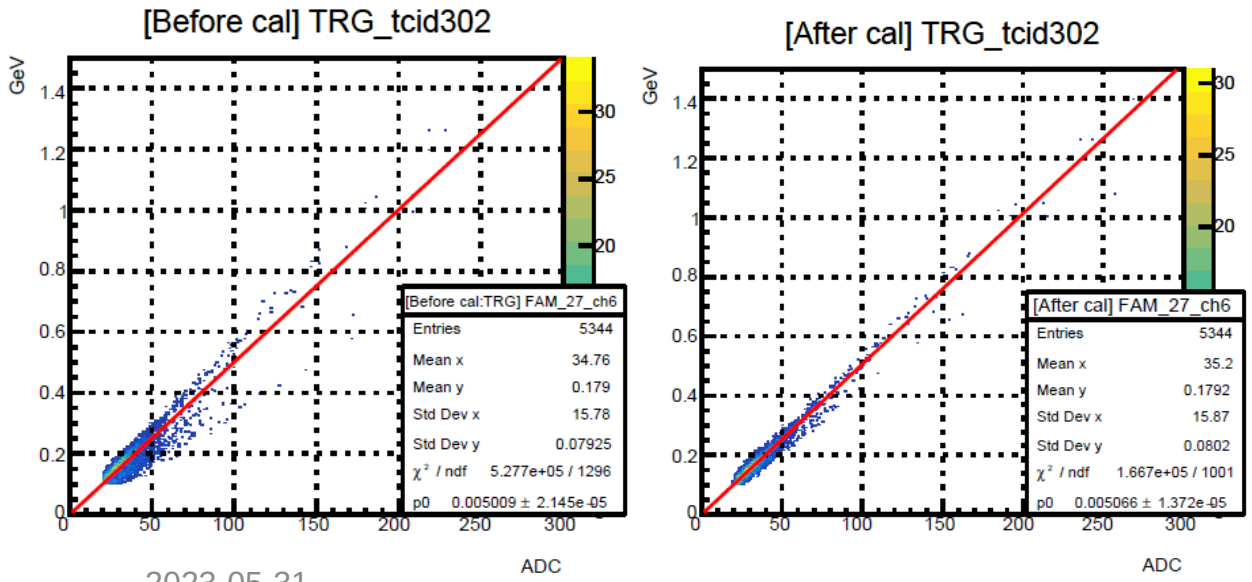




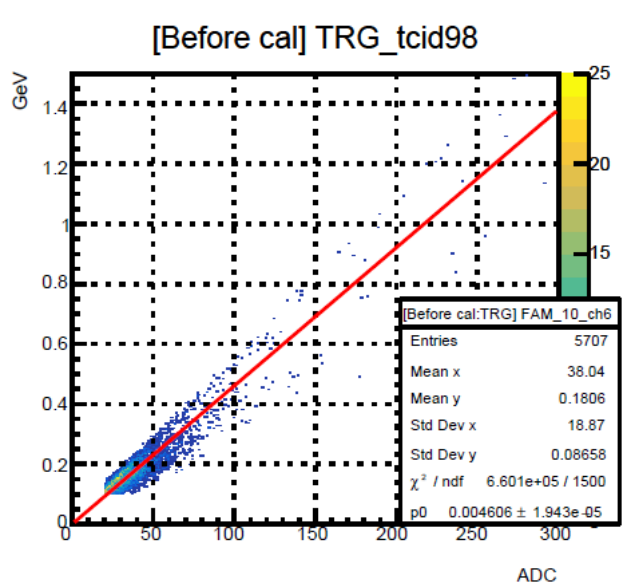
- After calibration, a large distribution near 200 ADC disappeared in second plot,
- Both before and after calibration results show a messy distribution under the line.
- I will check the channels in detail to find out the cause.

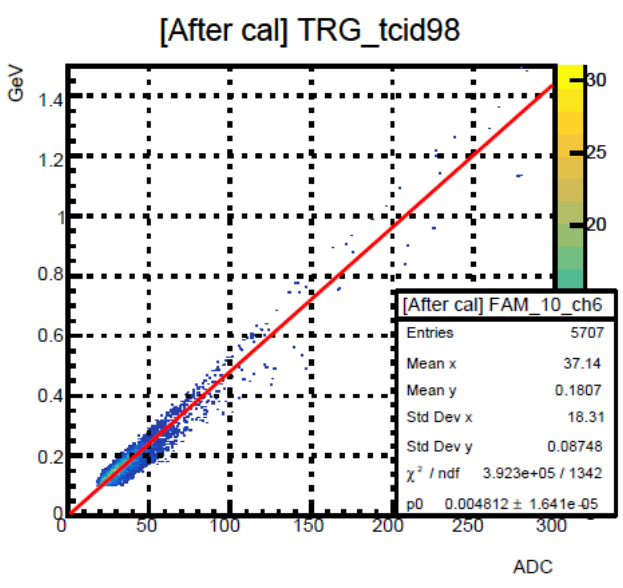
Good results channels

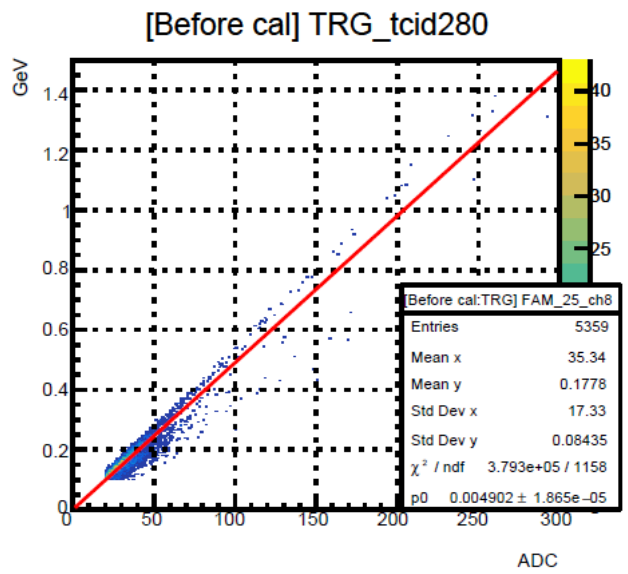


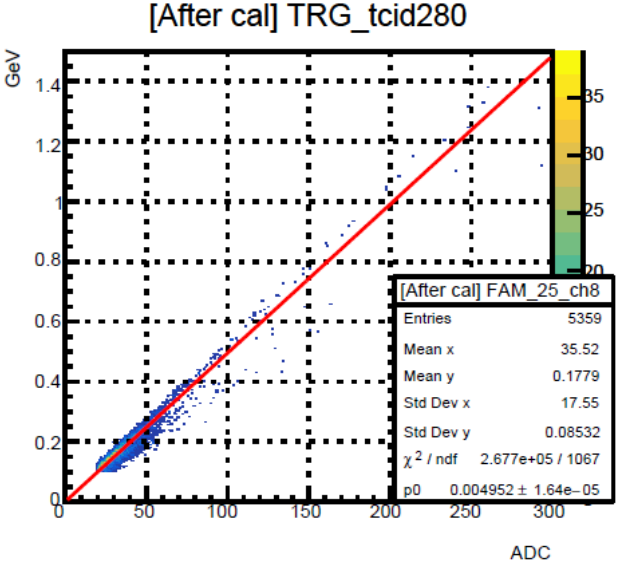


Bad results channels









Summary and Plan

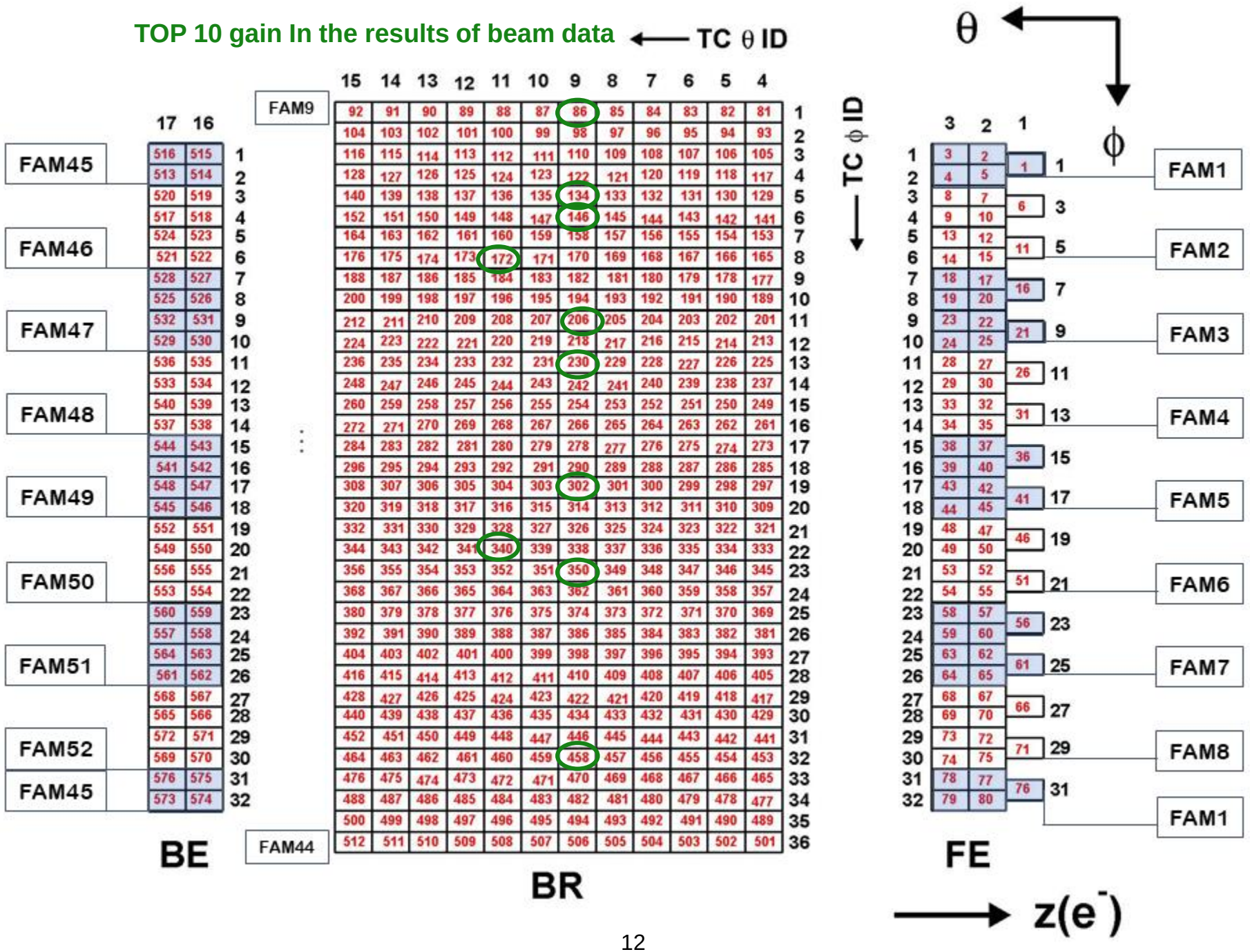
- The jumper setting work is successful as expected.
- There is a problematic channels, but it will be solved through further studies and investigations.
- As a result of the calibration, all channels with a gain of more than 1 disappeared except for one channel.
- But the messy distributions still stand out.
- This may be caused by low statistics or may be caused by the difference between beam run and cosmic run.
- For accurate understanding, we will check how the coefficient has changed for each channel.

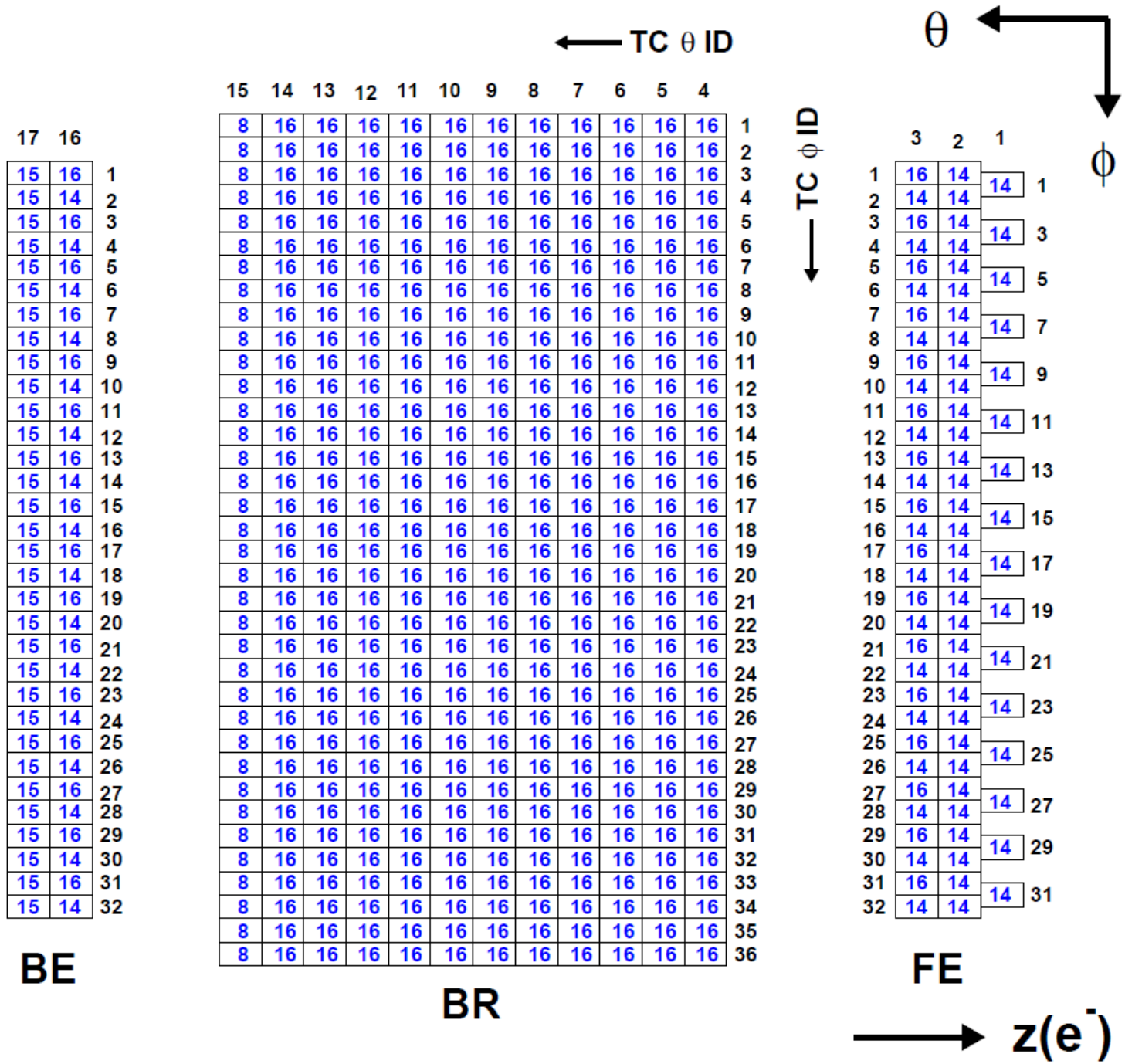
	TCID	CellID	Collector	ShaperID	Channel	Gain_floa	Coefficie	Coefficie	exp24 gain float
1	87	4753	1	7	2	0.506556	45	62	
2	88	5473	1	8	3	0.51889	47	62	
3	86	4034	1	6	5	0.565773	51	62	
4	86	4468	1	6	16	0.638002	56	63	
5	101	6054	2	9	7	0.588708	53	62	
6	98	4182	2	6	6	0.769347	60	63	
7	98	4039	2	6	9	0.882205	62	63	
8	116	7643	3	12	6	0.946166	62	62	0.8814
9	122	4477	4	6	4	0.584999	53	62	
10	128	7646	4	12	4	0.585877	53	63	
11	136	5347	5	8	10	0.54357	50	62	
12	134	4049	5	6	1	0.568857	52	62	
13	134	4483	5	6	12	1.069205	63	63	1.0552
14	160	5497	7	8	3	0.537186	49	62	
15	158	4057	7	6	1	0.549095	50	62	
16	162	6652	7	10	15	0.550119	50	62	
17	164	7514	7	12	3	0.578975	52	62	
18	162	6506	7	10	6	0.910888	62	62	0.8928
19	172	5504	8	8	15	0.599556	54	63	
20	182	4067	9	6	9	0.492729	43	62	
21	196	5367	10	8	10	0.509384	46	62	
22	206	4073	11	6	1	0.643154	56	63	
23	221	6093	12	9	3	0.55483	51	62	
24	218	4511	12	6	12	0.605403	54	62	
25	230	4514	13	6	8	0.609922	54	63	
26	252	3370	15	4	8	0.60777	54	62	
27	252	3371	15	4	12	0.64791	56	62	
28	279	4817	17	7	2	0.619105	55	62	
29	280	5537	17	8	3	0.781048	60	62	
30	289	3671	18	5	10	0.572185	52	62	
31	292	5544	18	8	15	0.641985	56	62	
32	292	5254	18	8	5	0.664618	57	62	
33	285	1654	18	1	8	0.902403	62	62	0.8945
34	302	4538	19	6	8	0.642603	56	62	
35	302	4539	19	6	12	0.698743	58	63	

Backup

TC map

TOP 10 gain In the results of beam data

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Attenuator coefficient and gain

- The calibration constants(β) can be obtained from this equation (3) which is extracted by minimizing (2) χ^2 function (1).
  Following equations are looped over all TCs.

(1) $$f(e^n, E_i^n, \alpha, \beta_i) = \sum_n \left(\alpha e^n - \sum_i \beta_i E_i^n \right)^2$$

(2) $$\frac{\partial f}{\partial \beta_i} = -2 \sum_n \left(\alpha e^n - \sum_j \beta_j E_j^n \right) E_i^n = 0$$

(3) $$\sum_n \alpha e^n E_i^n = \sum_n \sum_j \beta_j E_j^n E_i^n$$

e : TC energy (ADC) from ECLTRG data

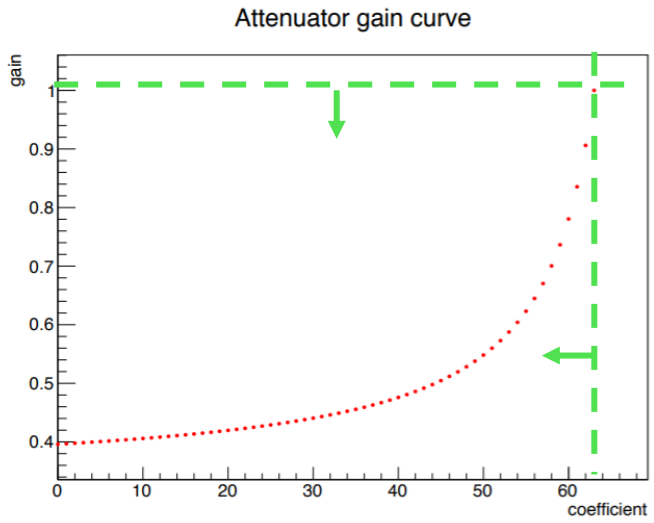
E : ECL Xtal energy in TC (GeV) from ECL data

α : ADC to energy conversion factor (MeV/ADC)

β : Gain ratio = new gain / old gain

n : Index of TC ID

i, j : Index for xtal(cell) ID in one TC



Gain ratio (β) = New gain / old gain

- Continuous gain by calculating matrix (eq (3))
- Discrete gain by matching attenuator coefficient

$$Gain = \frac{1 + \frac{470}{2500\left(1 - \frac{Att}{63}\right) + 240}}{1 + \frac{470}{240}}$$

This discrete gain (as attenuator coefficient) is stored in the ShaperDSP(potentiometer).

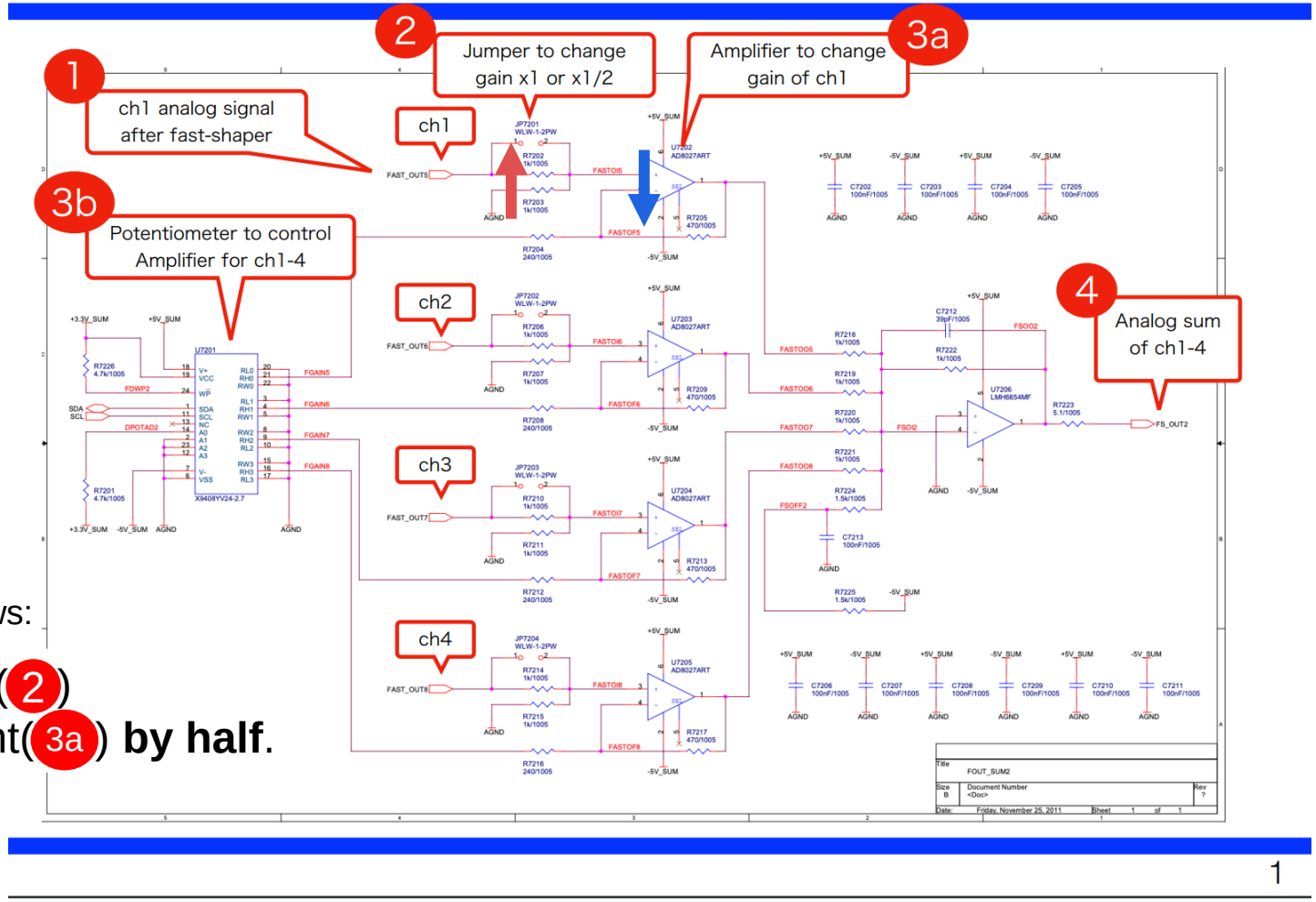
How to calibrate ECLTRG energy

- **Attenuator coefficient (6 bit)** is downloaded by ECL server to (3b) the “potentiometer”
- Based on the coefficient, the potentiometer changes voltage value in (3a) “**amplifier**” and then the gain of (1) is changed.
- At (4), analog sum for ch1-4 is done.
- Note that gain is changed by factor 2 with jumper ON and OFF at (2).

※ The relationship btw the jumper and the coefficient is as follows:

- **Doubling** the gain by using the jumper-change(2) reduces the corresponding attenuator coefficient(3a) **by half**.

The schematic of ShaperDSP

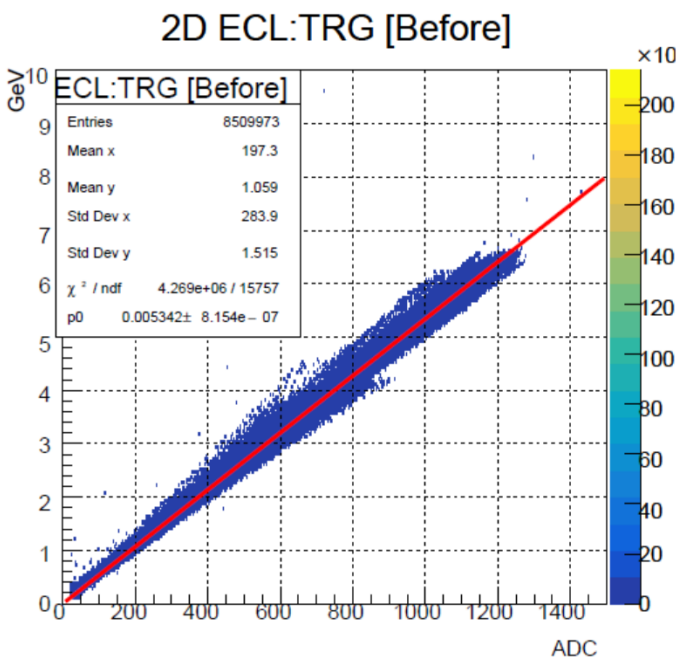


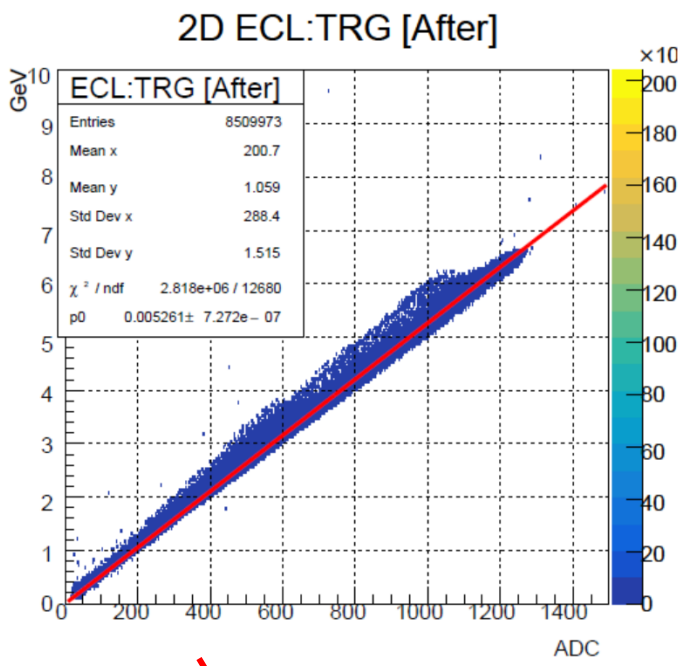
2D plot for ECLTRG TC(E) vs ECL TC(E)

bhabha+hadron skim

data size : **1.0/fb**

TC (E) cut used for matrix calculation : TC (E) > 30 ADC



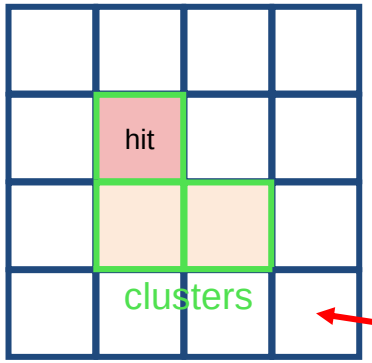


For detail check, channels with a gain of more than 1 were investigated.

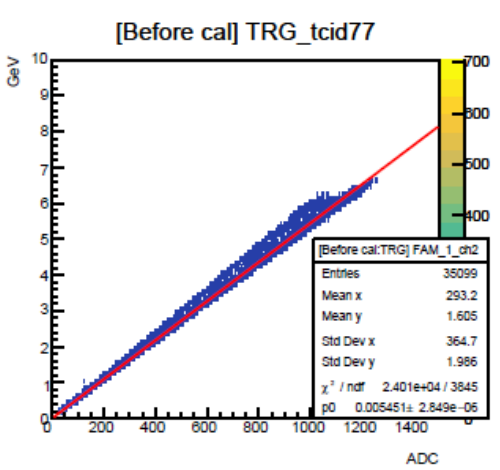
(Example Channel TCID77)

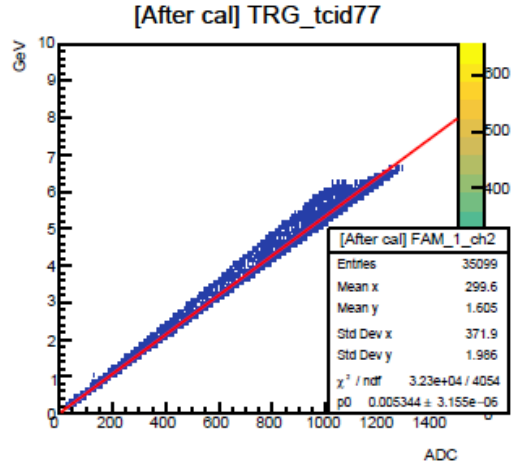
cellID 379 in TC 77 has gain 1.1686.

1 TC (16 Cells)

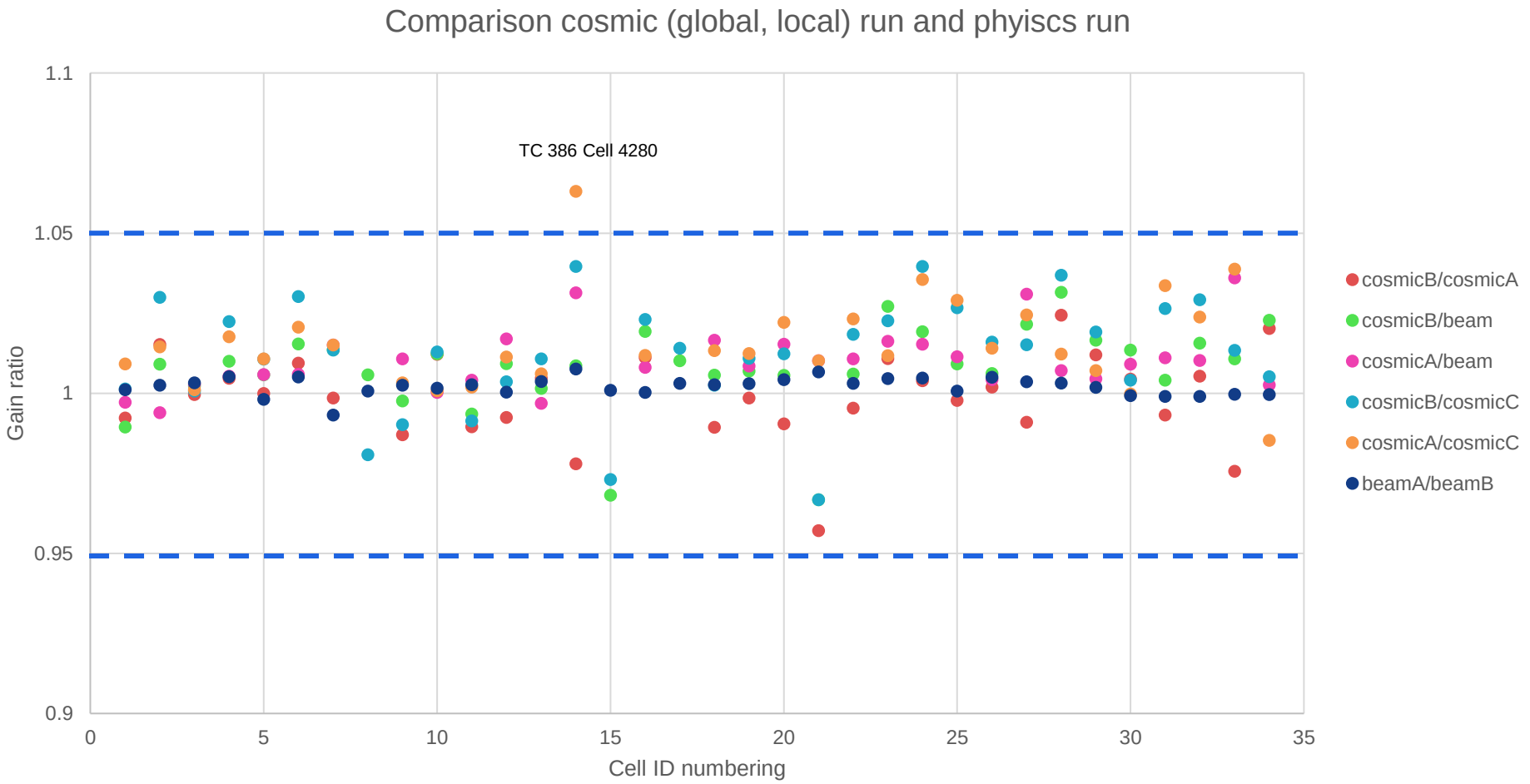


1 Cell





Comparison different type's runs (consistency check)



cosmicA : local cosmic run
(e27 after changing 3ch's jumpers)
cosmicB : local cosmic run
(e27 before changing 3ch's jumpers)
cosmicC : global cosmic run (2021b)
BeamA : physics run (2022a)
BeamB : physics run (2021c)

- The physics run's gain ratio are within 1%.
- The difference between Local, Global Cosmic and Physics run is constant within about 5%.
- TCID386 (CellID4280) showed 6% gain shift in cosmicA/cosmicC, but no work (ex, SDSP change) was performed during cosmicA, B and C.

(There were enough statistics, no abnormally high energy problems, and the correction was good. From C to A, naturally? the gain value seems to have increased little by little by 4% + 2%.)

Table of channel lists for continuous gain >=0.9

	TCID	CellID	Collector	ShaperID	Channel	Coefficient
1	86	4034	1	6	5	63
2	86	4468	1	6	16	63
3	87	4753	1	7	2	62
4	88	5473	1	8	3	62
5	98	4182	2	6	6	63
6	98	4039	2	6	9	63
7	101	6054	2	9	7	62
8	110	4042	3	6	5	62
9	122	4477	4	6	4	62
10	128	7646	4	12	4	63
11	134	4049	5	6	1	62
12	134	4483	5	6	12	63
13	136	5347	5	8	10	62
14	146	4197	6	6	2	63
15	146	4054	6	6	5	63
16	146	4055	6	6	9	63
17	146	4056	6	6	13	62
18	146	4200	6	6	14	62
19	149	6072	6	9	15	62
20	150	6503	6	10	10	62
21	158	4057	7	6	1	62
22	160	5497	7	8	3	62
23	162	6652	7	10	15	62
24	164	7514	7	12	3	62
25	172	5504	8	8	15	63
26	182	4067	9	6	9	62
27	196	5367	10	8	10	62
28	206	4073	11	6	1	63
29	218	4511	12	6	12	62
30	221	6093	12	9	3	62
31	230	4514	13	6	8	63
32	252	3370	15	4	8	62
33	252	3371	15	4	12	63
34	279	4817	17	7	2	62
35	280	5537	17	8	3	62
36	289	3671	18	5	10	62
37	292	5254	18	8	5	62
38	292	5544	18	8	15	63
39	302	4538	19	6	8	63
40	302	4539	19	6	12	63
41	314	4541	20	6	4	62
42	319	7423	20	11	12	62
43	326	4547	21	6	12	62
44	327	4692	21	7	13	62
45	328	5555	21	8	11	62
46	329	6129	21	9	3	62
47	330	6852	21	10	16	63
48	338	4117	22	6	1	63
49	340	5560	22	8	15	63
50	342	6854	22	10	8	62
51	350	4123	23	6	9	63
52	352	5561	23	8	3	63
53	360	3408	24	4	16	63
54	372	3412	25	4	16	62
55	374	4275	25	6	10	62
56	384	3413	26	4	4	62
57	386	4280	26	6	14	63
58	390	6870	26	10	8	63
59	400	5578	27	8	7	62
60	401	5867	27	9	9	62

	TCID	CellID	Collector	ShaperID	Channel	Coefficient
61	408	3424	28	4	16	62
62	414	6878	28	10	8	63
63	420	3425	29	4	4	62
64	434	4440	30	6	15	62
65	446	4156	31	6	13	62
66	457	4014	32	5	8	62
67	457	4015	32	5	12	63
68	458	4160	32	6	13	63
69	470	4161	33	6	1	62
70	470	4164	33	6	13	62
71	484	5606	34	8	7	63
72	484	5608	34	8	15	63
73	487	7479	34	11	12	62
74	496	5609	35	8	3	63
75	496	5467	35	8	10	62
76	509	6192	36	9	15	62
77	76	95	37	1	4	63
78	77	379	37	2	5	63
79	1	50	37	6	4	63
80	8	878	38	3	14	62
81	12	233	38	7	1	62
82	16	59	39	1	4	63
83	18	789	39	3	12	63
84	22	313	39	7	5	63
85	25	244	39	10	2	62
86	26	64	40	1	5	63
87	27	319	40	2	5	63
88	31	188	40	6	12	62
89	32	325	40	7	5	63
90	34	1070	40	9	16	62
91	36	189	41	1	11	62
92	36	192	41	1	12	63
93	37	331	41	2	5	63
94	39	815	41	4	12	62
95	41	193	41	6	11	62
96	42	337	41	7	5	63
97	43	819	41	8	12	63
98	44	821	41	9	12	62
99	49	1097	42	4	16	62
100	66	89	44	1	4	62
101	67	277	44	2	1	62
102	71	92	44	6	4	63
103	73	855	44	8	12	62
104	573	8608	45	1	5	62
105	575	7912	45	3	14	63
106	575	8060	45	3	15	62
107	514	8070	45	6	4	62
108	514	8068	45	6	6	63
109	518	8074	46	2	6	63
110	519	8072	46	3	5	63
111	522	8080	46	6	6	63
112	525	8560	47	1	5	63
113	527	8083	47	3	6	62
114	527	7805	47	3	13	62
115	530	8092	47	6	6	63
116	531	7959	47	7	8	62
117	534	7974	48	2	7	63
118	534	7827	48	2	14	63
119	538	8104	48	6	6	62
120	538	7983	48	6	7	62

	TCID	CellID	Collector	ShaperID	Channel	Coefficient
121	539	8101	48	7	6	62
122	539	7835	48	7	16	63
123	540	8485	48	8	9	63
124	542	7847	49	2	12	63
125	542	7846	49	2	13	63
126	543	8107	49	3	6	62
127	547	8113	49	7	8	62
128	551	8119	50	3	6	63
129	555	8125	50	7	6	63
130	559	8131	51	3	6	62
131	560	8589	51	4	6	62
132	562	7892	51	6	12	62
133	563	8137	51	7	6	62
134	564	8593	51	8	6	63
135	567	8143	52	3	6	62
136	568	8725	52	4	2	63
137	568	8662	52	4	3	63
138	568	8597	52	4	6	63
139	569	8732	52	5	1	63
140	569	8667	52	5	4	63
141	571	8149	52	7	6	62
142	571	7907	52	7	16	62
143	572	8666	52	8	3	63
144	572	8601	52	8	6	63

Total channel's number(#) : 144 /8736

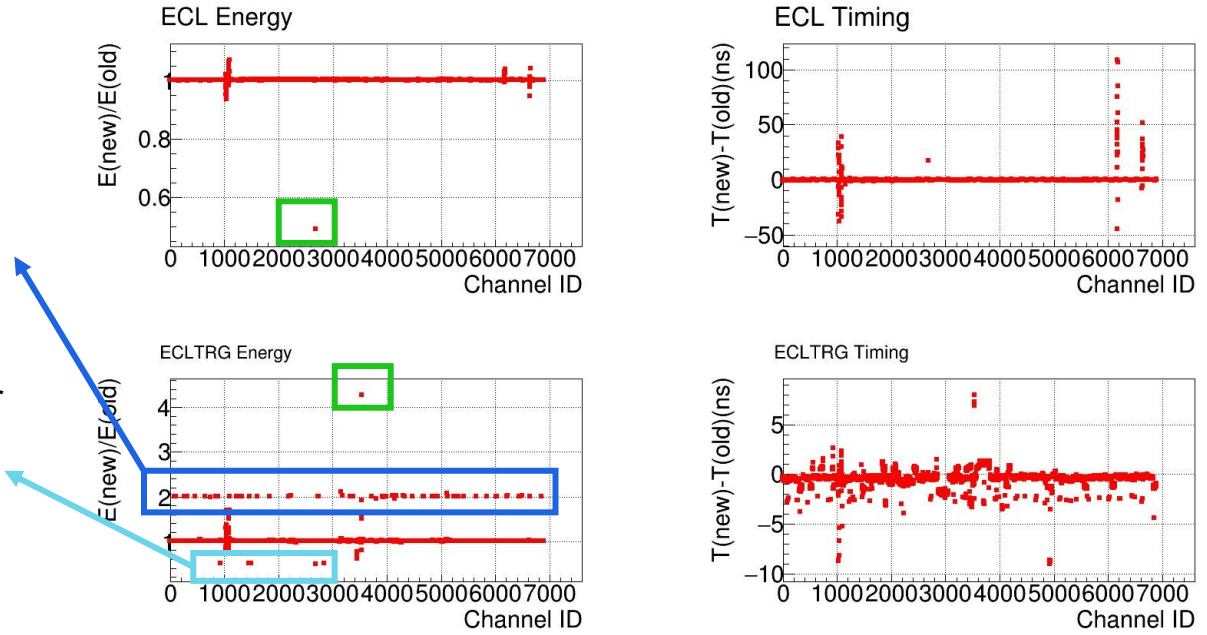
SDSP boards # : 117
BR # : 62
FW # : 24
BW # : 31

Status of the jumper work

- All channels are jumper-changed successfully,
  so, the gain of chs that changed jumper become doubled.
  (Currently, the end cap side cannot be checked,
  79 channels were checked in the barrel.)

- The 6 channels' gain was halved: the channels did the jumper test last year but returned to the jumper settings.

- During the jumper change, there was a channel 'Crate5 SDSP6ch12' with jumper setting already turned on.
  The jumper setting was done on 2018/09/07 but the gain is exceeded 1. this channels need to check continuously.

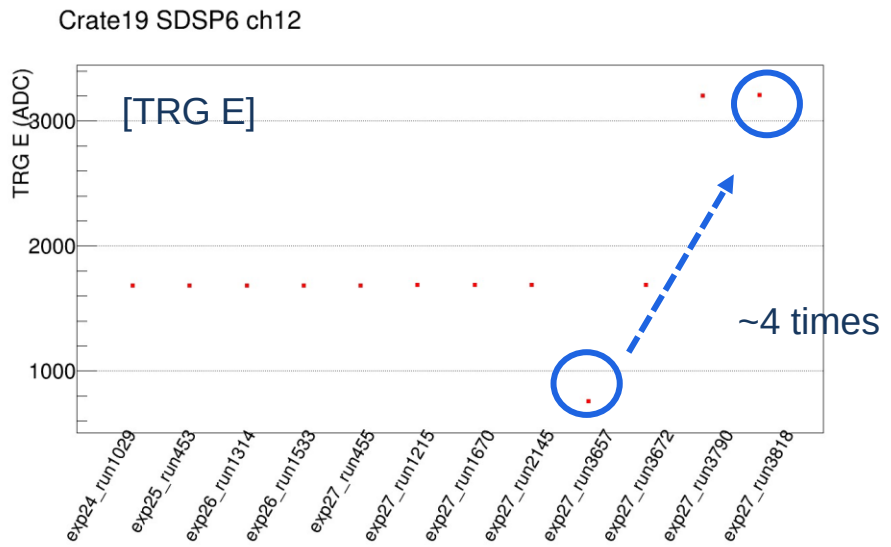


exp 27 run 3818 (after jumper change) vs exp 27 run 3657 (before jumper change)

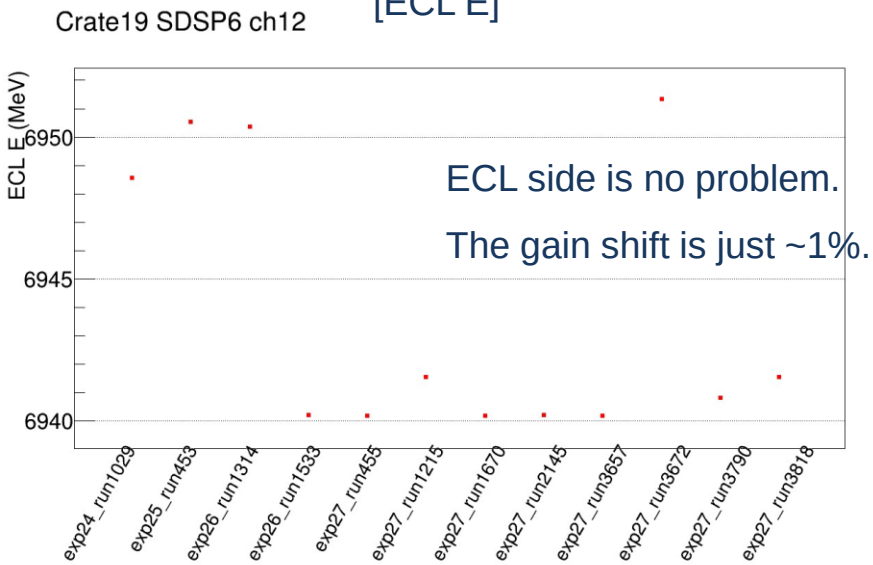
- Green box in the plots above:
  - [ECL] Crate15 SDSP1 ch11 was problem and it is fixed by Alex and Yuriy on 5/26.
  - [TRG] Crate19 SDSP 6 ch12 shows gain ratio ~4.

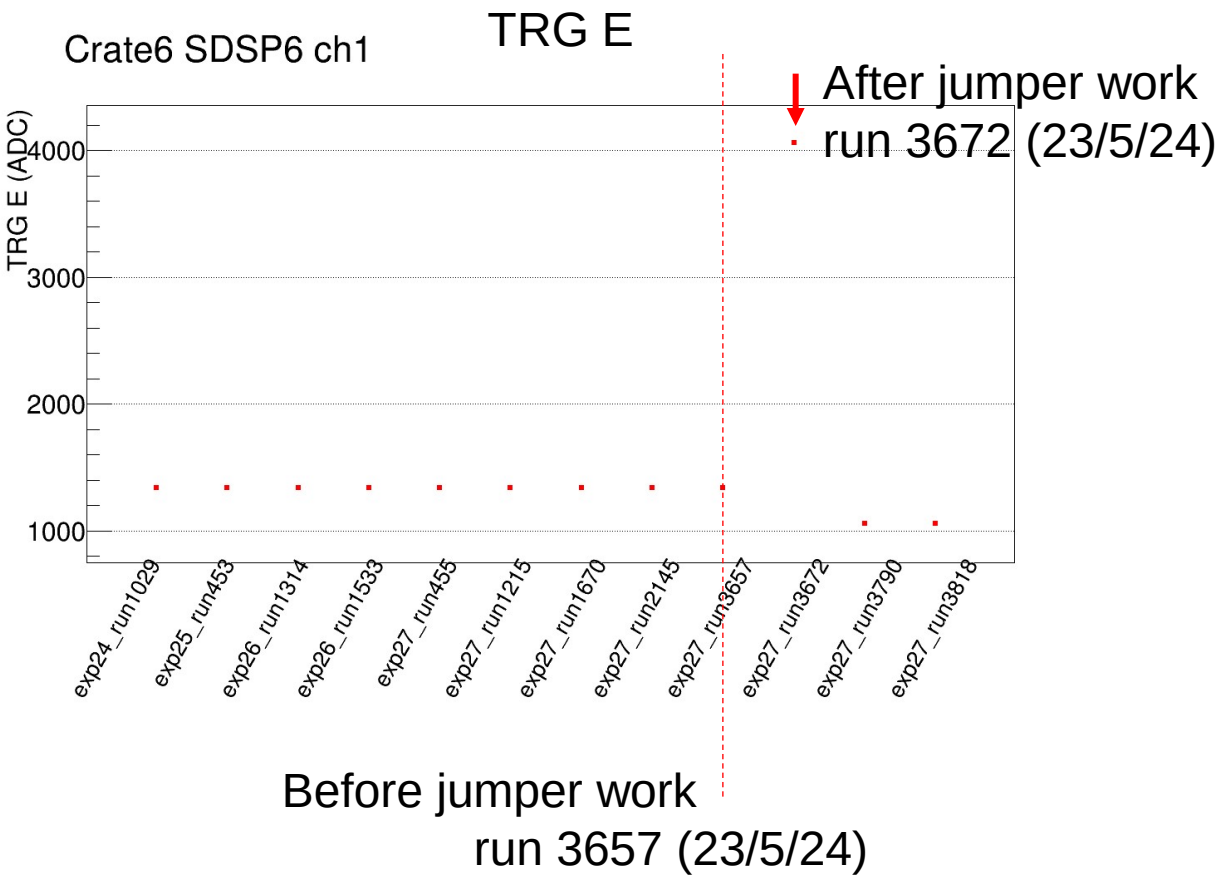
    At run3657 the energy was temporarily low and since then the gain has been doubled by the jumper setting on. The difference made the gain seem to have jumped four times, but there is no problem, I think.

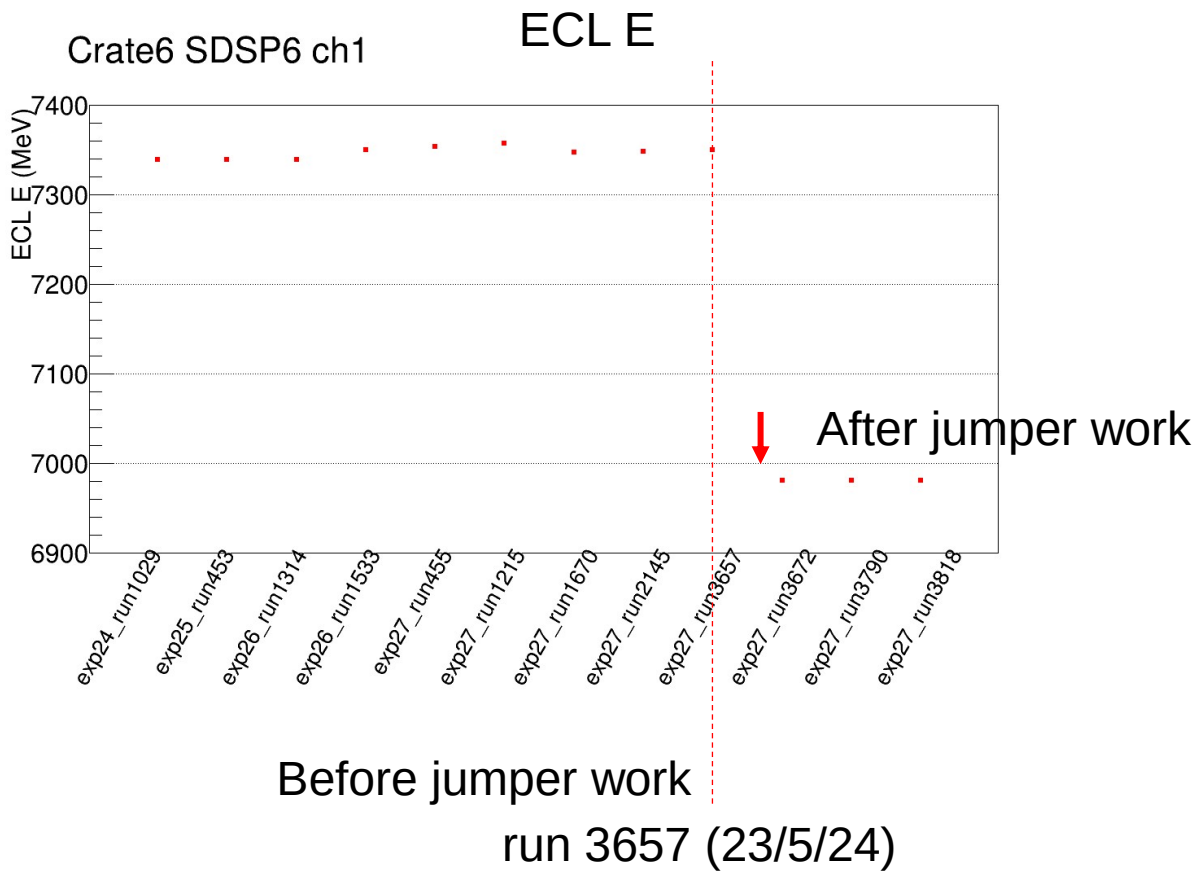
  - [TRG] Crate6 SDSP6 ch1 also has same situation. (next page)



[ECL E]

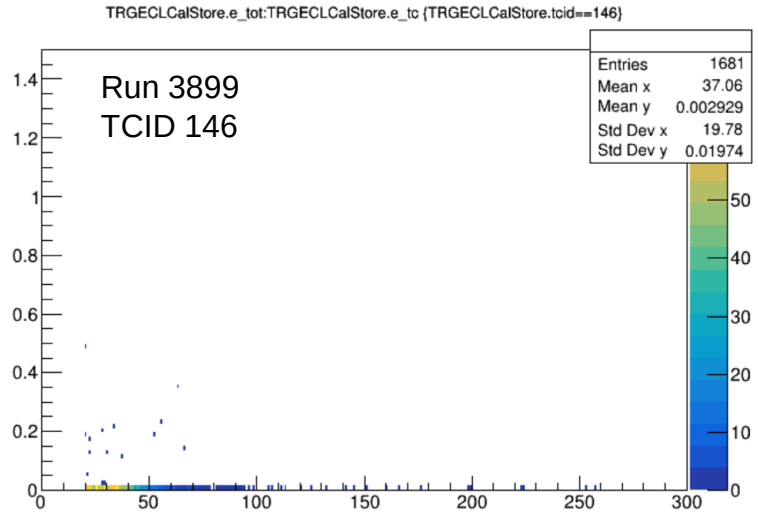


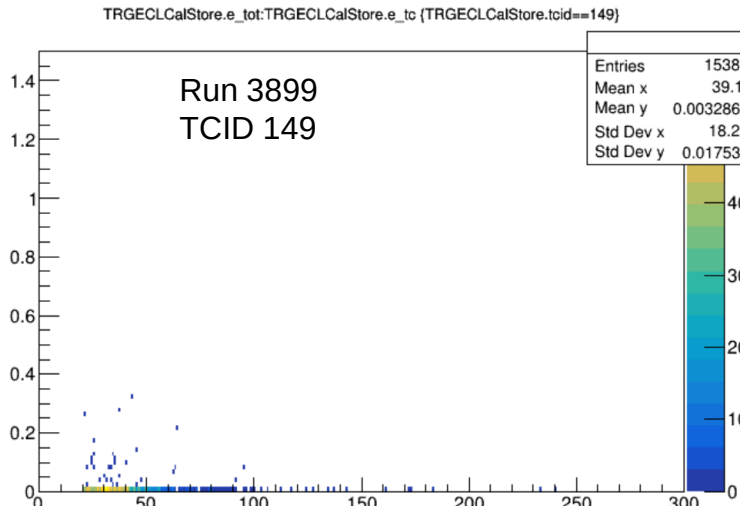


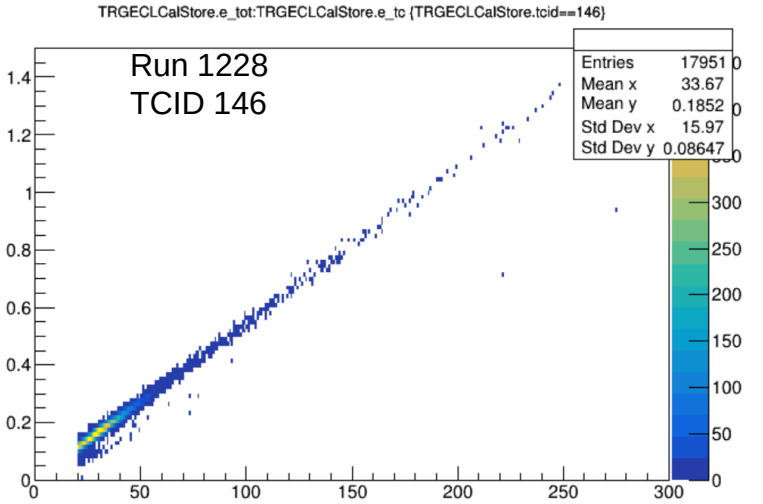


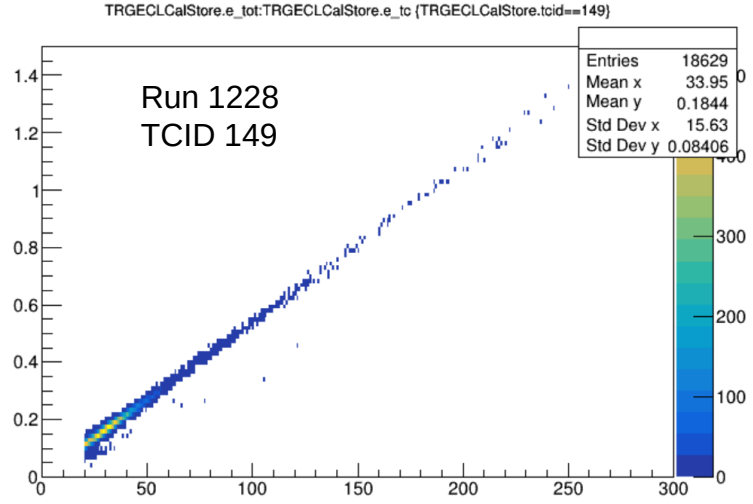
- TRG E suddenly tripled at run 3672.
- At the same time, ECL E has lower about 3% since run 3672.
- Is the reason why TRG E has changed momentarily because of ECL E?

Problematic channels



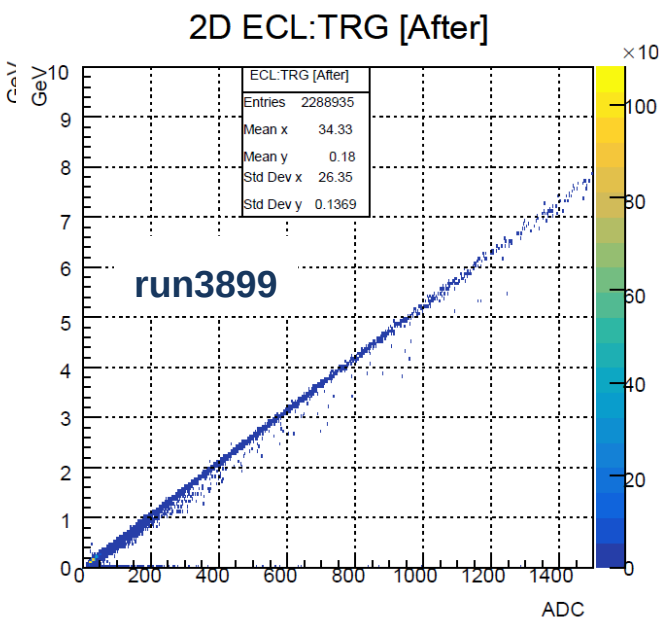


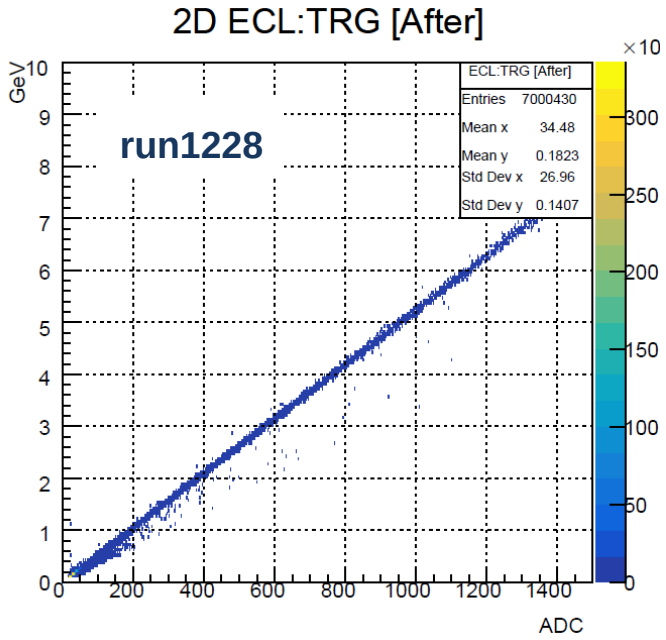




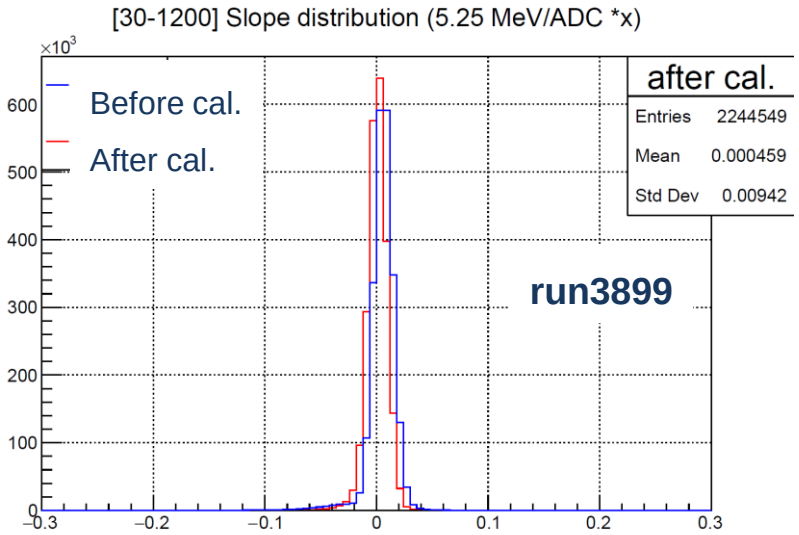
	TCID	CellID	Collector	ShaperID	Channel	Gain_float	Coefficient
1	134	4483	5	6	12	1.069205	63
2	146	4053	**6**	**6**	1	inf	63
3	146	4197	**6**	**6**	2	inf	63
4	146	4341	**6**	**6**	3	inf	63
5	146	4485	**6**	**6**	4	4417.091	63
6	146	4054	**6**	**6**	5	inf	63
7	146	4198	**6**	**6**	6	inf	63
8	146	4342	**6**	**6**	7	inf	63
9	146	4486	**6**	**6**	8	inf	63
10	146	4055	**6**	**6**	9	inf	63
11	146	4199	**6**	**6**	10	inf	63
12	146	4343	**6**	**6**	11	inf	63
13	146	4487	**6**	**6**	12	inf	63
14	146	4056	**6**	**6**	13	80.94726	63
15	146	4200	**6**	**6**	14	103.3302	63
16	146	4344	**6**	**6**	15	115.1593	63
17	146	4488	**6**	**6**	16	73.3781	63
18	149	5781	**6**	**9**	1	inf	63
19	149	5925	**6**	**9**	2	inf	63
20	149	6069	**6**	**9**	3	inf	63
21	149	6213	**6**	**9**	4	inf	63
22	149	5782	**6**	**9**	5	inf	63
23	149	5926	**6**	**9**	6	inf	63
24	149	6070	**6**	**9**	7	inf	63
25	149	6214	**6**	**9**	8	inf	63
26	149	5783	**6**	**9**	9	inf	63
27	149	5927	**6**	**9**	10	inf	63
28	149	6071	**6**	**9**	11	inf	63
29	149	6215	**6**	**9**	12	inf	63
30	149	5784	**6**	**9**	13	inf	63
31	149	5928	**6**	**9**	14	inf	63
32	149	6072	**6**	**9**	15	inf	63
33	149	6216	**6**	**9**	16	inf	63

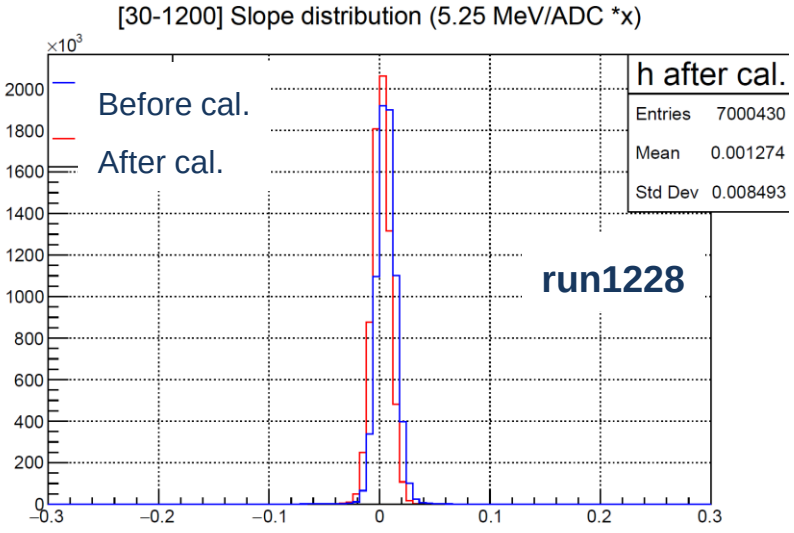
Comparing the calibration results with the slope distribution





- There are many messy distributions under the line.
  and this phenomenon shows in other cosmic runs too.
- When comparing the distribution of slope for each run,
  the distribution of run1228 with a higher entries is cleaner.





Continuous gain table for channels changed jumper setting

	TCID	CellID	Collector	ShaperID	Channel	Gain_floa	Coefficie	Coefficie	exp24 gain float
1	87	4753	1	7	2	0.506556	45	62	
2	88	5473	1	8	3	0.51889	47	62	
3	86	4034	1	6	5	0.565773	51	62	
4	86	4468	1	6	16	0.638002	56	63	
5	101	6054	2	9	7	0.588708	53	62	
6	98	4182	2	6	6	0.769347	60	63	
7	98	4039	2	6	9	0.882205	62	63	
8	116	7643	3	12	6	0.946166	62	62	0.8814
9	122	4477	4	6	4	0.584999	53	62	
10	128	7646	4	12	4	0.585877	53	63	
11	136	5347	5	8	10	0.54357	50	62	
12	134	4049	5	6	1	0.568857	52	62	
13	134	4483	5	6	12	1.069205	63	63	1.0552
14	160	5497	7	8	3	0.537186	49	62	
15	158	4057	7	6	1	0.549095	50	62	
16	162	6652	7	10	15	0.550119	50	62	
17	164	7514	7	12	3	0.578975	52	62	
18	162	6506	7	10	6	0.910888	62	62	0.8928
19	172	5504	8	8	15	0.599556	54	63	
20	182	4067	9	6	9	0.492729	43	62	
21	196	5367	10	8	10	0.509384	46	62	
22	206	4073	11	6	1	0.643154	56	63	
23	221	6093	12	9	3	0.55483	51	62	
24	218	4511	12	6	12	0.605403	54	62	
25	230	4514	13	6	8	0.609922	54	63	
26	252	3370	15	4	8	0.60777	54	62	
27	252	3371	15	4	12	0.64791	56	62	
28	279	4817	17	7	2	0.619105	55	62	
29	280	5537	17	8	3	0.781048	60	62	
30	289	3671	18	5	10	0.572185	52	62	
31	292	5544	18	8	15	0.641985	56	62	
32	292	5254	18	8	5	0.664618	57	62	
33	285	1654	18	1	8	0.902403	62	62	0.8945
34	302	4538	19	6	8	0.642603	56	62	
35	302	4539	19	6	12	0.698743	58	63	

	TCID	CellID	Collector	ShaperID	Channel	Gain_floa	Coefficie	Coefficie	exp24 gain float
36	314	4541	20	6	4	0.614752	55	62	
37	319	7423	20	11	12	0.678154	57	63	
38	327	4692	21	7	13	0.567931	52	62	
39	326	4547	21	6	12	0.581643	53	62	
40	329	6129	21	9	3	0.583245	53	62	
41	328	5555	21	8	11	0.592848	53	62	
42	330	6852	21	10	16	0.658102	57	63	
43	342	6854	22	10	8	0.606395	54	62	
44	338	4117	22	6	1	0.64322	56	63	
45	340	5560	22	8	15	0.748252	59	63	
46	352	5561	23	8	3	0.557975	51	62	
47	350	4123	23	6	9	0.664208	57	63	
48	360	3408	24	4	16	0.578478	52	62	
49	374	4275	25	6	10	0.500048	44	62	
50	372	3412	25	4	16	0.690897	58	62	
51	390	6870	26	10	8	0.539421	49	62	
52	386	4280	26	6	14	0.543784	50	62	
53	384	3413	26	4	4	0.577829	52	62	
54	400	5578	27	8	7	0.512858	46	62	
55	401	5867	27	9	9	0.51873	47	62	
56	404	7595	27	12	5	0.911304	62	62	0.8956
57	408	3424	28	4	16	0.531037	48	62	
58	414	6878	28	10	8	0.616722	55	63	
59	420	3425	29	4	4	0.540294	49	62	
60	434	4440	30	6	15	0.52814	48	62	
61	458	4160	32	6	13	0.633655	55	63	
62	457	4014	32	5	8	0.70534	58	62	
63	457	4015	32	5	12	0.749609	59	63	
64	470	4161	33	6	1	0.643342	56	62	
65	470	4164	33	6	13	0.664159	57	62	
66	487	7479	34	11	12	0.598902	54	62	
67	484	5608	34	8	15	0.654315	56	62	
68	484	5606	34	8	7	0.685725	58	62	
69	482	4165	34	6	1	0.91948	62	62	0.8975
70	496	5467	35	8	10	0.610828	54	62	
71	496	5609	35	8	3	0.63244	55	62	
72	501	1726	36	1	8	0.906723	62	62	0.8975