

Update on dark-noise/gain measurements @ IFIC, Valencia

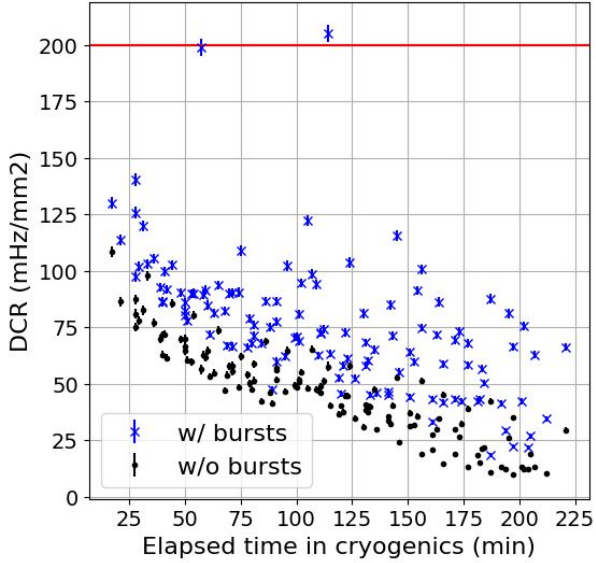
Julio Ureña, Carlos G. Benítez, Jose A. Soto

Photosensors WG - 27 February 2024



Dark noise summary from 2024/02/13 talk (tray 68)

Boards: 1425-1426,1429,1431-1432,1435-1438,1441-1447,1449,1451-1452,1456



Test Number	Board ID	Test Date	Thermal C	VoP	Socket Number	MASSIBO Version	MASSIBO Board
1	1425	20_dic_2023	2	45	1	1	1
2	1426	20_dic_2023	2	45	2	1	1
3	1429	20_dic_2023	2	45	3	1	1
4	1431	09_jan_2024	1	45	1	1	1
5	1432	09_jan_2024	1	45	2	1	1
6	1435	09_jan_2024	1	45	3	1	1
7	1436	23_jan_2024	2	45	1	1	1
8	1437	23_jan_2024	2	45	2	1	1
9	1438	23_jan_2024	2	45	3	1	1
10	1441	12_jan_2024	1	45	1	1	1
11	1442	12_jan_2024	1	45	2	1	1
12	1443	12_jan_2024	1	45	3	1	1
13	1444	17_jan_2024	1	45	1	1	1
14	1445	17_jan_2024	1	45	2	1	1
15	1446	17_jan_2024	1	45	3	1	1
16	1447	18_jan_2024	1	45	1	1	1
17	1449	18_jan_2024	1	45	2	1	1
18	1451	18_jan_2024	1	45	3	1	1
19	1452	19_jan_2024	1	45	1	1	1
20	1456	19_jan_2024	1	45	2	1	1

150 mHz/mm2

200 mHz/mm2

DCR_mHz_per_mm2

	1425	1426	1429	1431	1432	1435	1436	1437	1438	1441	1442	1443	1444	1445	1446	1447	1449	1451	1452	1456
1	42.3	90.3	58.2	66.2	86.6	115.6	97.4	62.0	74.9	140.5	60.1	59.8	105.6	70.8	33.1	125.7	77.5	91.4	130.1	66.2
2	113.6	76.2	46.4	103.1	102.2	100.7	91.8	122.2	42.0	86.7	80.9	71.6	90.5	62.6	43.3	92.7	94.7	86.3	102.0	75.0
3	119.8	86.6	44.3	102.7	98.5	58.8	89.8	63.4	58.4	80.4	72.5	73.1	89.6	45.8	43.0	86.2	74.1	42.2	86.3	70.5
4	99.8	68.8	43.1	90.0	205.2	68.0	81.3	52.5	18.5	91.6	72.9	56.7	66.9	68.3	41.1	84.9	61.2	50.3	82.1	93.9
5	77.8	73.0	69.5	93.7	103.7	87.7	90.5	45.8	22.3	90.1	60.1	29.3	79.1	45.2	75.8	66.5	45.0	81.1	198.9	52.5
6	72.0	58.1	42.3	108.8	65.2	66.4	68.0	55.3	62.9	67.8	84.9	21.6	47.6	63.9	34.4	71.4	71.4	26.9	82.3	81.1

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Outliers tests (Dark noise)

DCR_mHz_per_mm2 - January

	1432	1441	1452
1	nan	nan	nan
2	nan	nan	nan
3	nan	nan	nan
4	205.2	91.6	82.1
5	nan	nan	198.9
6	nan	nan	nan

New measurement

DCR_mHz_per_mm2 - February

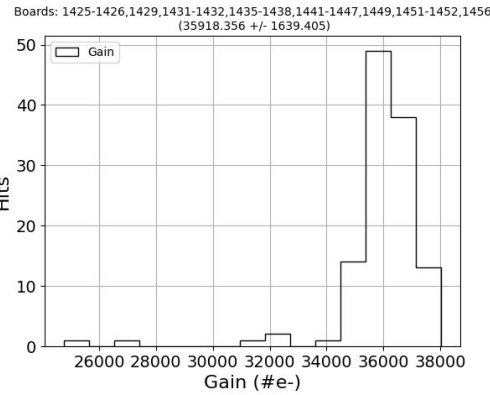
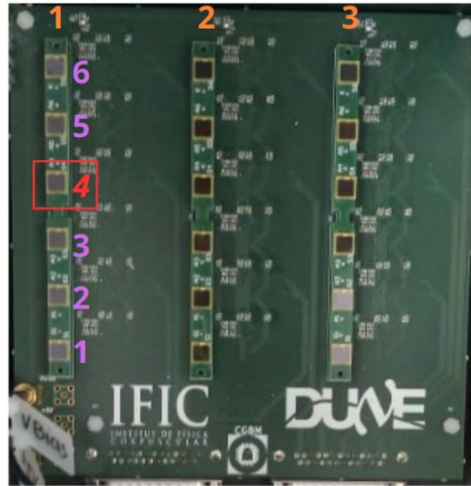
	1432	1441	1452
1	nan	nan	nan
2	nan	nan	nan
3	nan	nan	nan
4	79.9	49.3	74.2
5	nan	nan	95.9
6	nan	nan	nan

→ The encountered outliers seem to be due to the random bursts

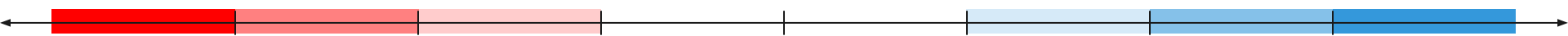
Gain summary from 2024/02/13 talk (tray 68)

Carlos G. Benítez

Test Number	Board ID	Test Date	Thermal C	VoP	Socket Number	MASSIBO Version	MASSIBO Board
1	1425	20_dic_2023	2	45	1	1	1
2	1426	20_dic_2023	2	45	2	1	1
3	1429	20_dic_2023	2	45	3	1	1
4	1431	09_jan_2024	1	45	1	1	1
5	1432	09_jan_2024	1	45	2	1	1
6	1435	09_jan_2024	1	45	3	1	1
7	1436	23_jan_2024	2	45	1	1	1
8	1437	23_jan_2024	2	45	2	1	1
9	1438	23_jan_2024	2	45	3	1	1
10	1441	12_jan_2024	1	45	1	1	1
11	1442	12_jan_2024	1	45	2	1	1
12	1443	12_jan_2024	1	45	3	1	1
13	1444	17_jan_2024	1	45	1	1	1
14	1445	17_jan_2024	1	45	2	1	1
15	1446	17_jan_2024	1	45	3	1	1
16	1447	18_jan_2024	1	45	1	1	1
17	1449	18_jan_2024	1	45	2	1	1
18	1451	18_jan_2024	1	45	3	1	1
19	1452	19_jan_2024	1	45	1	1	1
20	1456	19_jan_2024	1	45	2	1	1



-3*std -2*std -std mean +std +2*std +3*std



	1425	1426	1429	1431	1432	1435	1436	1437	1438	1441	1442	1443	1444	1445	1446	1447	1449	1451	1452	1456
1	3.6e+04	3.6e+04	3.7e+04	3.6e+04	3.5e+04	3.6e+04	3.6e+04	3.6e+04	3.6e+04	3.5e+04	3.6e+04	3.6e+04	3.5e+04	3.6e+04	3.6e+04	3.6e+04	3.6e+04	3.7e+04	3.6e+04	3.5e+04
2	3.6e+04	3.7e+04	3.6e+04	3.4e+04	3.6e+04	3.5e+04	3.6e+04	3.7e+04	3.6e+04	3.5e+04	3.6e+04	3.6e+04	3.6e+04	3.5e+04	3.5e+04	3.5e+04	3.6e+04	3.7e+04	3.6e+04	3.7e+04
3	3.7e+04	3.7e+04	3.7e+04	3.6e+04	3.6e+04	3.7e+04	3.7e+04	3.6e+04	3.6e+04	3.7e+04	3.5e+04	3.6e+04	3.7e+04	3.7e+04	3.7e+04	3.8e+04	3.7e+04	3.7e+04	3.6e+04	3.7e+04
4	3.6e+04	3.7e+04	3.6e+04	3.2e+04	3.6e+04	3.6e+04	3.2e+04	3.7e+04	3.6e+04	2.5e+04	3.7e+04	3.5e+04	3.1e+04	3.7e+04	3.6e+04	3.6e+04	3.8e+04	3.6e+04	2.7e+04	3.7e+04
5	3.6e+04	3.7e+04	3.6e+04	3.6e+04	3.6e+04	3.5e+04	3.6e+04	3.6e+04	3.5e+04	3.6e+04	3.6e+04	3.5e+04	3.6e+04	3.6e+04	3.6e+04	3.8e+04	3.7e+04	3.7e+04	3.6e+04	3.7e+04
6	3.7e+04	3.8e+04	3.6e+04	3.6e+04	3.6e+04	3.6e+04	3.7e+04	3.6e+04	3.6e+04	3.6e+04	3.6e+04	3.5e+04	3.6e+04	3.6e+04	3.7e+04	3.7e+04	3.8e+04	3.6e+04	3.6e+04	3.7e+04

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Outliers tests (gain)

Before slot-4 replacement

gain_in_#e- - January

	1432	1441	1452
1	nan	nan	nan
2	nan	nan	nan
3	nan	nan	nan
4	3.6e+04	2.5e+04	2.7e+04
5	nan	nan	3.6e+04
6	nan	nan	nan

S. 2

S. 1

S. 1

gain_in_#e- - February

	1432	1441	1452
1	nan	nan	nan
2	nan	nan	nan
3	nan	nan	nan
4	1.9e+04	3.6e+04	3.8e+04
5	nan	nan	3.6e+04
6	nan	nan	nan

S. 1

S. 3

S. 2

After slot-4 replacement

Dedicated test of slot-4 of socket-1 on 2024/02/19
G ~ 3.5e+04 #e-

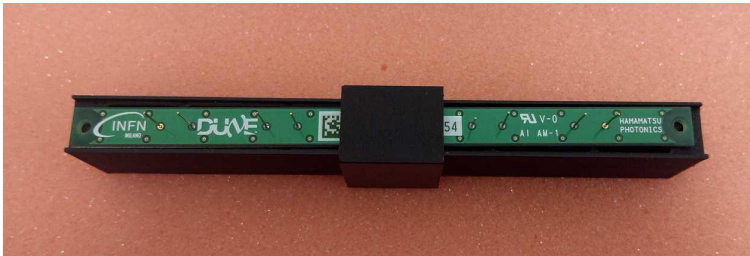
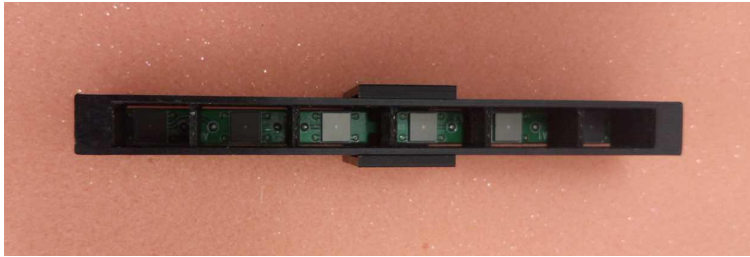
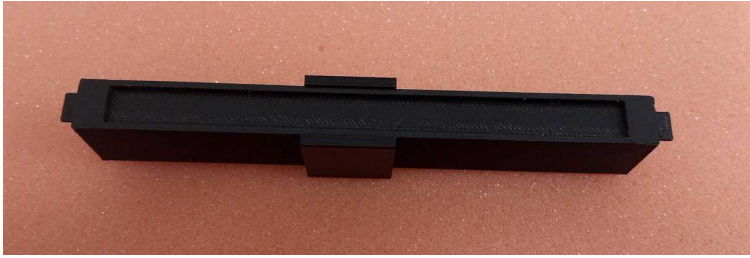
2024/02/22

With black separators, but not covered
Sockets 1 and 2 (12 different SiPMs)

gain_in_#e- - 2024/02/22 Test

	1641	1642
1	3.4e+04	3.4e+04
2	3.4e+04	3.4e+04
3	3.6e+04	3.5e+04
4	3.5e+04	3.5e+04
5	3.6e+04	3.5e+04
6	3.5e+04	3.6e+04

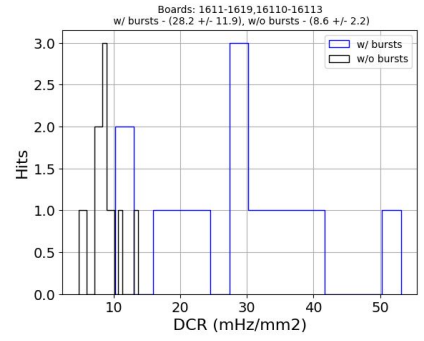
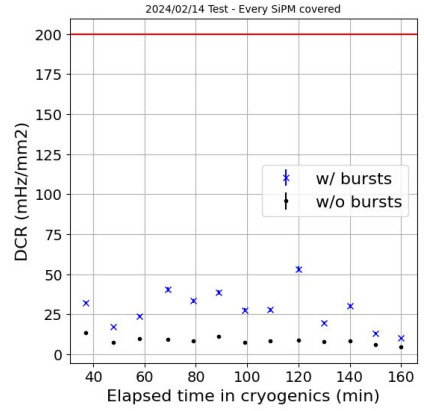
Black covers



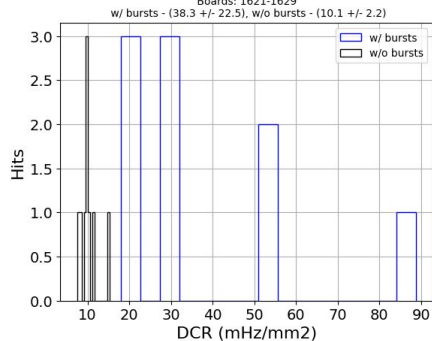
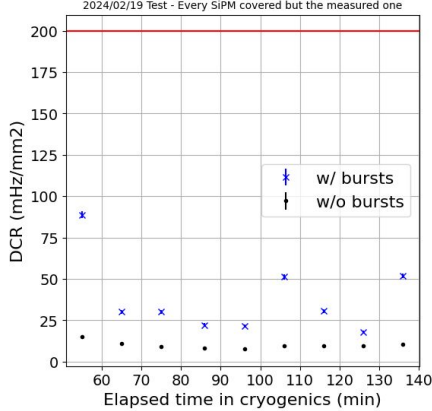
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Black covers tests

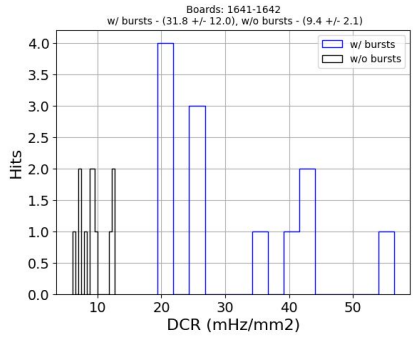
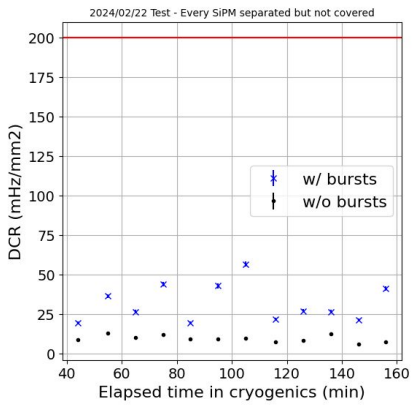
2024/02/14
With black covers
Socket 1, sipm 1, for 13 times in a row



2024/02/19
With black covers except for the measured SiPM
Socket 1, sipm 6, for 9 times in a row



2024/02/22
With black separators, but not covered
Sockets 1 and 2 (12 different SiPMs)



- The result **suggests** that the DCR thermalization was due SiPM-SiPM optical crosstalk
- Using separators but not covers may allow us to perform gain measurements using an LED