



Can we save some lost sensors?

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Status summary

- Yonsei university group is grateful for the cordial support from CERN in setting up the test system, and **we are finally in stable operation phase to deliver promise to the collaboration, efficient operation of production test. We started to look into the test data in consultation with Magnus and CERN crew, and hope to contribute towards detector construction in time.**

Shifter house



Contents summary

- The best results among multiple tests
- Only one classification parameter failing and relaxed selection criteria

The best results among multiple tests

Period: 2018-02-09 ~ 2018-06-02

Chips : 12,973

Current criteria	Relaxed criteria
Classify from last the test	Classify from best results among multiple tests
Yield:61.10%(7,927)	Yield: 61.20%(7,940)

0.10%(13)↑

Chip	1st	2nd	current	relaxed
1	ok	ok	ok	ok
2	ok	nk	nk	ok
3	nk	ok	ok	ok
4	nk	nk	nk	nk
5	ok		ok	ok
6	nk		nk	nk

13 chips, “Destroyed chip” or “Test error”?

Period: 2018-02-09 ~ 2018-06-02

Chips : 12,973

Total cases	13
Minimum Backbias Voltage become bad	7
Maximum Backbias Current become bad	2
<i>Aborted at SEU test (test not completed)</i>	2
Threshold become bad	1
Digital current become bad	1

Only one classification parameter failing and relaxed selection criteria

Period: 2018-02-09 ~ 2018-11-10

Chips: 28,995

Yield: 62.53% (18,130)

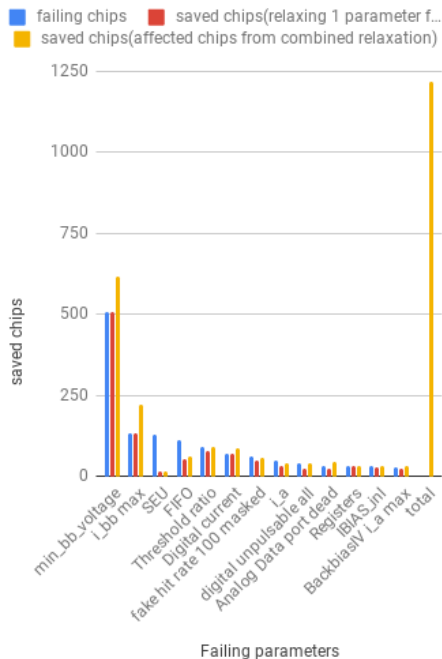
Interest of investigation: Only one classification parameter failing sensors

There are 47 classification parameters per test, and we investigated the cases 46 classification parameters pass selection criteria (BRONZE).

Plots shown below are from chips that failing 'the only one' classification parameter.

Relaxed Selection Criteria

Total: 28,995



Failing parameters	chips	fraction	Current cut	Relaxed cut	saved chips (relaxing 1 parameter from original)	saved fraction	saved chips (affected chips from combined relaxation)
Minimum Backbias Voltage	509	1.76%	[-6,-4]	[-6,0]	509	1.76%	617
Maximum Backbias Current	135	0.47%	[-999,6]	[-999,7.1]	135	0.47%	220
SEU	127	0.44%	[0,0]	[0,17]	16	0.06%	16
FIFO	112	0.39%	[0,0]	[0,10]	55	0.19%	63
Threshold ratio	92	0.32%	[0.1,0.5]	[0.1,0.62]	79	0.27%	93
Digital current	71	0.24%	[35,70]	[35,96]	69	0.24%	86
Fake Hit Rate 100 masked	62	0.21%	[0,1e-5]	[0,3.4e-5]	51	0.18%	58
Analog current	47	0.16%	[10.42,15.54]	[10.42,27]	31	0.11%	42
Digital scan unpulsable	42	0.14%	[0,5243]	[0,10000]	23	0.08%	41
Analog scan dead pixels	34	0.12%	[0,5243]	[0,9000]	22	0.08%	46
Registers	33	0.11%	[0,0]	[0,1]	33	0.11%	34
IBIAS inl	31	0.11%	[-0.01,0.05]	[-0.01,0.08]	30	0.10%	31
Backbias Maximum Analog Current	30	0.10%	[11.05,17.11]	[10.7,19]	23	0.08%	31
total						4.21%	1,220

Combined Relaxed Selection Criteria

Total: 1,220

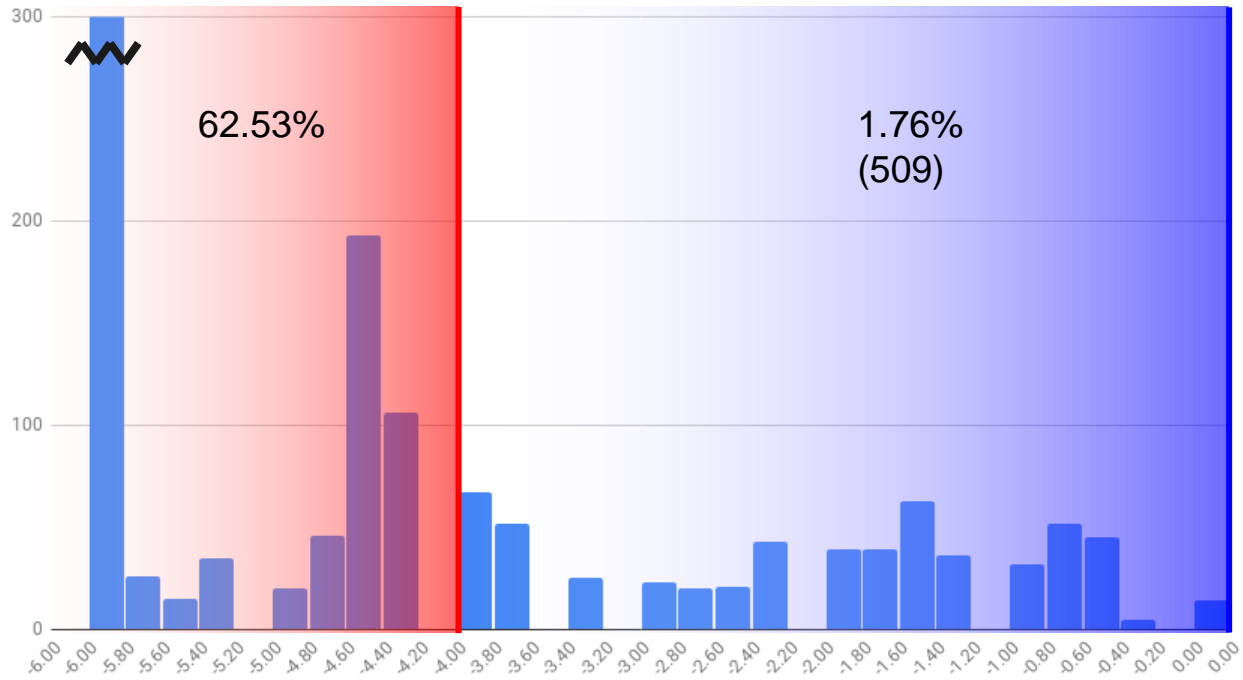
Min Backbias Voltage	Max Backbias Current	SEU	FIFO	Threshold ratio	Digital current	Fake Hita rate 100 masked	Analog current	Digital scan unpulsable	Analog scan dead	Registers	IBIAS_inl	Backbias max analog current	chips
TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	509
FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	135
FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	79
FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	69
TRUE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	69
FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	55
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	51
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	33
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	31
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	30
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	23
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	23
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	22
FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	16
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	FALSE	FALSE	14
TRUE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	8
FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	6
TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	5
TRUE	TRUE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	5
TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	5
TRUE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	4
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	TRUE	4
TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	3
...else													21
Total: 617	Total: 820	Total: 16	Total: 63	Total: 23	Total: 26	Total: 58	Total: 42	Total: 44	Total: 46	Total: 24	Total: 24	Total: 24	

Minimum Backbias Voltage

Current cut: [-6, -4]

Relaxed cut: [-6, 0]

Histogram of Minimum Backbias voltage

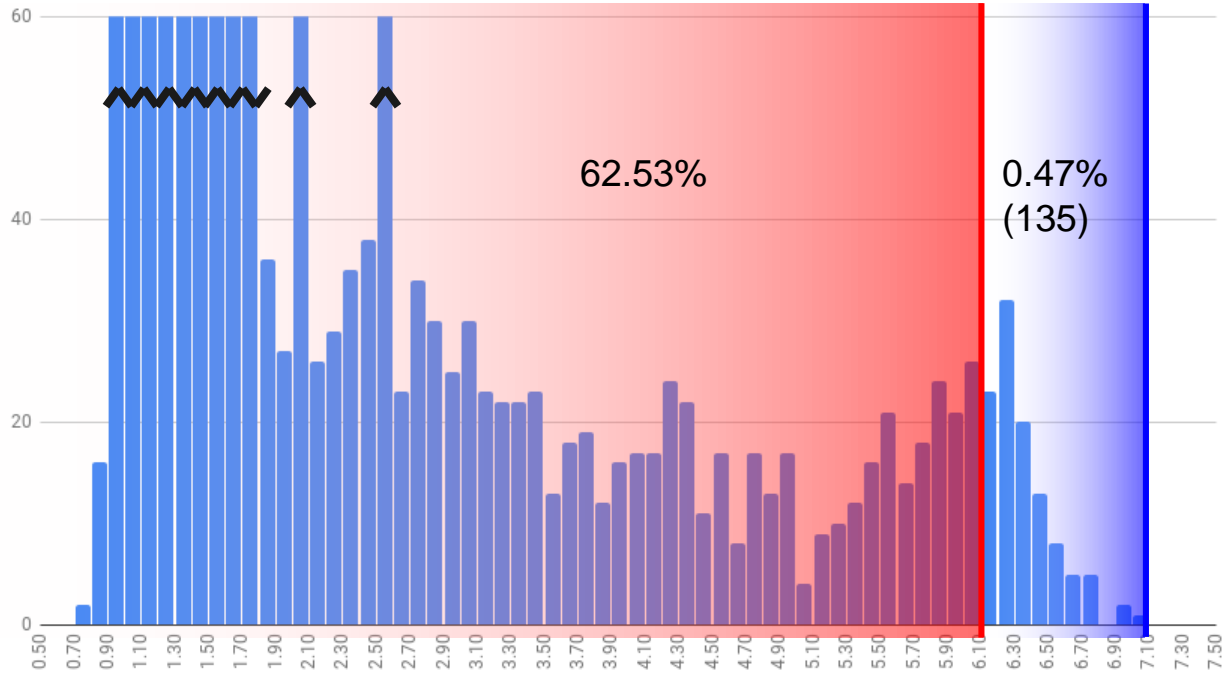


Maximum Backbias Current

Current cut: [-999, 6]

Relaxed cut: [-999, 7.1]

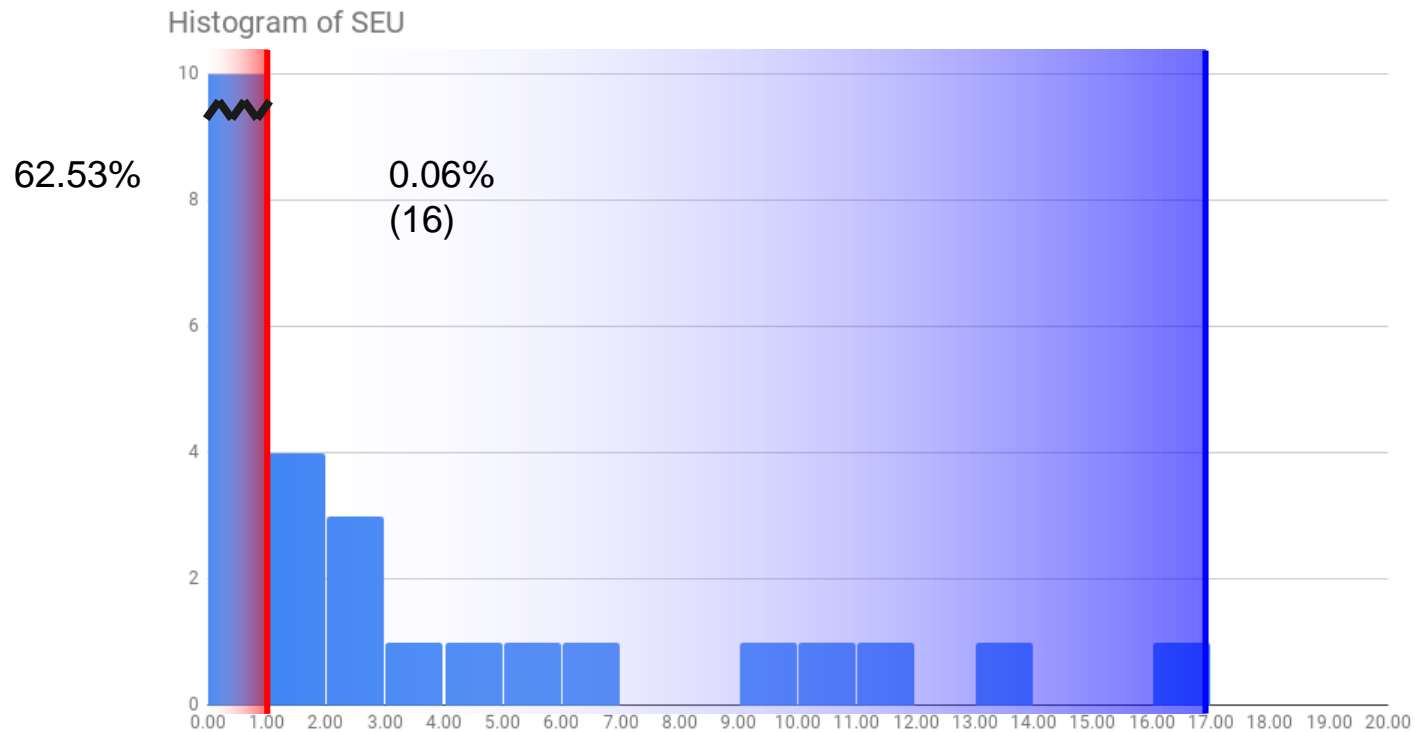
Histogram of Maximum Backbias Current



SEU

Current cut: [0, 0]

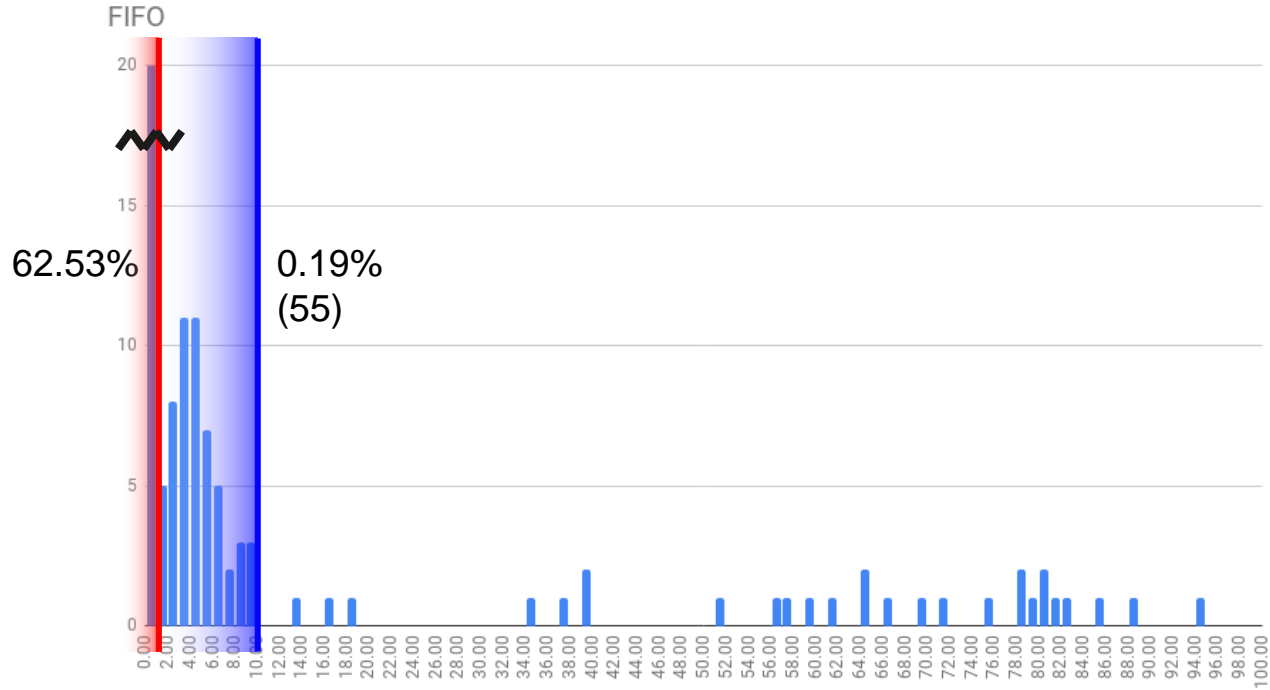
Relaxed cut: [0, 17]



FIFO

Current cut: [0, 0]

Relaxed cut: [0, 10]

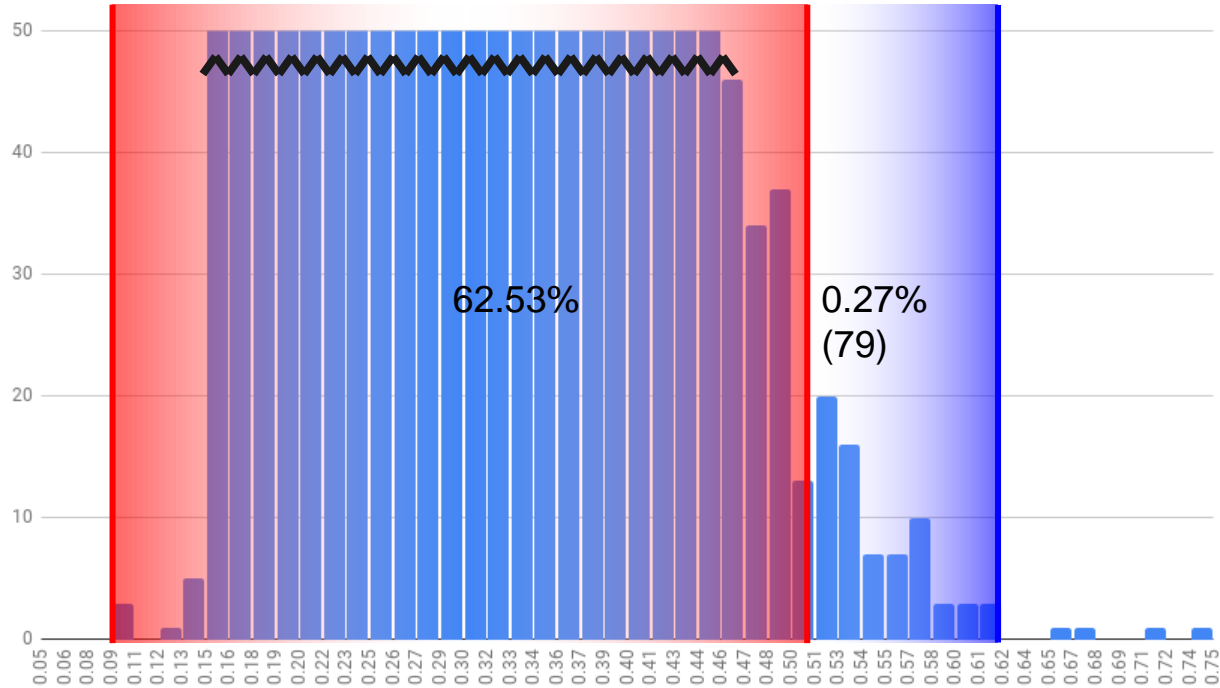


Threshold data port ratio

Current cut: [0.1, 0.5]

Relaxed cut: [0.1, 0.62]

Histogram of Threshold ratio

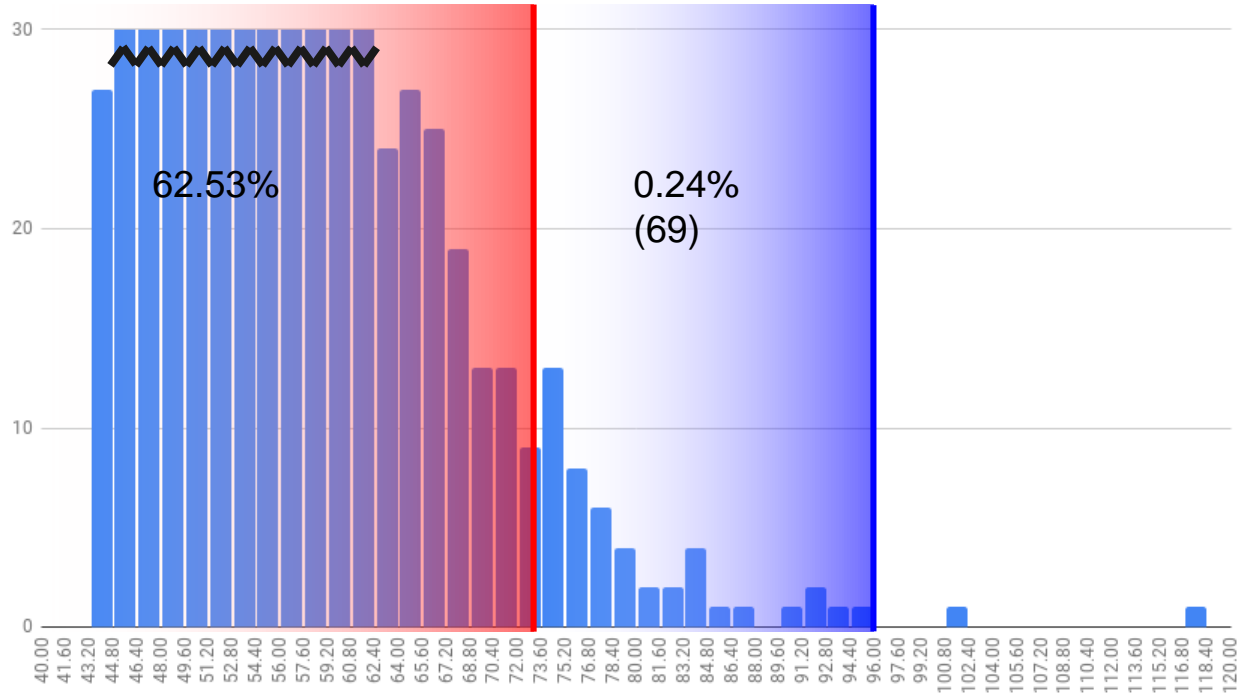


Digital current

Current cut: [35, 70]

Relaxed cut: [35, 96]

Histogram of digital current

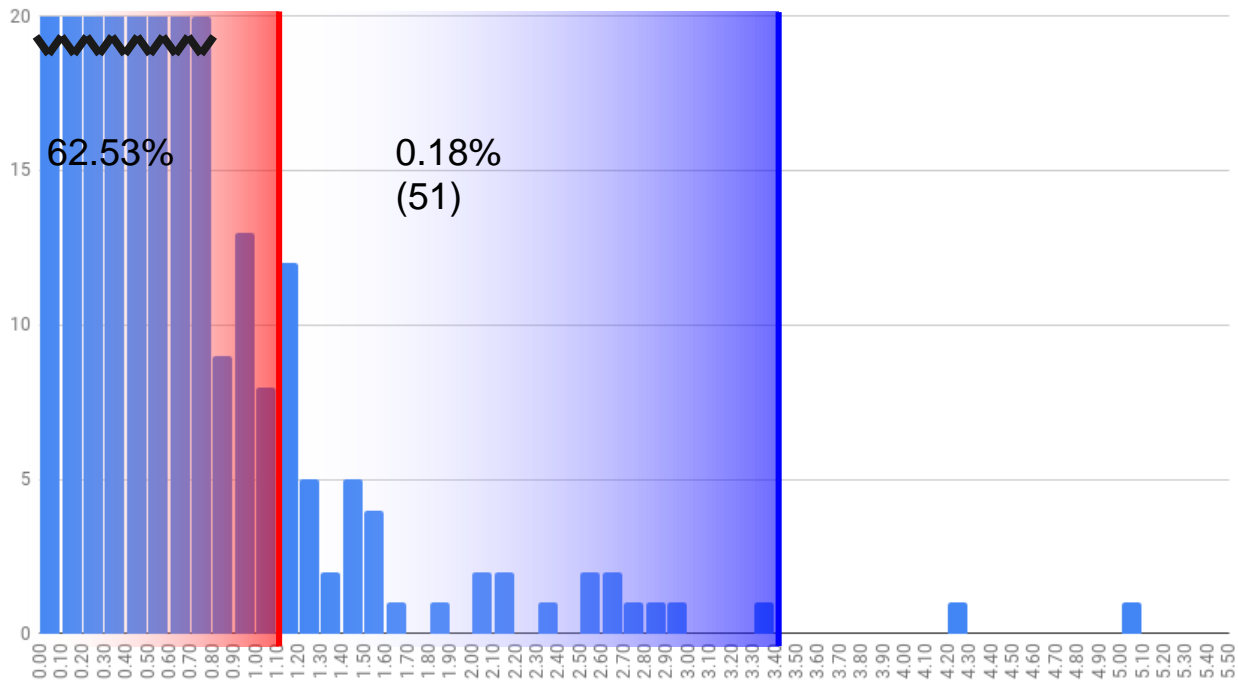


Fake hit rate 100 masked

Current cut: [0, 1e-5]

Relaxed cut: [0, 3.4e-5]

Fake Hit Rate * 100000

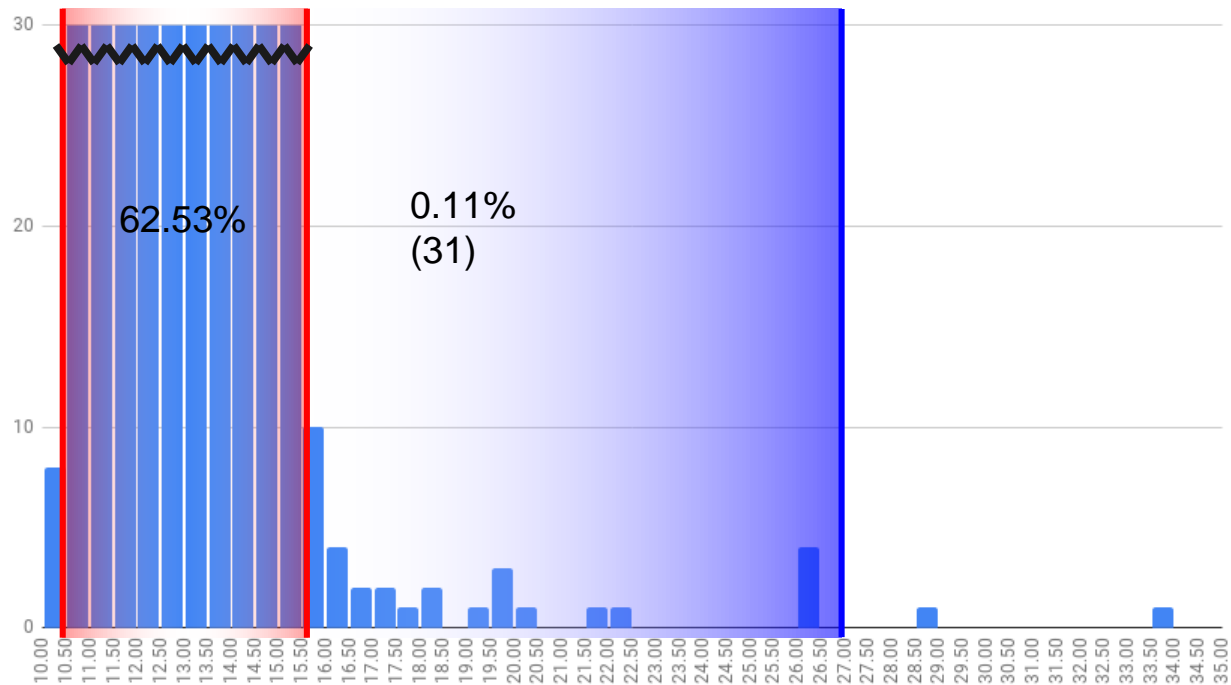


Analog current

Current cut: [10.42, 15.54]

Relaxed cut: [10.42, 27]

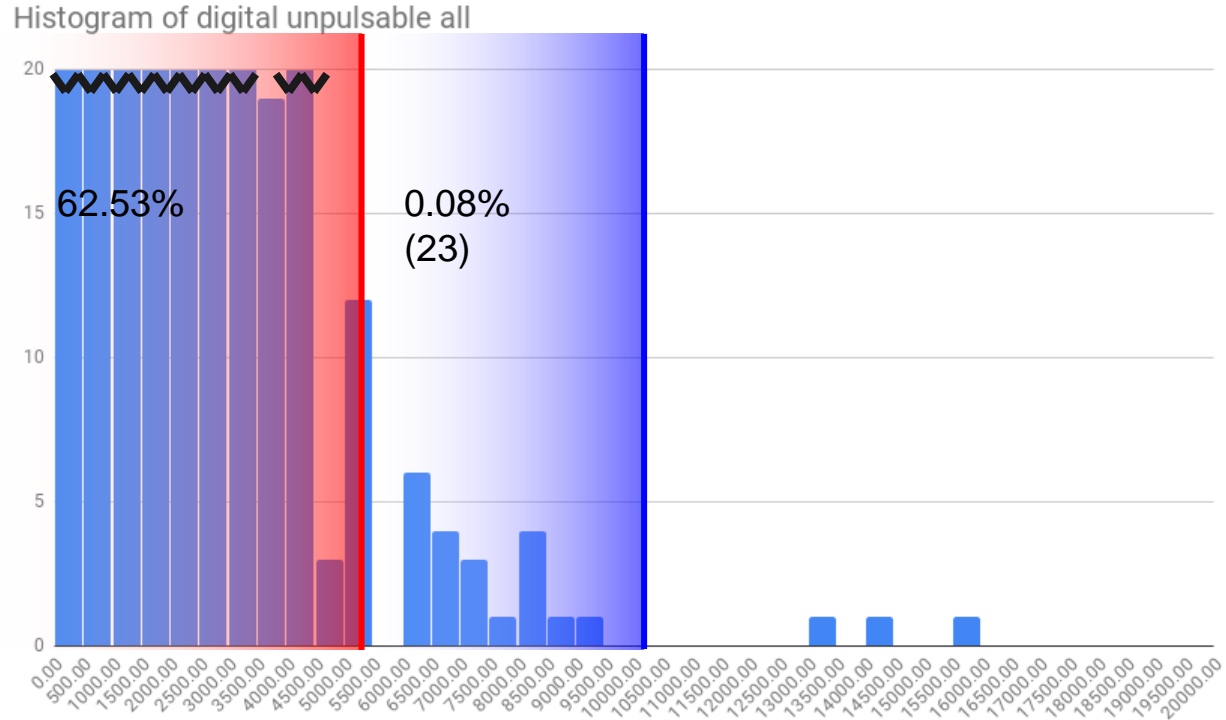
Histogram of analog current



Digital scan unpulsable

Current cut: [0, 5243]

Relaxed cut: [0, 10000]

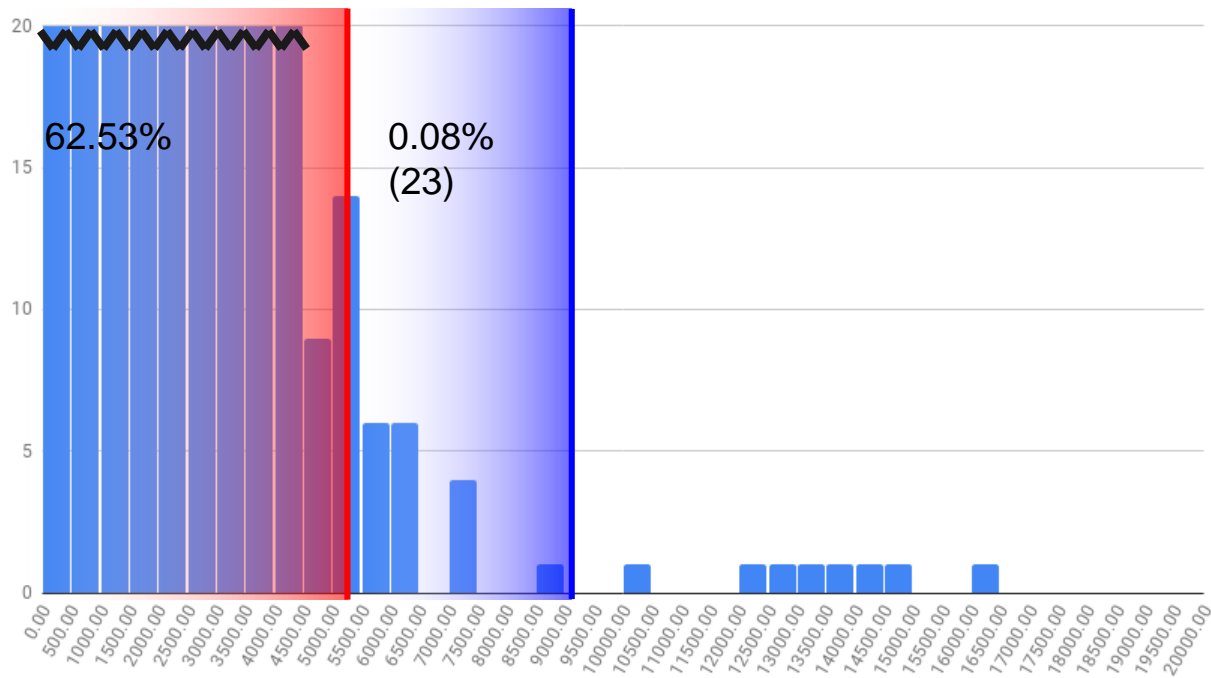


Analog scan dead pixels

Current cut: [0, 5243]

Relaxed cut: [0, 9000]

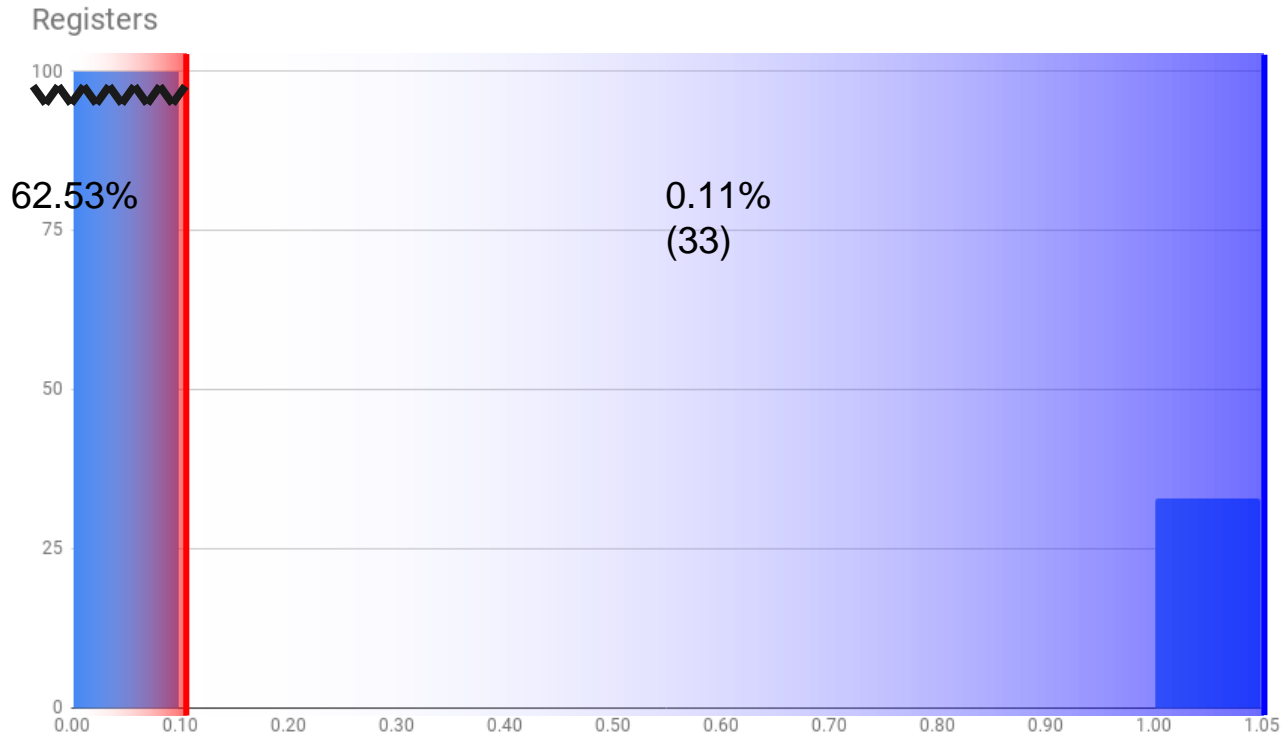
Histogram of Analog Data port dead



Registers

Current cut: [0, 0]

Relaxed cut: [0, 1]

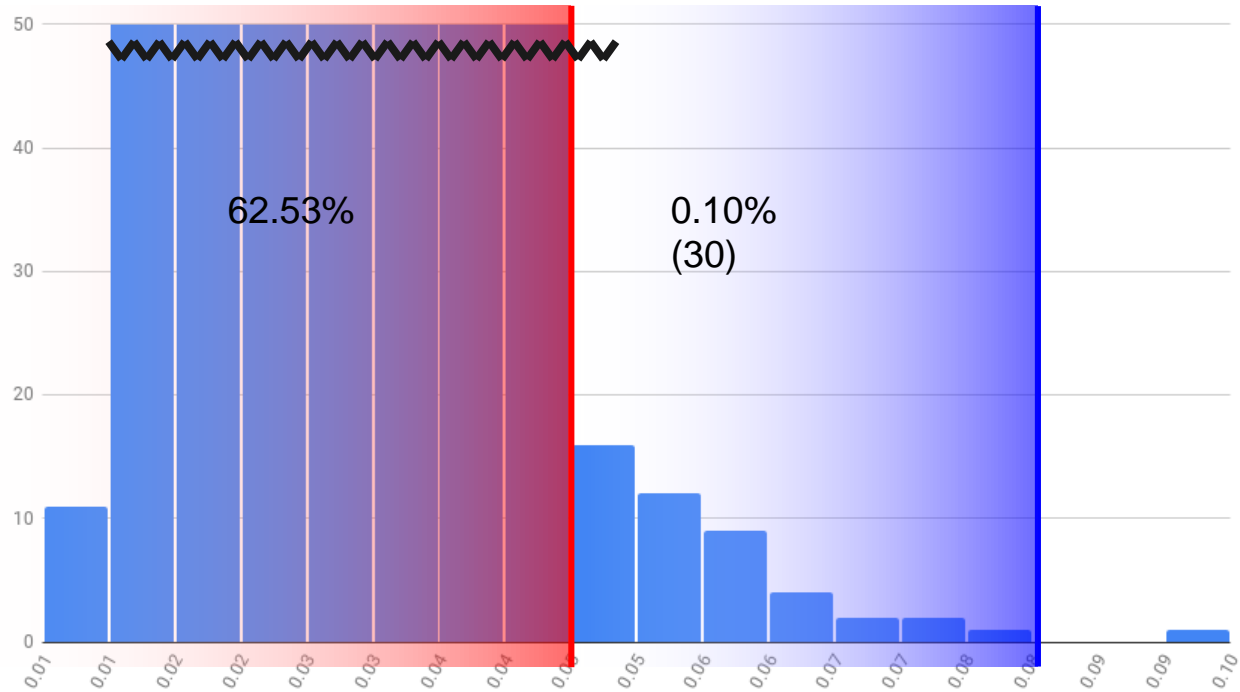


IBIAS inl

Current cut: [-0.01, 0.05]

Relaxed cut: [-0.01, 0.08]

Histogram of IBIAS inl



Backbias Maximum Analog Current

Current cut: [11.05, 17.11]

Relaxed cut: [10.7, 19]

Histogram of backbias maximum analog current

