SciBar MA-PMT (Multi Anode PMT) Cross-talk Measurement

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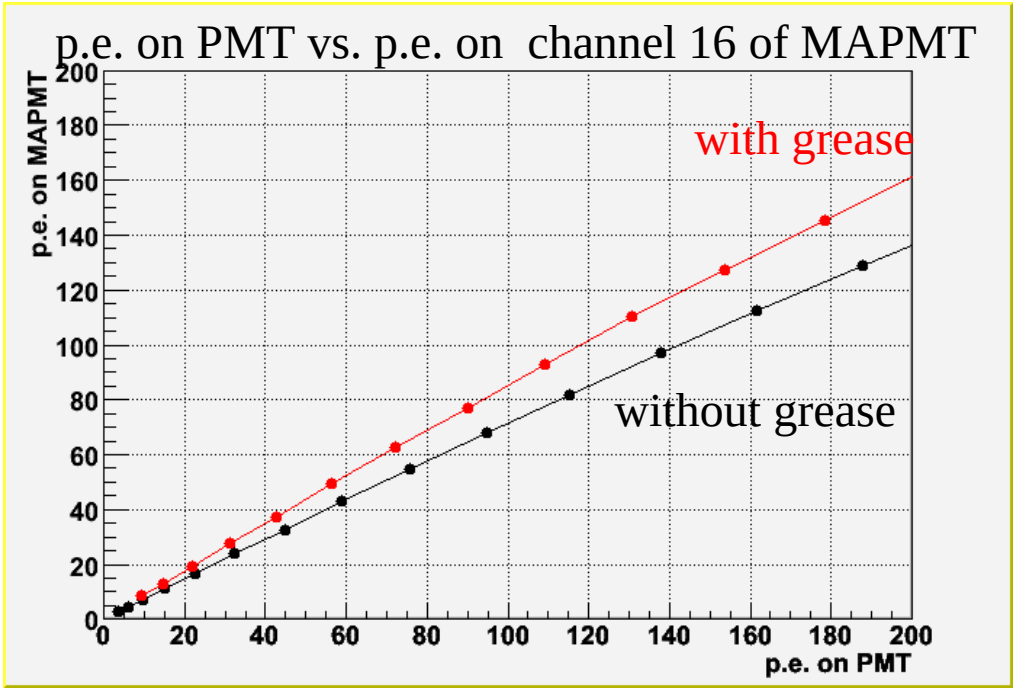
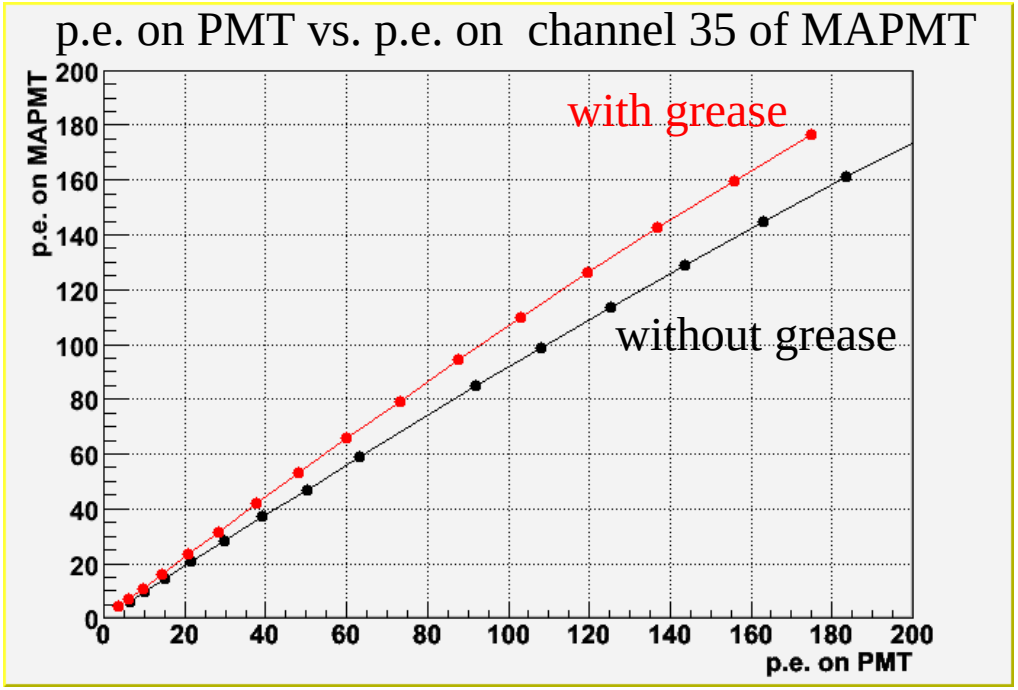
Number of p.e. on MAPMT





With grease, number of p.e. increases 18% in average.

Average of Cross-talk Value

0	1	2	3	4	5	6	7
8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23
24	25	26	27	28	29	30	31
32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47
48	49	50	51	52	53	54	55
56	57	58	59	60	61	62	63

without grease

0.1	0.2	0.3	0.2	0.1
0.1	0.7	3.3	0.9	0.3
0.2	2.8		2.9	0.3
0.3	0.8	3.6	0.7	0.1
0.0	0.1	0.2	0.0	0.0

with grease

0.1	0.2	0.1	0.1	0.1
0.0	0.9	3.6	0.9	0.1
0.1	2.8		4.1	0.2
0.0	0.8	4.8	0.8	0.0
0.0	0.1	0.2	0.1	0.0

error ~0.4%

Summary

- Number of p.e. increases about 18% with optical grease.

- I divided 64 channel MAPMT into 9 sections and calculated average of cross-talk value.

- Cross-talk value was larger with optical grease than that without optical grease.
(increases 40% at maximum.)

backup

Average of Cross-talk Value

0	1	2	3	4	5	6	7
8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23
24	25	26	27	28	29	30	31
32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47
48	49	50	51	52	53	54	55
56	57	58	59	60	61	62	63

without grease

0.4	2.6		3.5	0.4
0.2	1.2	5.2	0.8	0.2
0.1	0.4	0.5	0.3	0.1

with grease

0.3	2.7		3.4	0.4
0.2	1.2	6.0	0.9	0.2
0.2	0.5	0.5	0.2	0.1

Average of Cross-talk Value

0	1	2	3	4	5	6	7
8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23
24	25	26	27	28	29	30	31
32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47
48	49	50	51	52	53	54	55
56	57	58	59	60	61	62	63

without grease

0.1	0.6	0.8	0.3	0.1
0.3	1.1	4.3	1.0	0.1
0.5	3.6		4.0	0.4

with grease

0.0	0.7	0.3	0.3	0.0
0.2	1.0	5.4	1.0	0.1
0.4	3.8		4.6	0.3

Average of Cross-talk Value

0	1	2	3	4	5	6	7
8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23
24	25	26	27	28	29	30	31
32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47
48	49	50	51	52	53	54	55
56	57	58	59	60	61	62	63

without grease

0.3	0.3	0.3
3.2	1.1	0.3
	4.5	0.4
4.3	1.1	0.3
0.3	0.2	0.1

with grease

0.3	0.3	0.2
3.3	1.1	0.4
	4.5	0.5
5.8	1.0	0.4
0.4	0.2	0.2

Average of Cross-talk Value

0	1	2	3	4	5	6	7
8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23
24	25	26	27	28	29	30	31
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48	49	50	51	52	53	54	55
56	57	58	59	60	61	62	63

without grease

0.1	0.2	0.4
0.3	1.0	4.0
0.6	2.5	
0.2	0.8	4.7
0.1	0.1	0.3

with grease

0.2	0.2	0.4
0.3	1.0	4.4
0.5	2.9	
0.3	0.8	5.7
0.1	0.1	0.4

Cross-talk Value of Corner of MAPMT

without grease

	2.8	0.6
5.2	0.7	0.4
0.9	0.4	0.4

with grease

	3.6	0.5
5.2	0.7	0.1
0.8	0.4	0.3

0	1	2	3	4	5	6	7
8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23
24	25	26	27	28	29	30	31
32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47
48	49	50	51	52	53	54	55
56	57	58	59	60	61	62	63

without grease

0.4	3.3	
0.5	1.0	4.9
0.2	0.8	0.6

with grease

0.3	3.7	
0.4	1.0	5.5
0.2	0.9	0.6

Cross-talk Value of Corner of MAPMT

without grease

0.4	0.4	0.1
3.4	0.1	0.2
	4.1	0.3

with grease

0.3	0.4	0.1
4.1	1.0	0.2
	5.8	0.3

0	1	2	3	4	5	6	7
8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23
24	25	26	27	28	29	30	31
32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47
48	49	50	51	52	53	54	55
56	57	58	59	60	61	62	63

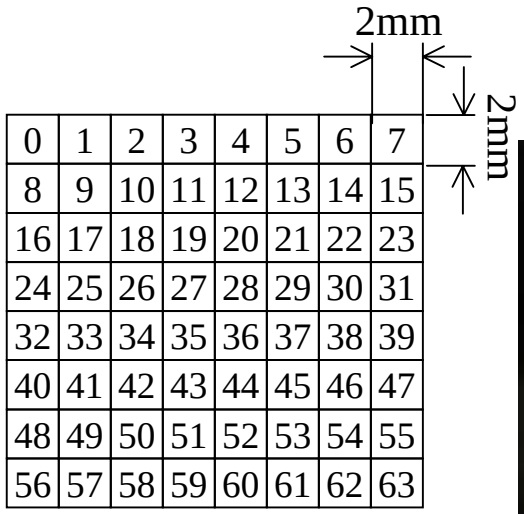
without grease

0.1	0.1	0.6
0.2	0.8	3.1
0.2	2.7	

with grease

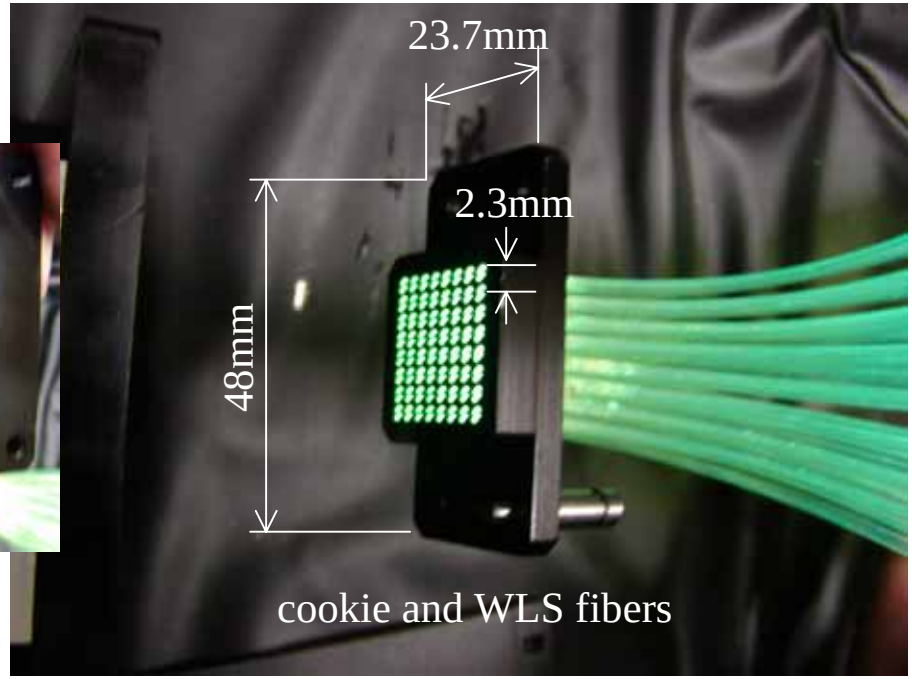
0.2	0.2	0.7
0.2	0.7	3.8
0.3	3.1	

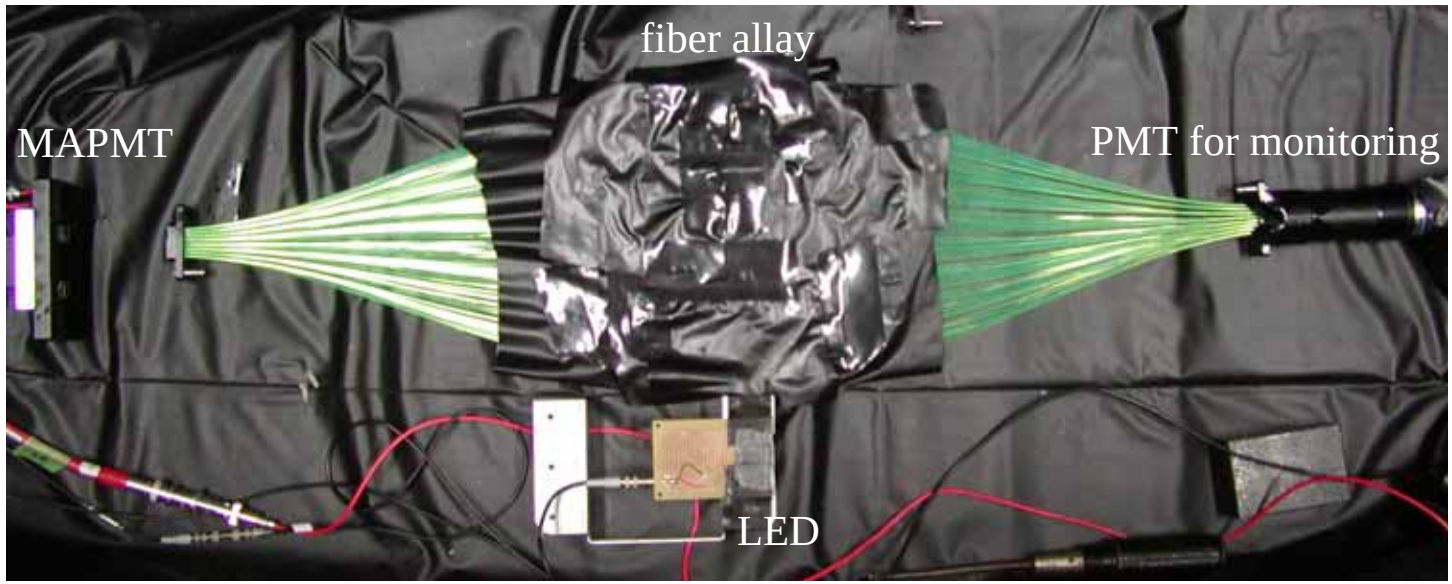
Setup for Cross-talk Measurement



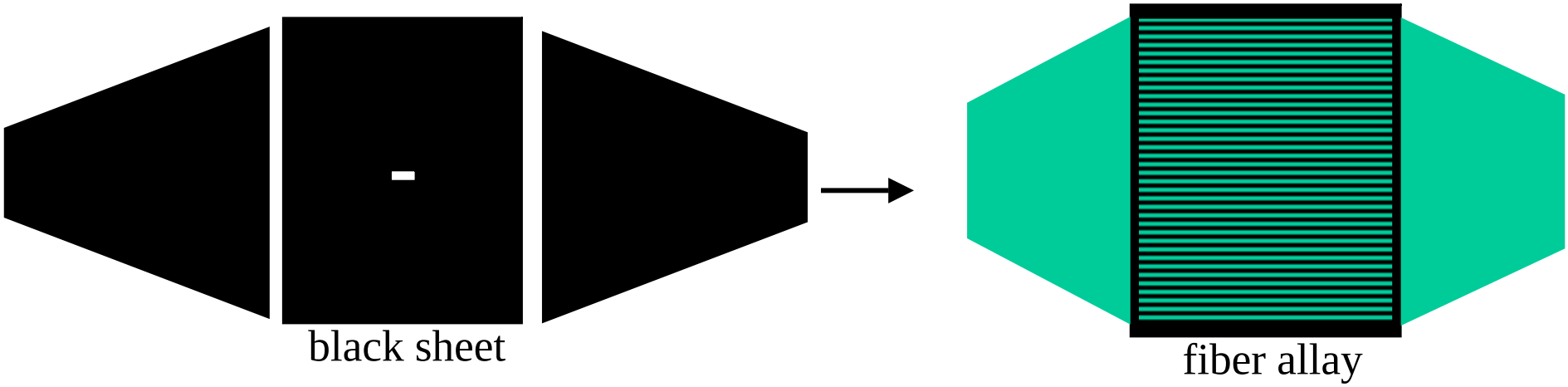
MAPMT channels

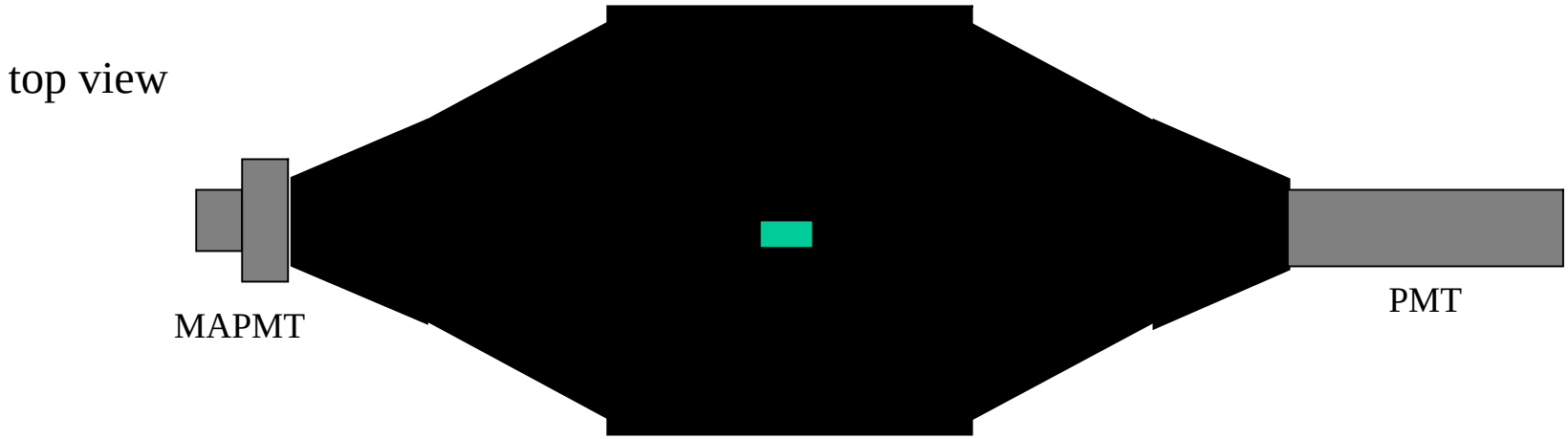
MAPMT

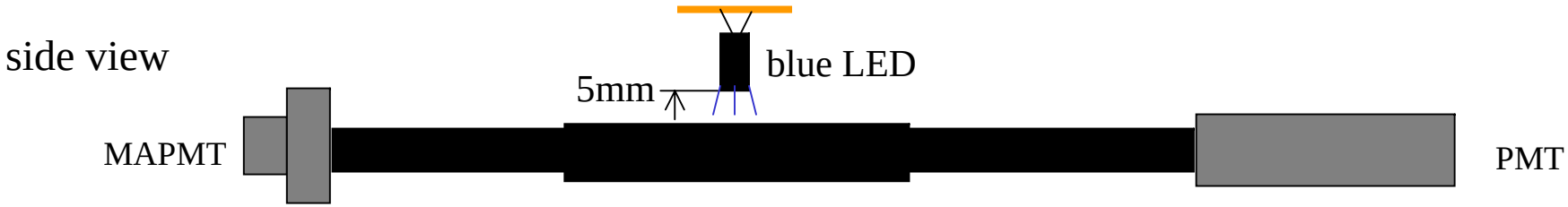




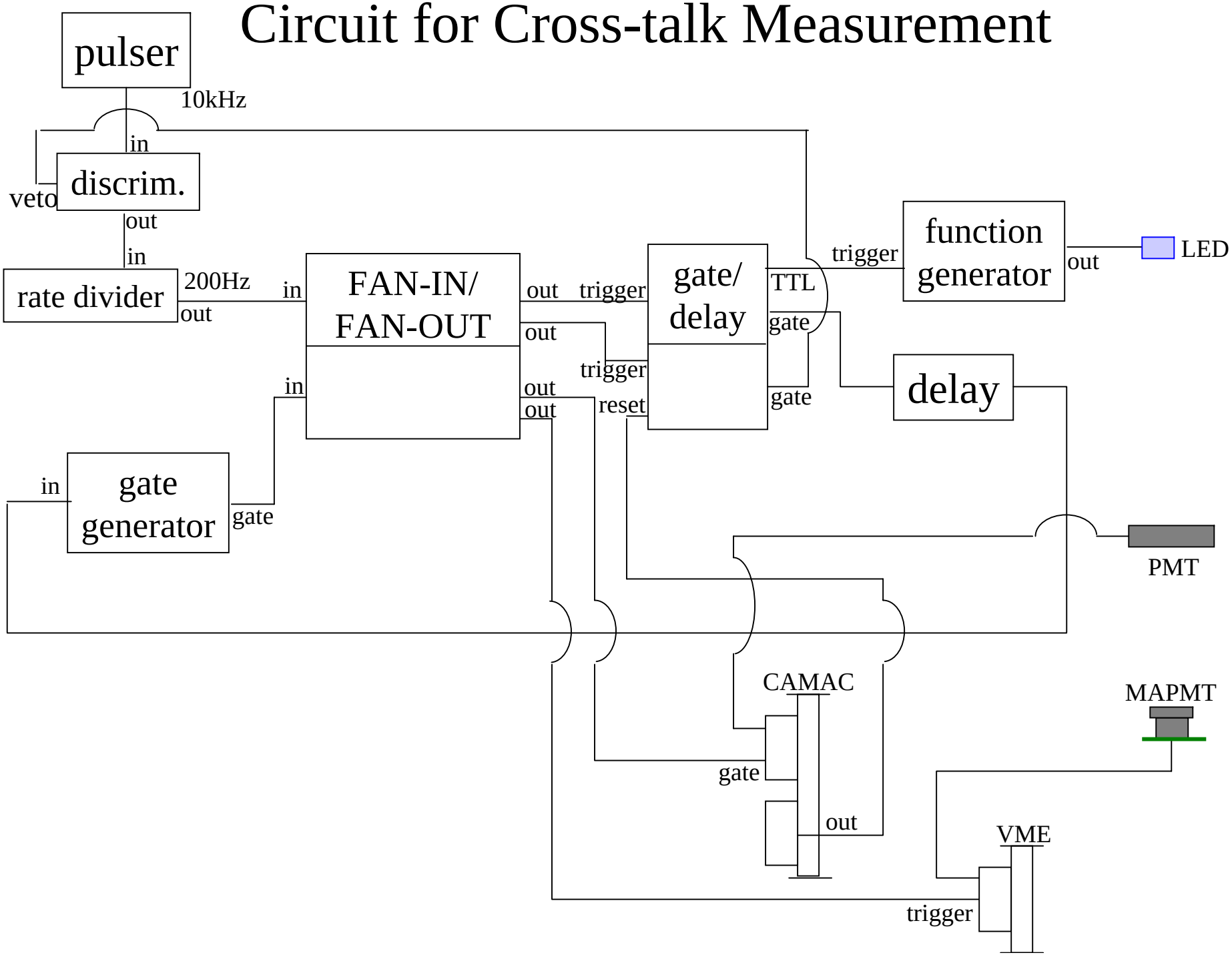
Setup for Cross-talk Measurement







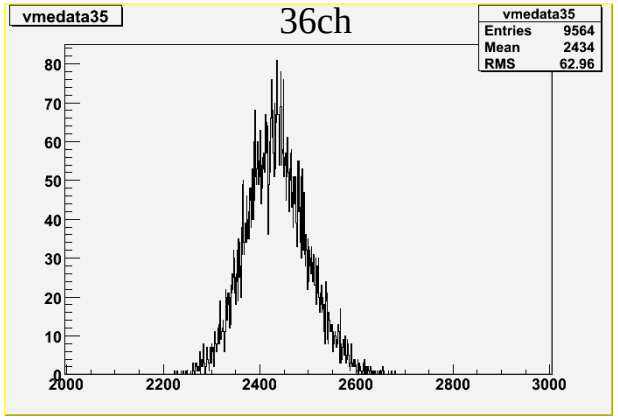
Circuit for Cross-talk Measurement

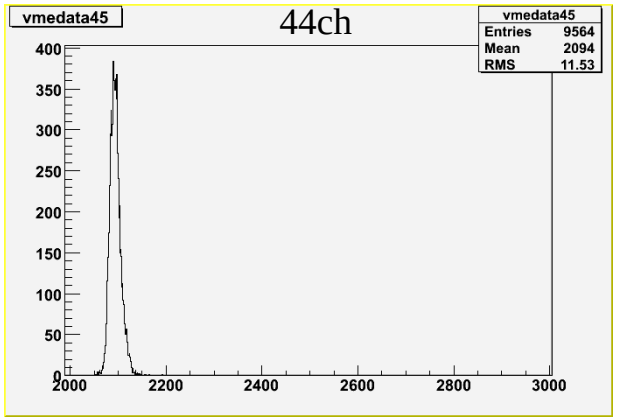


Cross-talk

0	1	2	3	4	5	6	7
8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23
24	25	26	27	28	29	30	31
32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47
48	49	50	51	52	53	54	55
56	57	58	59	60	61	62	63

MAPMT

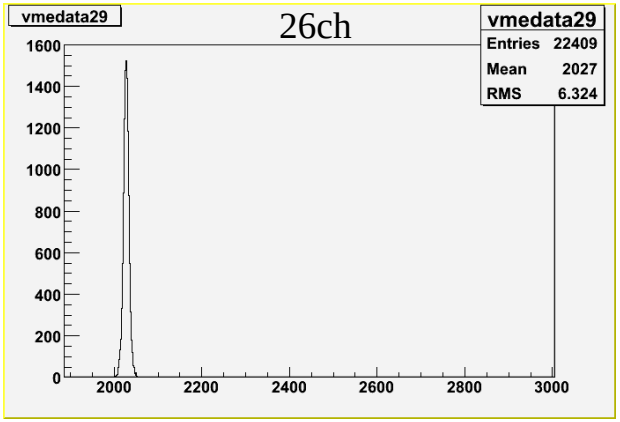


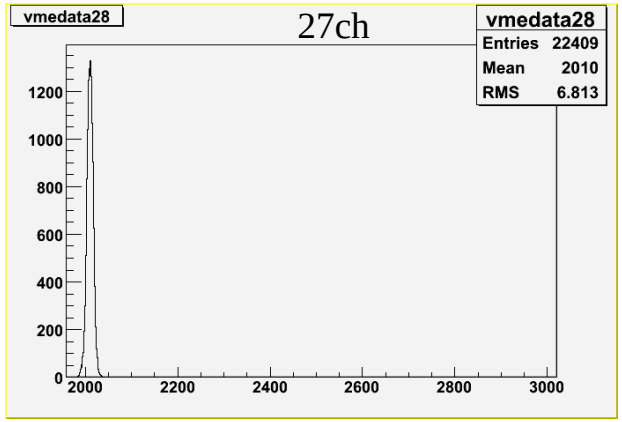


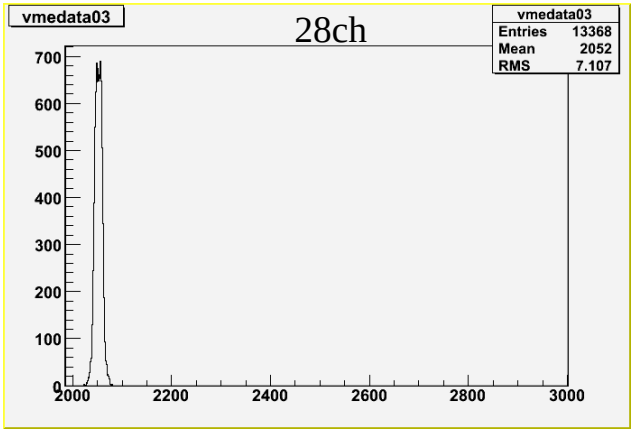
Light from LED entered 36ch through fiber.

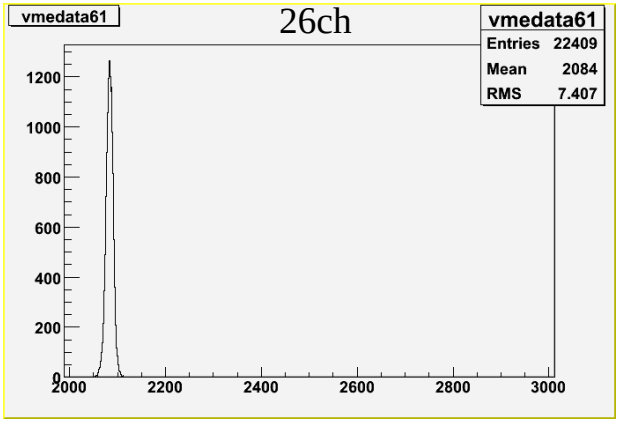
$$\text{cross-talk of 44ch (\%)} = \frac{\text{mean of ADC (pedestal subtracted) of 44ch}}{\text{mean of ADC (pedestal subtracted) of 35ch}} \times 100$$

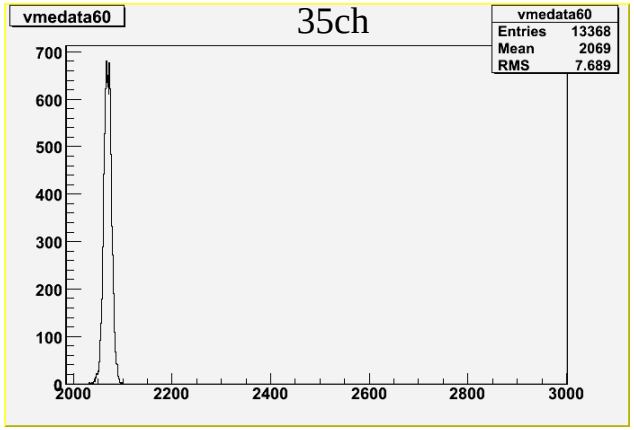
Pedestal

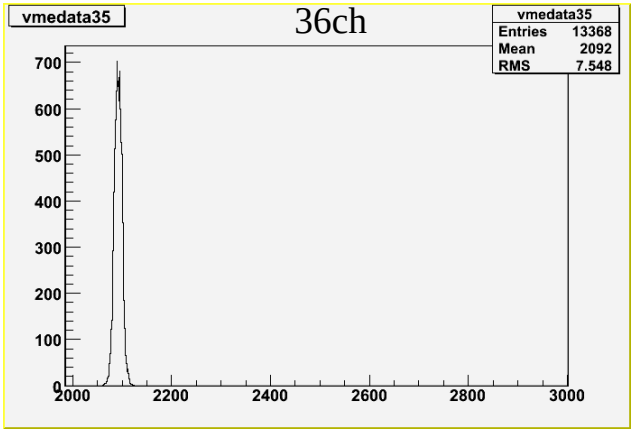

vmedata29
26ch
vmedata29
Entries 22409
Mean 2027
RMS 6.324

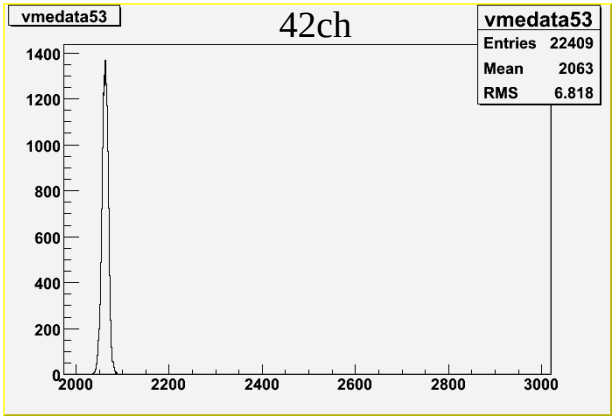

vmedata28
27ch
vmedata28
Entries 22409
Mean 2010
RMS 6.813

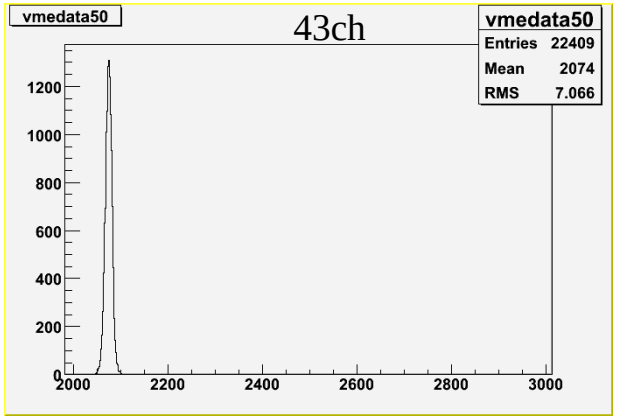

vmedata03
28ch
vmedata03
Entries 13368
Mean 2052
RMS 7.107

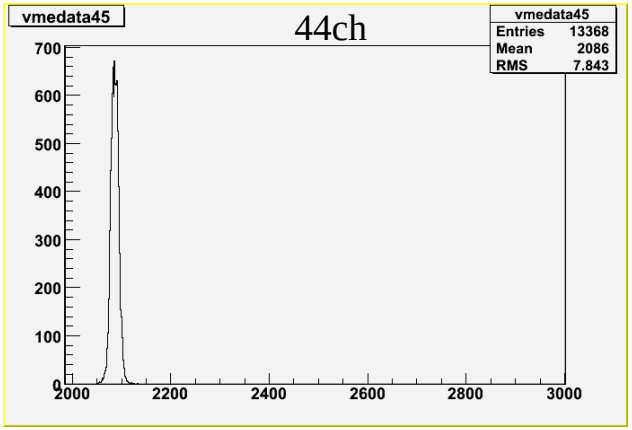

vmedata61
26ch
vmedata61
Entries 22409
Mean 2084
RMS 7.407


vmedata60
35ch
vmedata60
Entries 13368
Mean 2069
RMS 7.689


vmedata35
36ch
vmedata35
Entries 13368
Mean 2092
RMS 7.548

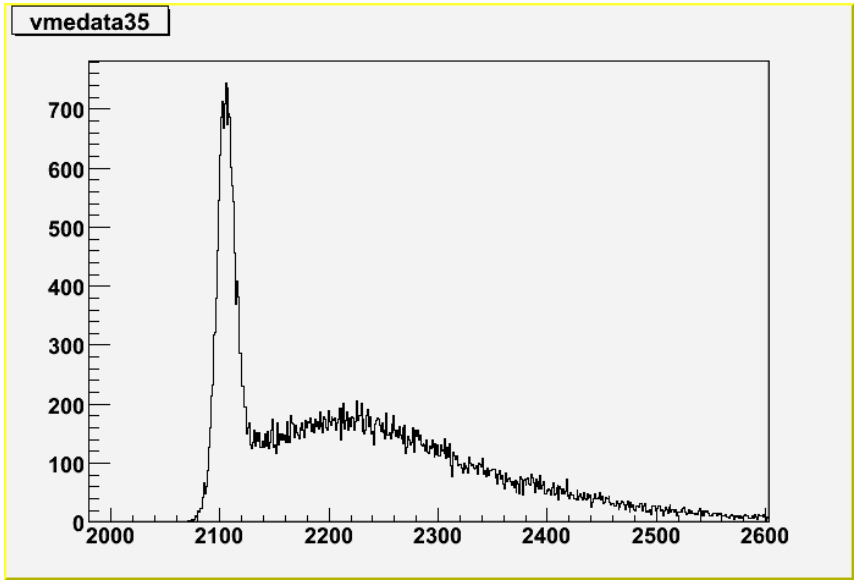

vmedata53
42ch
vmedata53
Entries 22409
Mean 2063
RMS 6.818

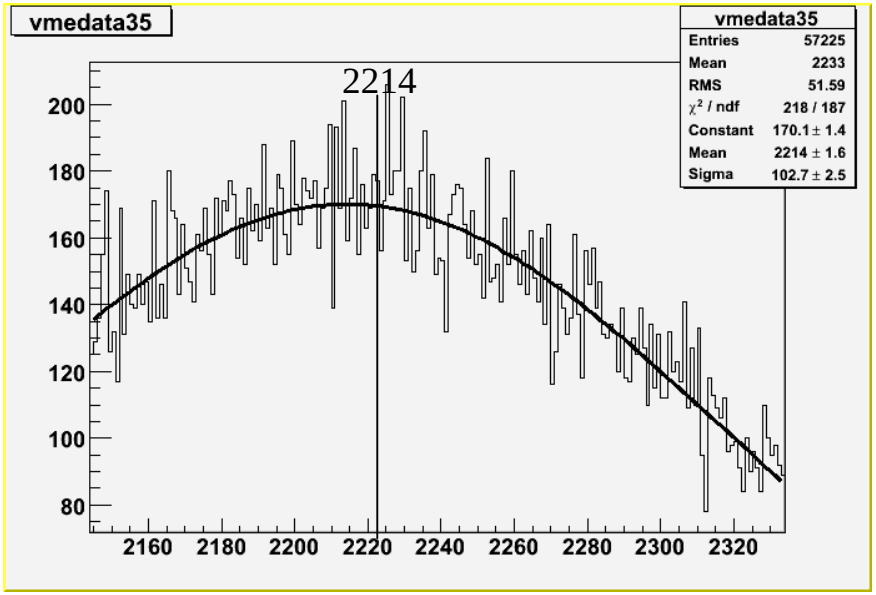

vmedata50
43ch
vmedata50
Entries 22409
Mean 2074
RMS 7.066


vmedata45
44ch
vmedata45
Entries 13368
Mean 2086
RMS 7.843

電荷とADCチャンネルの関係

1photo-electron peak





gain: 6.8×10^6
at 950V