Studies on the energy calibration

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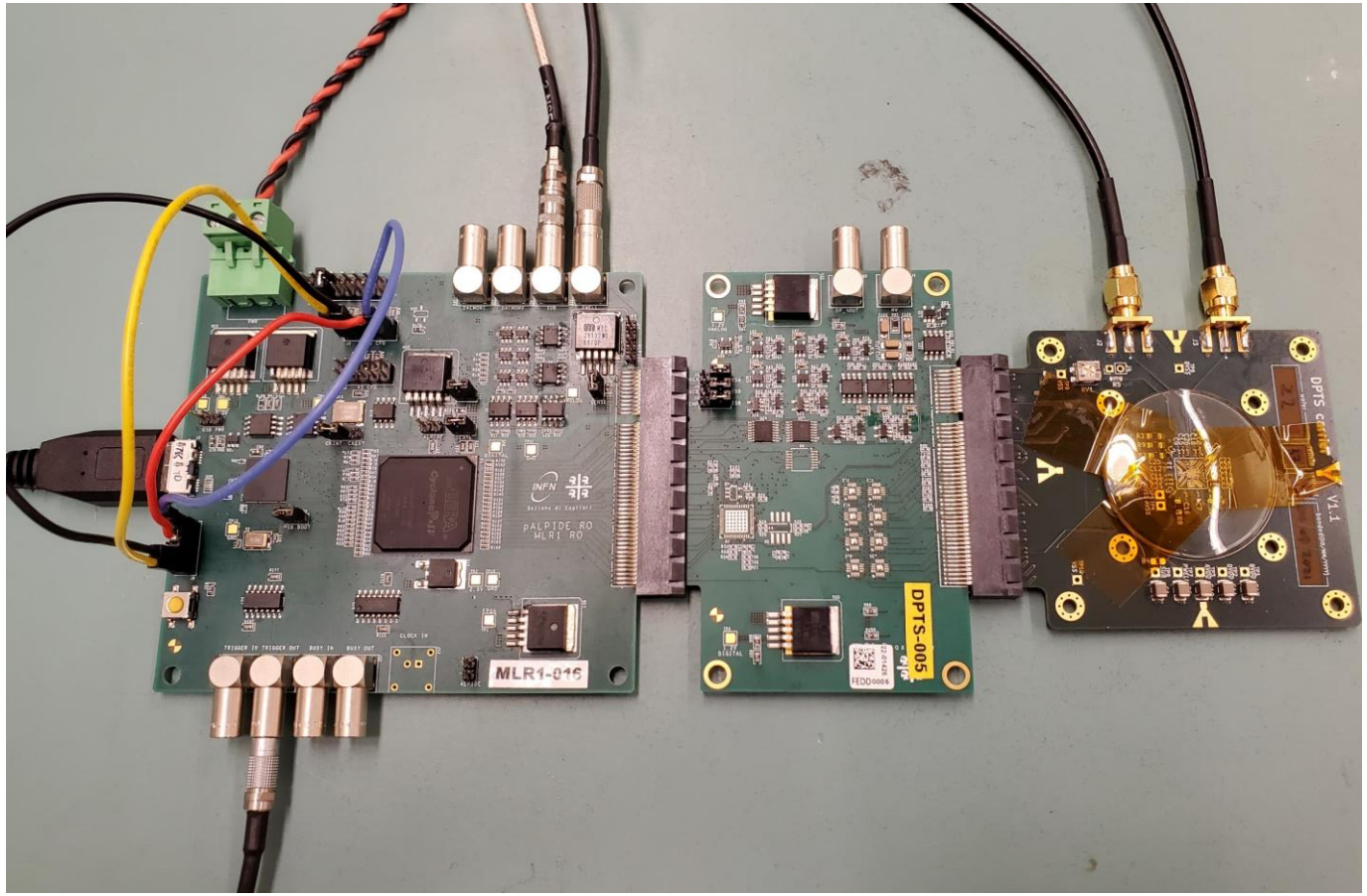
General information

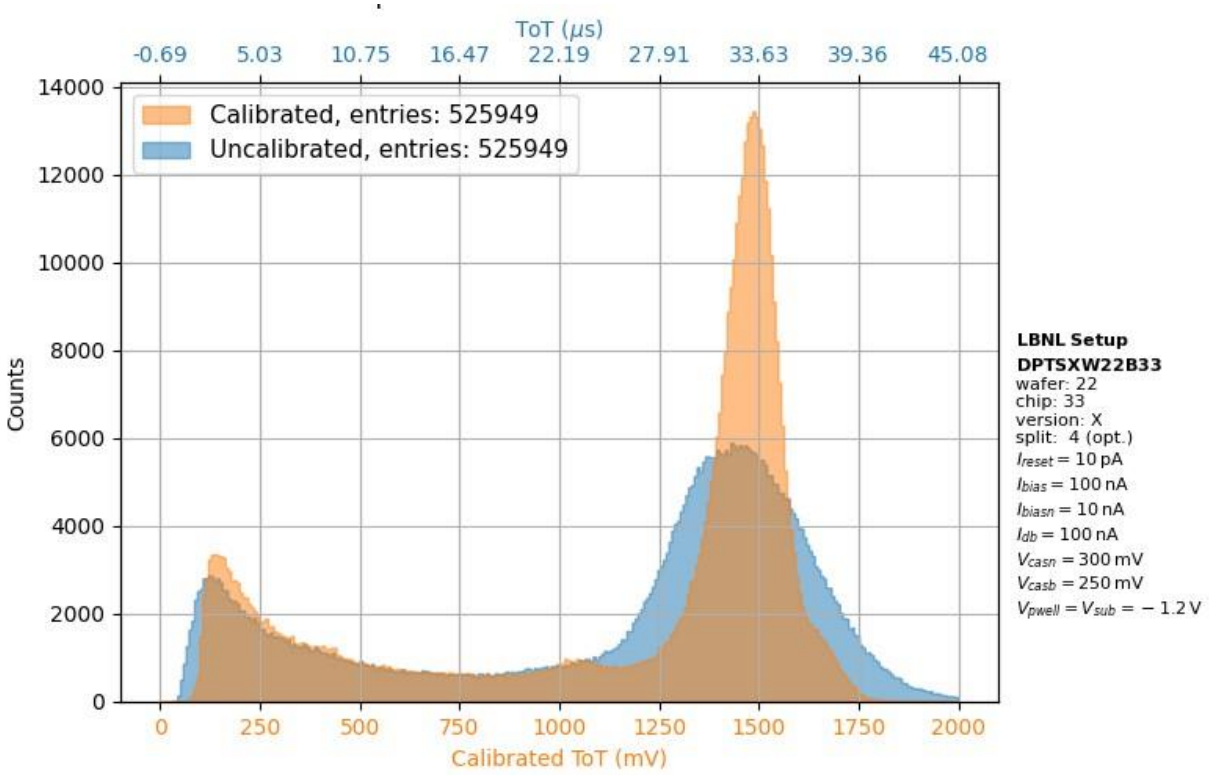
- DPTS Setup for ALICE ITS3
- Proximity board DPTS 05
- Chip DPTSX-W22B33
- Measurements with Fe55
- Until now, combined 1.000.000 events

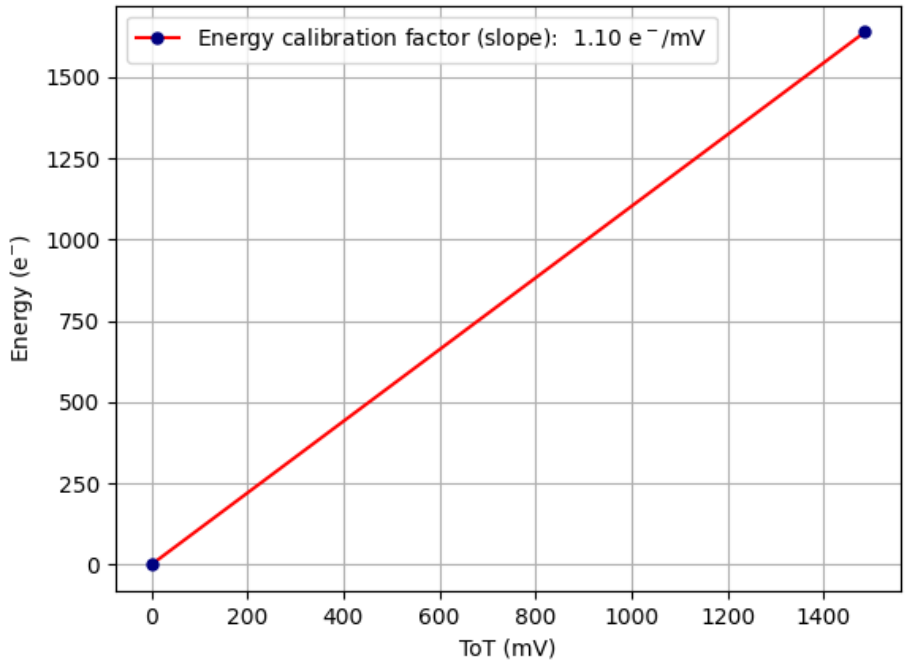


Data analysis

1. Data taking with Fe55 source
2. Pixel decoding via PID/GID data
   - From time structure to data array
3. Calibration via ToT data
   - From collected charged to mV
4. Energy calibration via Fe55 peaks
   - From mV to charge

Energy calibration factor

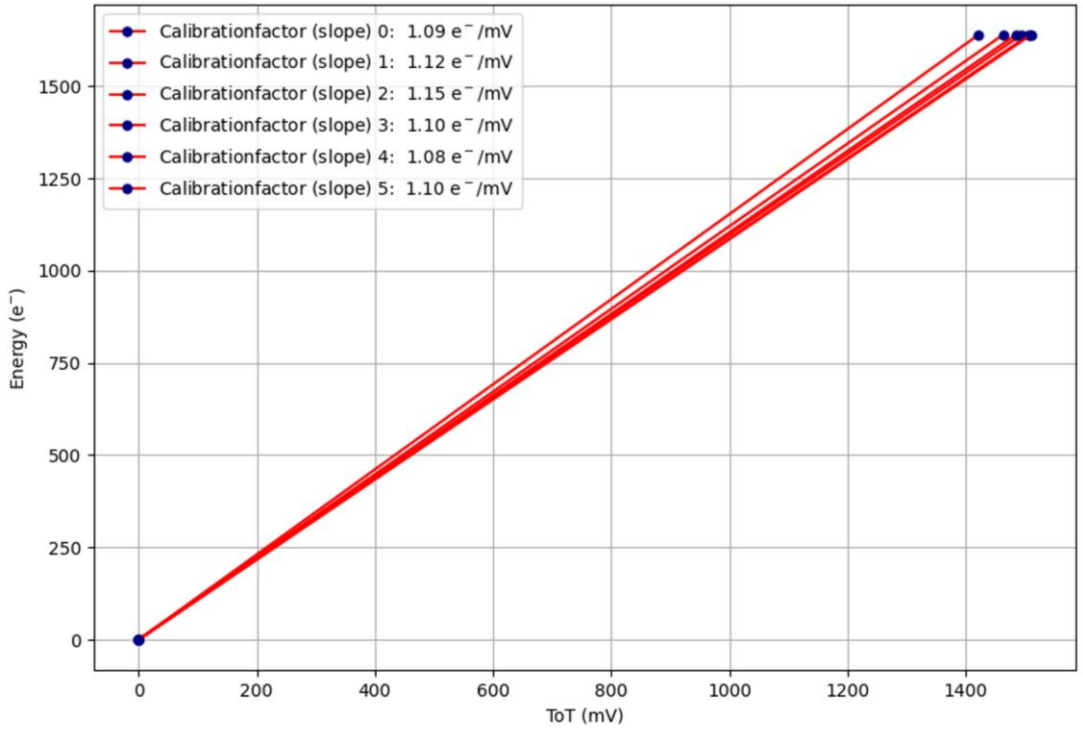




Deviations in energy calibration

- Energy calibration important for accurately assessing the size of the ToT pixel-to-pixel variation
- Different calibrations occured for different Datasets

➔Pixel for Pixel study

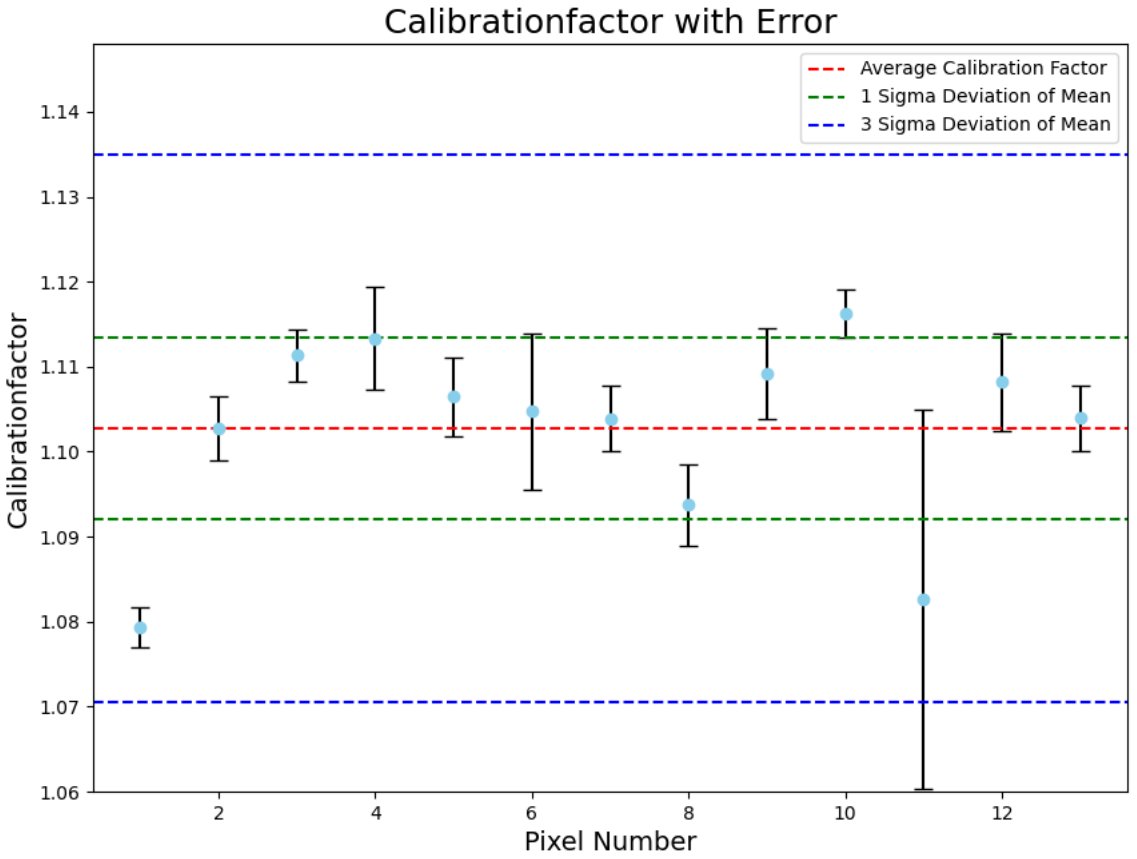


Events	Run-Date	Calib.	chi_squ.	error mu	error sigma	error amp	error base
100k	20230817	1.0872	0.1388	0.6948	1.4412	8795.7917	36.956
300k	20231003	1.1202	0.0092	0.4733	1.5617	42421.3085	174.112
100k	20231005	1.153	0.0339	0.4903	1.2343	8730.1807	38.0476
100k	20231010	1.0967	0.0549	0.5917	1.681	12569.3876	54.6088
400k	20231116	1.0849	0.0144	0.3702	0.9639	31507.5447	134.2466
Combined	20231120	1.1037	0.0158	0.7128	3.7935	390077.6132	1410.3793

Pixel for Pixel energy calibration

- Pixels randomly chosen
- Deviations ~4%
- Less than 3 σ of mean

PixelNr.	Pixel-x	Pixel-y	Calib.-factor	Error
1	10	10	1.0794	0.00234
2	12	23	1.1027	0.00379
3	12	5	1.1114	0.00306
4	15	19	1.1133	0.00606
5	16	11	1.1065	0.00464
6	17	7	1.1047	0.00916
7	19	3	1.1039	0.00384
8	2	20	1.0937	0.00474
9	25	20	1.1092	0.00535
10	5	17	1.1163	0.00281
11	7	15	1.0826	0.02229
12	8	15	1.1082	0.00577
13	8	16	1.1039	0.00388

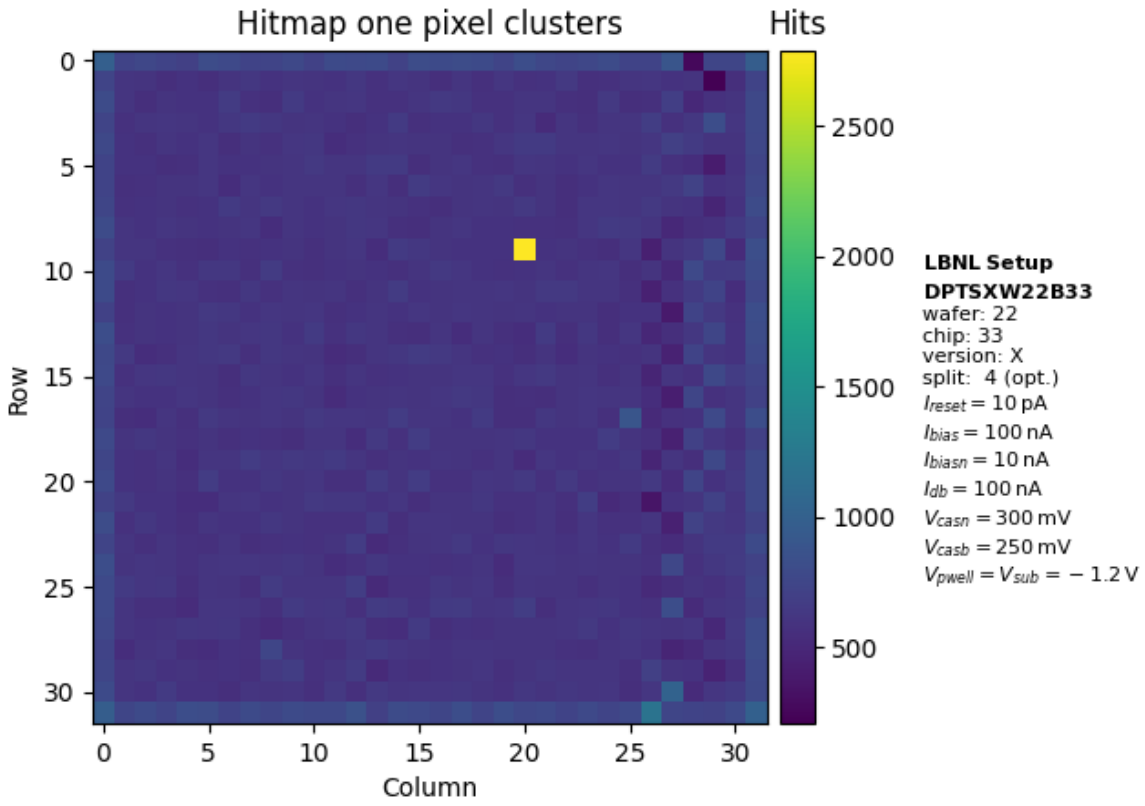


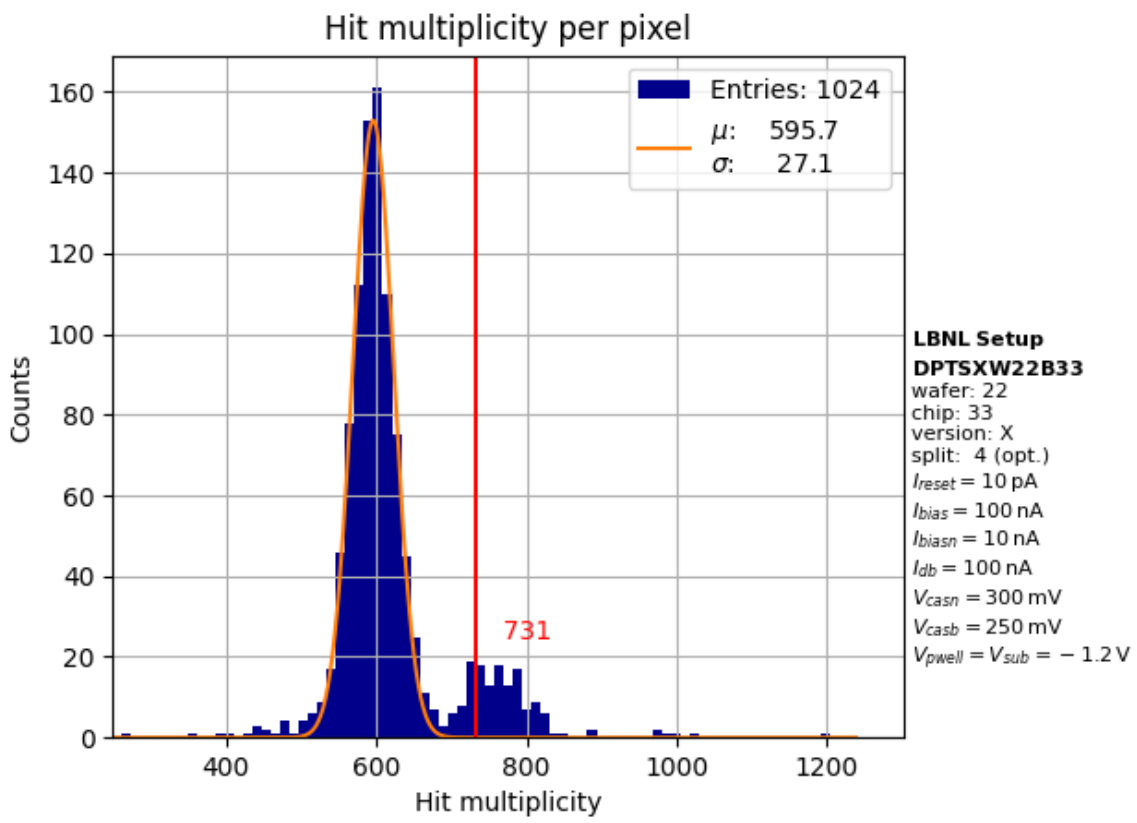
Possible Explanations

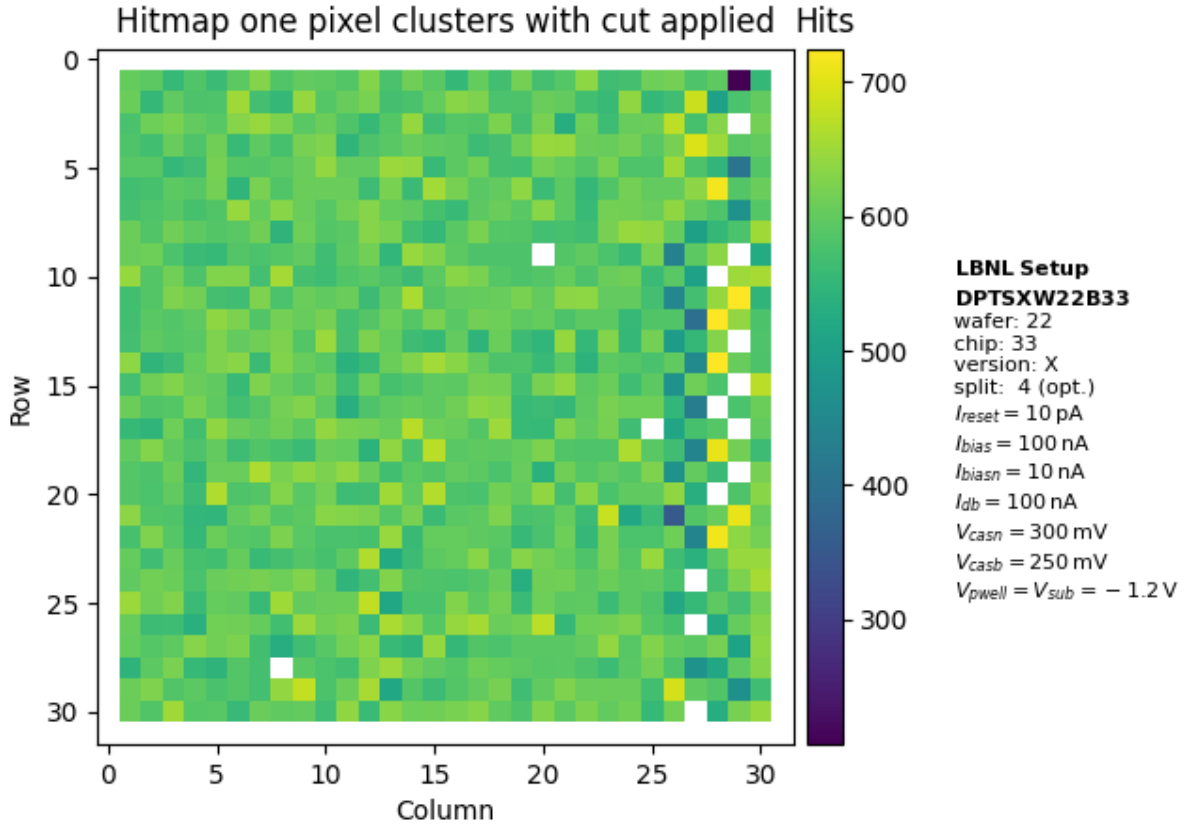
- Deviations during ToT calibration
  - To small
- Temperature dependence in measurement
  - Currently in focus
  - PID/GID calibration change with T
  - Temperature control needed
    - Coming soon
- Errors during decoding

Unexpected clusters in Matrix

- Some pixel multiplicities are to high, some are to low
- Noise cut cuts some events out
- Possibly to due PID/GID decoding




Hit multiplicity per pixel
Entries: 1024
μ: 595.7
σ: 27.1
731
Counts
Hit multiplicity
LBNL Setup
DPTSXW22B33
wafer: 22
chip: 33
version: X
split: 4 (opt.)
I_{reset} = 10 pA
I_{bias} = 100 nA
I_{biasn} = 10 nA
I_{db} = 100 nA
V_{casn} = 300 mV
V_{casb} = 250 mV
$V_{pwell} = V_{sub} = -1.2$ V


Hitmap one pixel clusters with cut applied
Hits
Row
Column
LBNL Setup
DPTSXW22B33
wafer: 22
chip: 33
version: X
split: 4 (opt.)
I_{reset} = 10 pA
I_{bias} = 100 nA
I_{biasn} = 10 nA
I_{db} = 100 nA
V_{casn} = 300 mV
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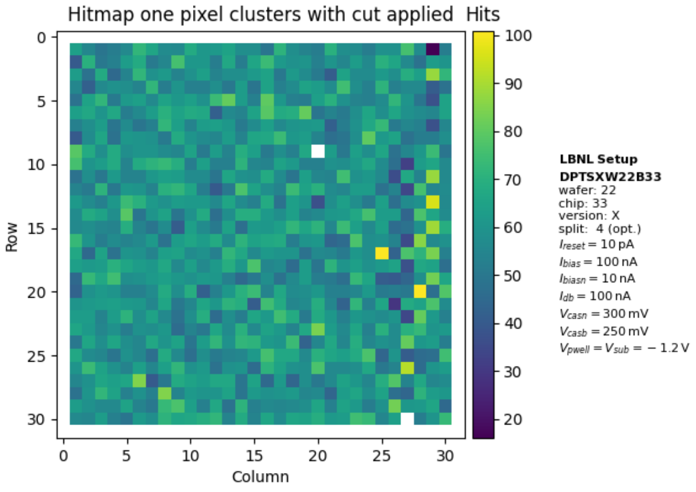
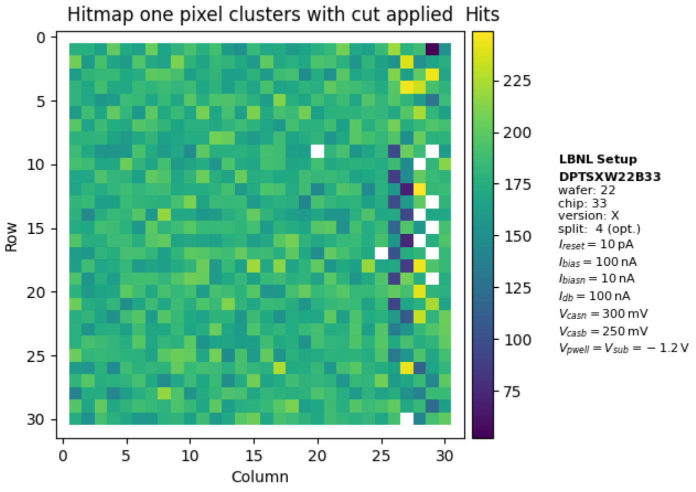
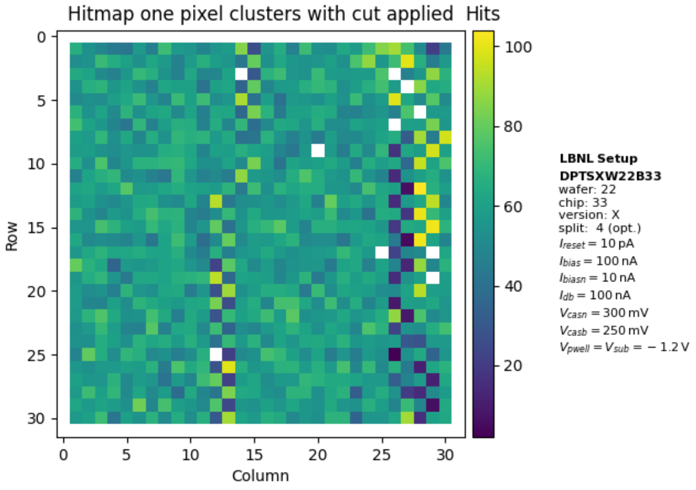
$V_{pwell} = V_{sub} = -1.2$ V

Different variations







Summary

- We took several datasets with Fe55
  - Combined 1.000.000 events
- We find artifacts in all datasets, maybe due to decoding errors
- The energy calibration factor varies by a few percent between different pixels and datasets

  ➔Needs further investigation
- Temperature in focus

Backup