



Pedestal Runs With Different Bias Voltage

Hung-Wei Liu, D. Tsionou, Saikat Karmakar
National Taiwan University

Runs and Setup

Runs Used

Date: 20240924 11:00~22:00

Run #	Run Type	Description	Shifter	Events
1727169610	Pedestal	Pedestal run for BV -400V	Daniela	70185
1727170256	Pedestal	Pedestal run BV -500V	Daniela	70405
1727173910	Pedestal	BV -600V	Daniela + Amina	70577
1727180386	Pedestal	BV -700V	Daniela + Amina	70522
1727206089	Pedestal	pedestal run after changing BV to -130V	Axel, Gizem	70267
1727207396	Pedestal	pedestal run after changing BV to -300V	Axel, Gizem	71322

- ❖ These are sorted in chronological order.

Test Beam Setup

Water temperature: 15°C

ROTATIONS

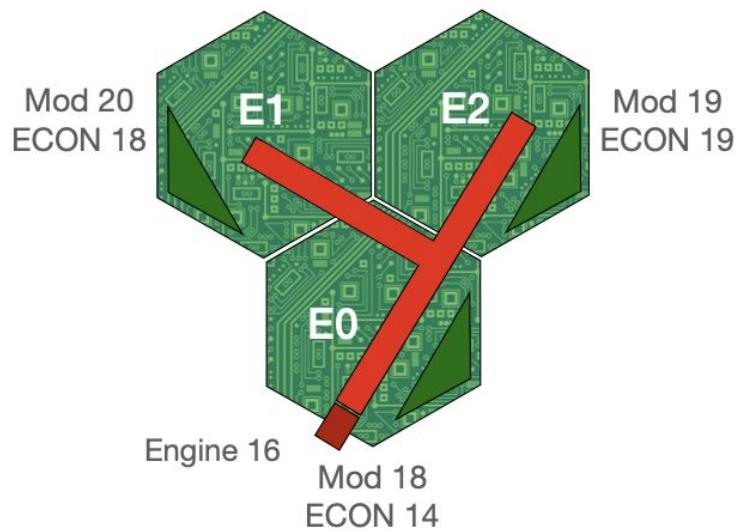


NUMBERING

Modules typecodes: 320MLF3WXIHO0NN
ECON SN: 01.000NN
Engine number: 000NN

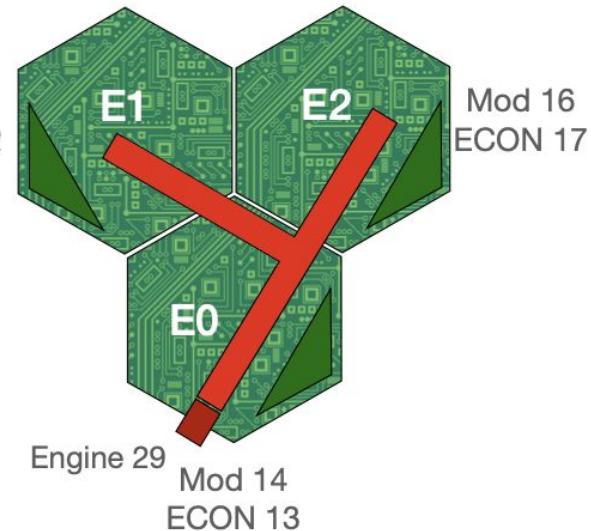
Front train

MPO12 fiber ID: B9
EMP channel (DAQ): 51
EMP channel (TPG): 59



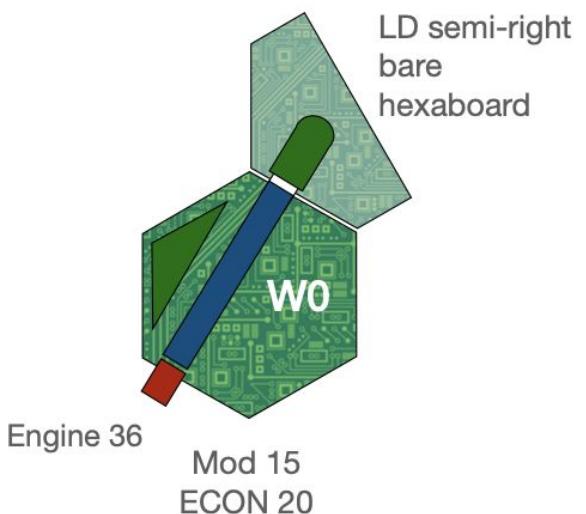
Back train

MPO12 fiber ID: B8
EMP channel (DAQ): 50
EMP channel (TPG): 58



Additional train

MPO12 fiber ID: B7
EMP channel (DAQ): 49
EMP channel (TPG): 57



Modules Involved

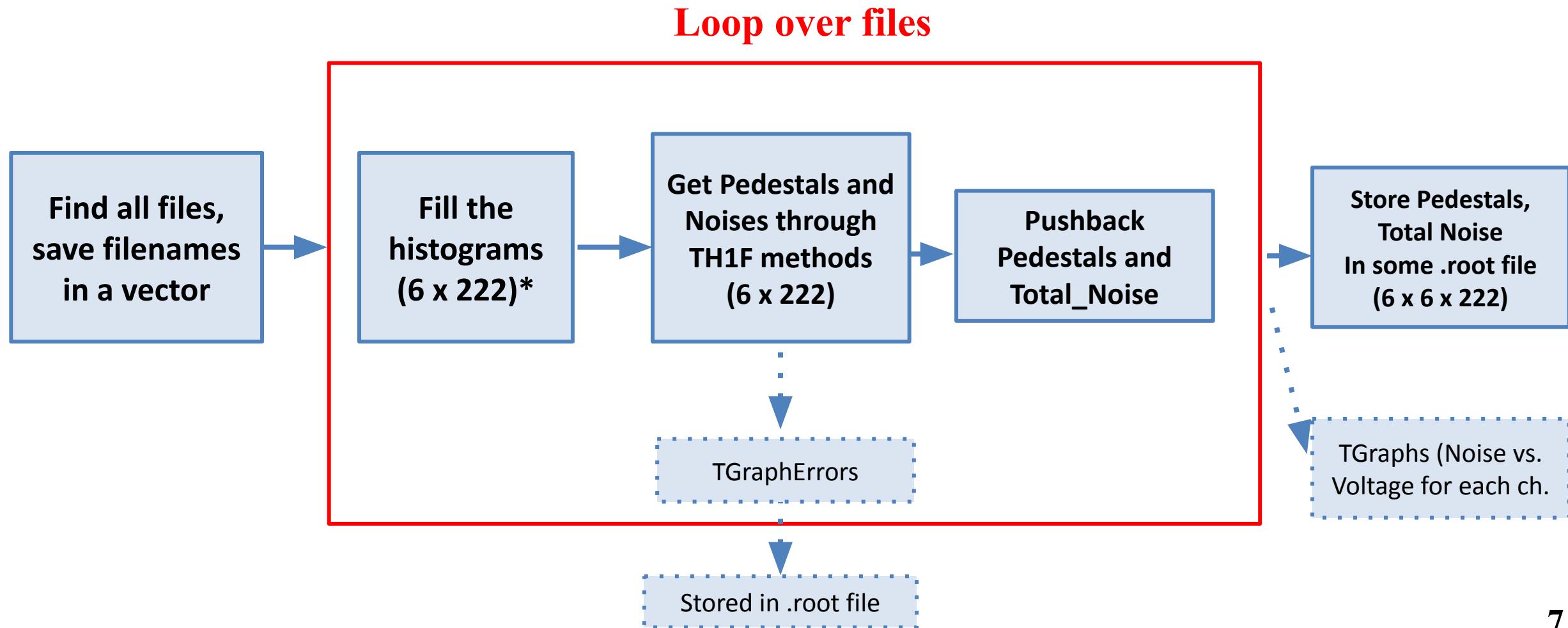
The sequential ID of the modules are given as follows:

- Module 0: ML_F3WX_IH00**19**
- Module 1: ML_F3WX_IH00**20**
- Module 2: ML_F3WX_IH00**18**
- Module 3: ML_F3WX_IH00**16**
- Module 4: ML_F3WX_IH00**17**
- Module 5: ML_F3WX_IH00**14**

Analysis Method

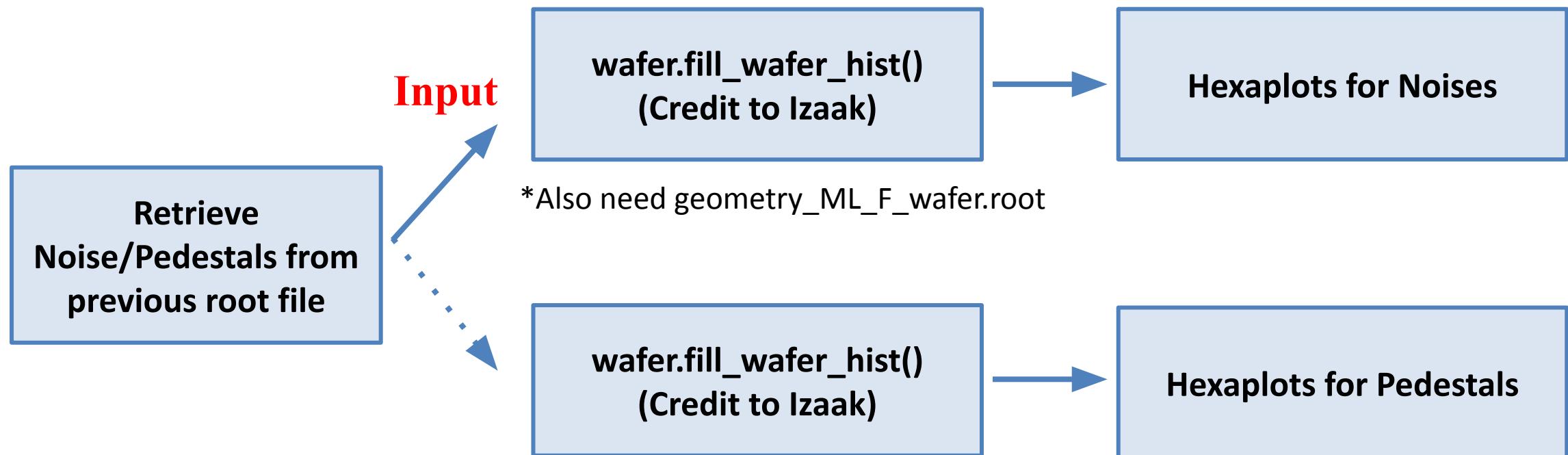
Script Structure: Noise Retrieval

Language: C++ with ROOT Library

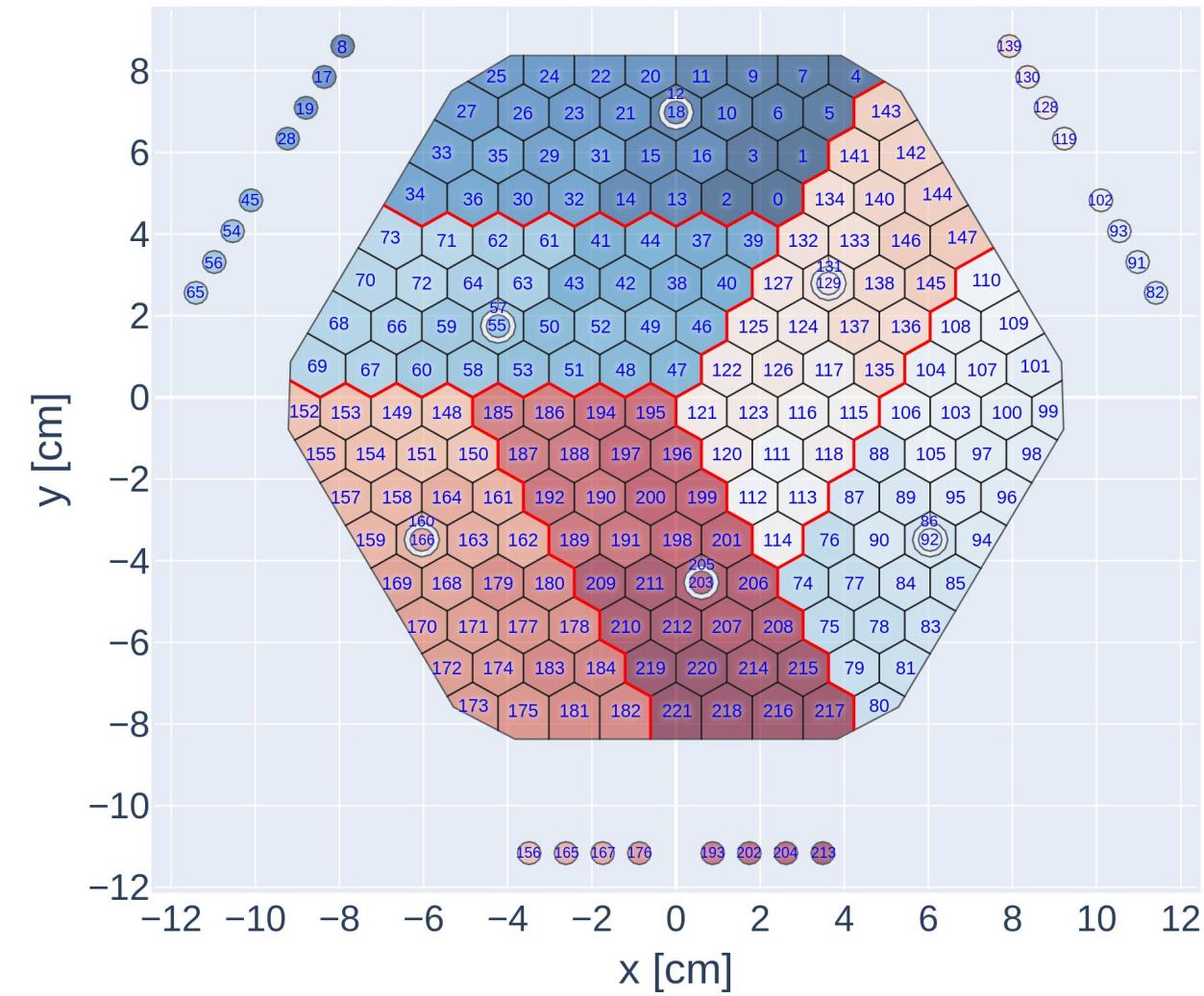


Script Structure: Creating Hexaplots

Language: Python



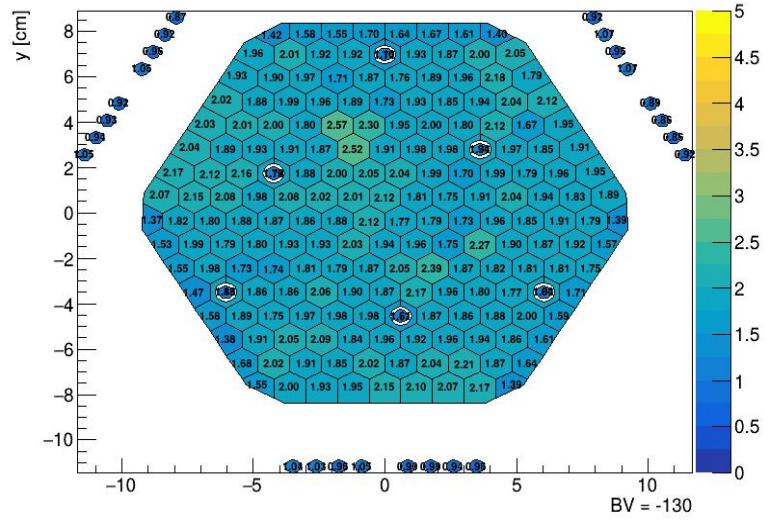
Channel ID map



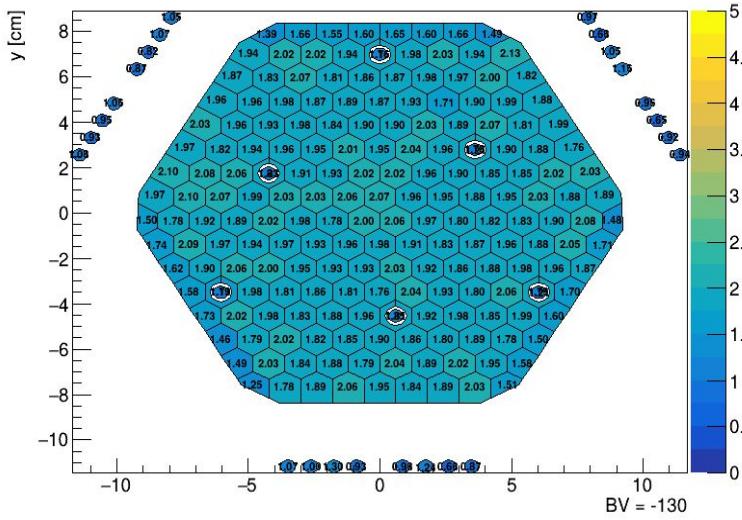
Results

- 130V

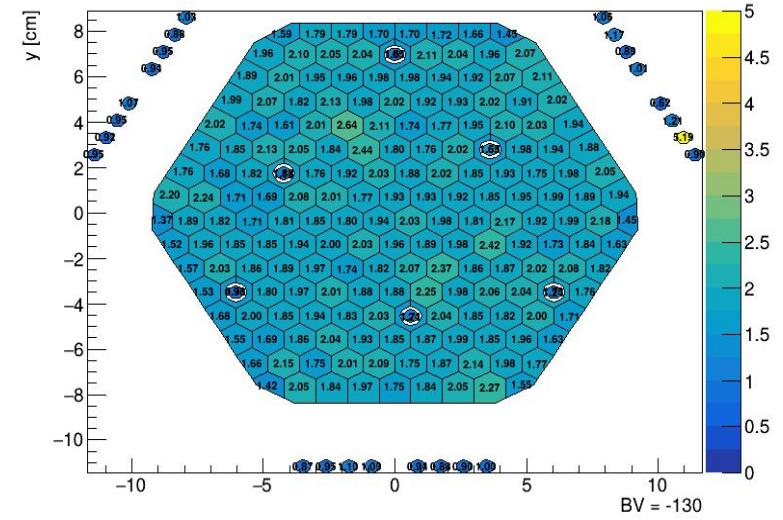
Total_Noise Map for Module 0



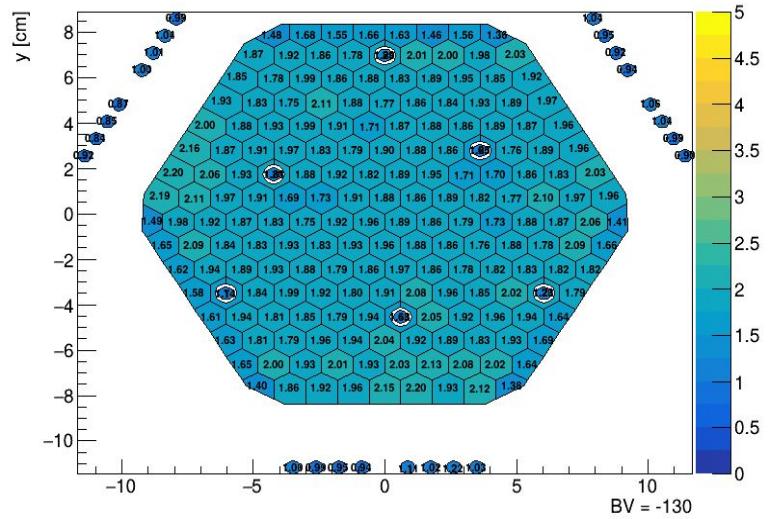
Total_Noise Map for Module 1



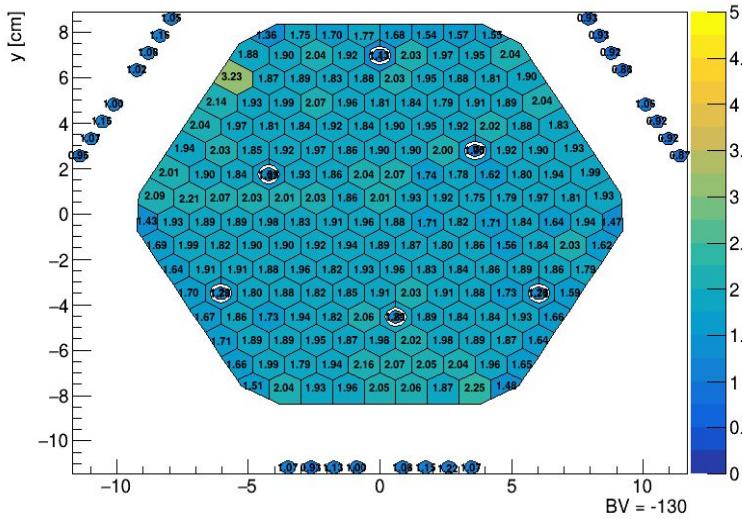
Total_Noise Map for Module 2



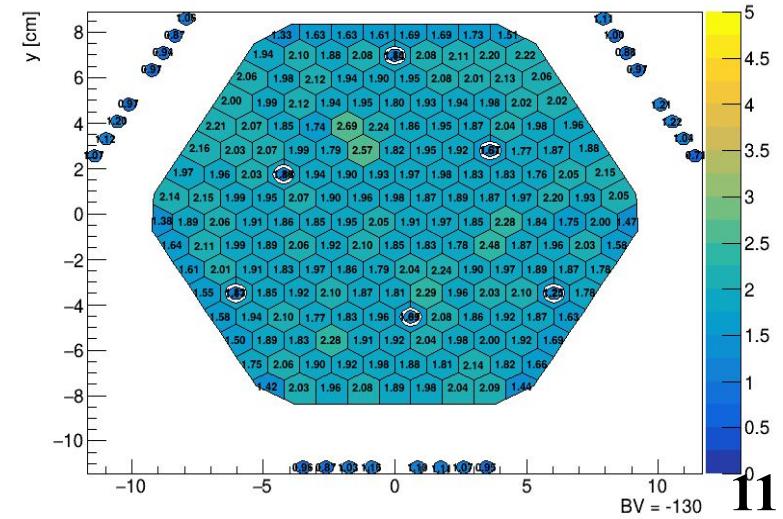
Total_Noise Map for Module 3



Total_Noise Map for Module 4

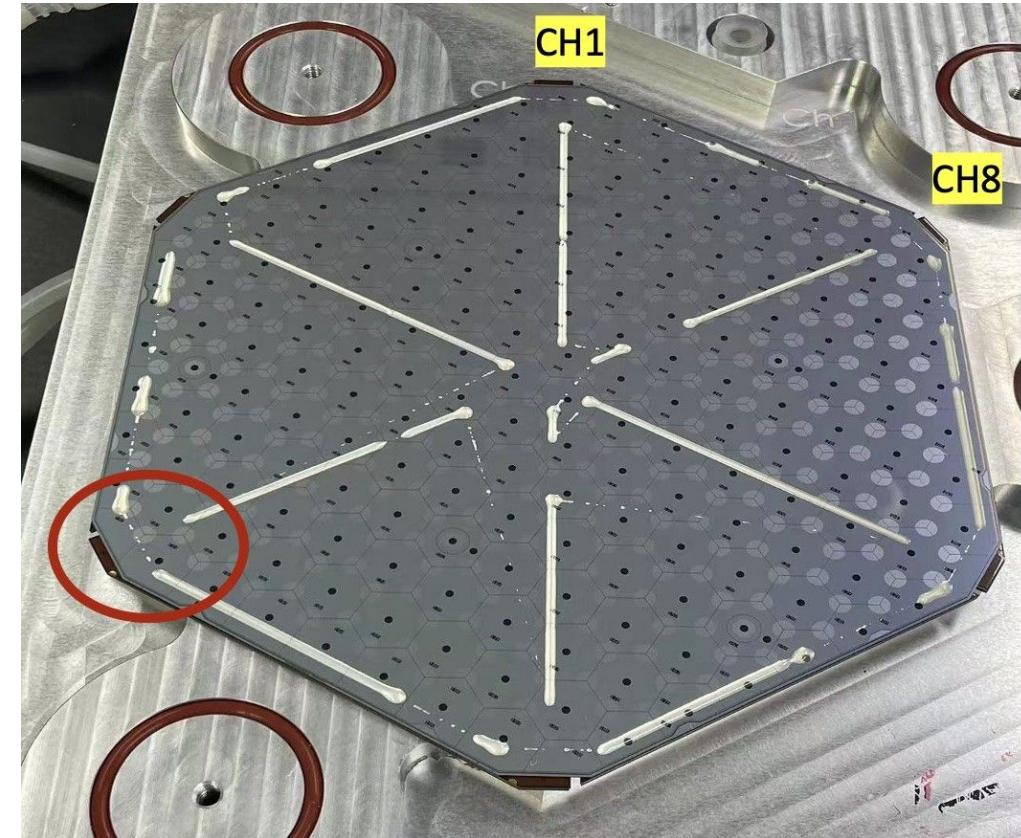
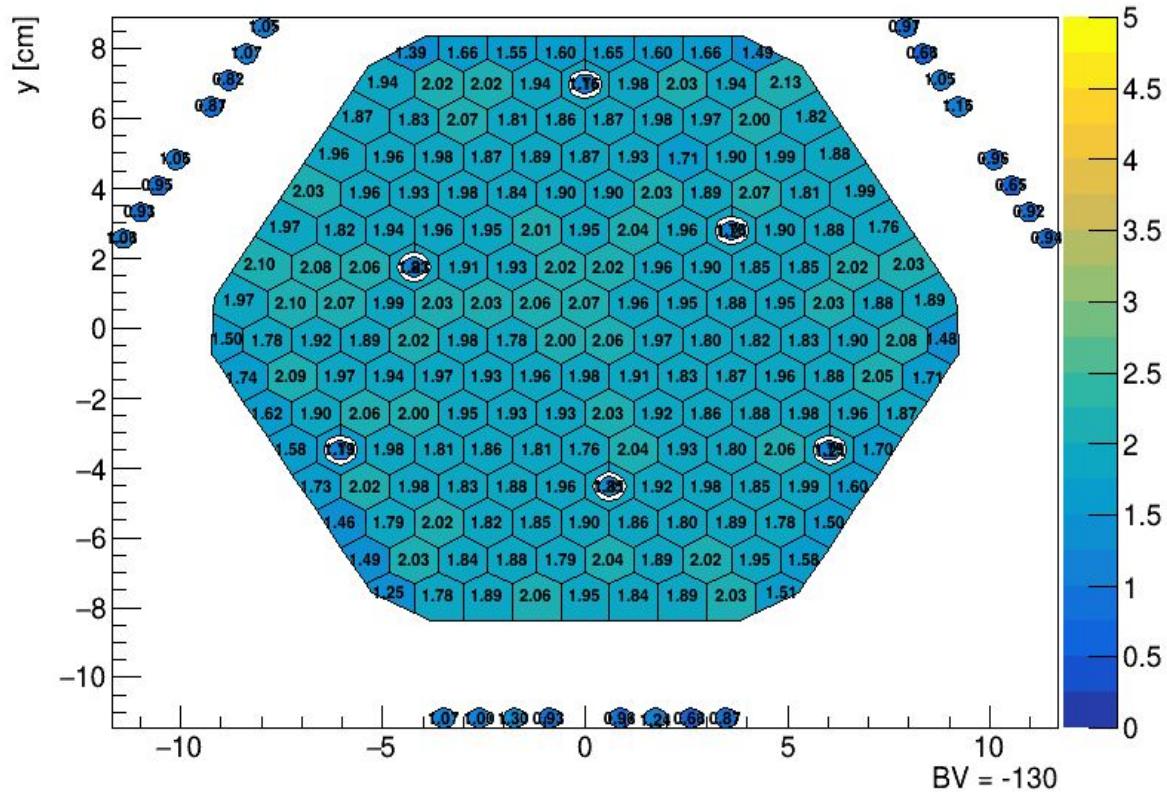


Total_Noise Map for Module 5



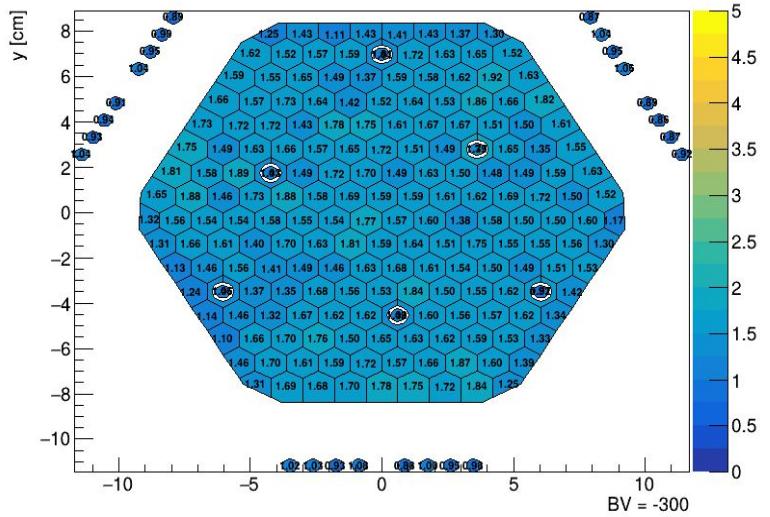
Glue Pattern and Noise Pattern

Module 1; BV = -130V

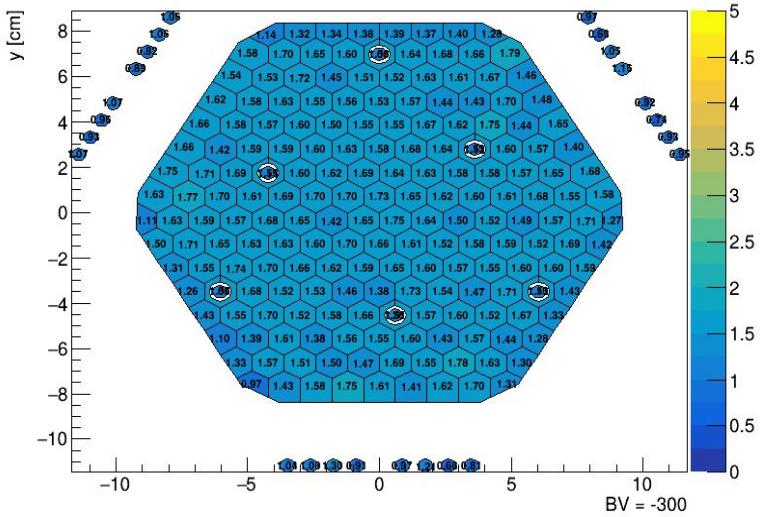


-300V

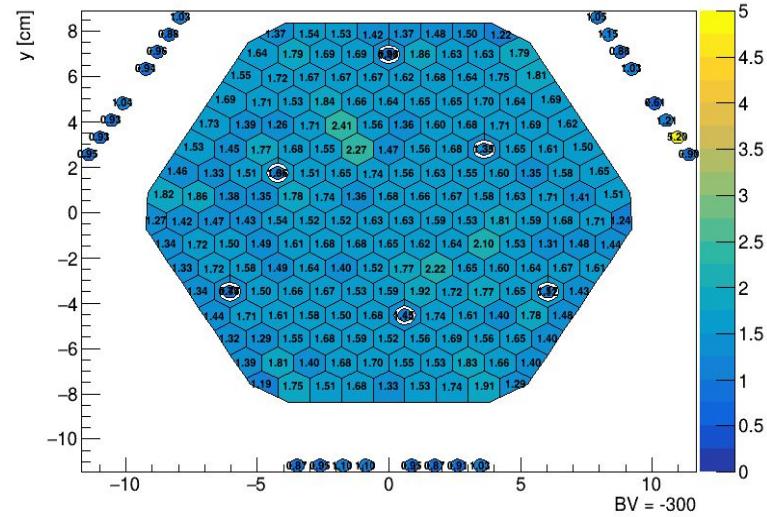
Total_Noise Map for Module 0



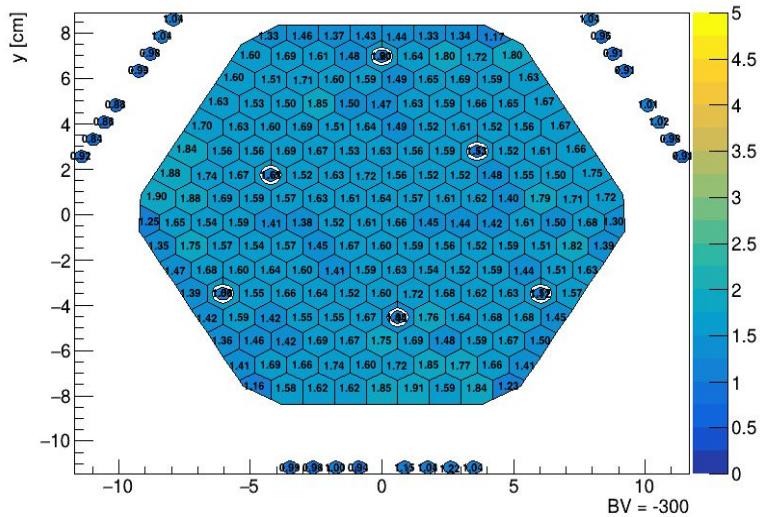
Total_Noise Map for Module 1



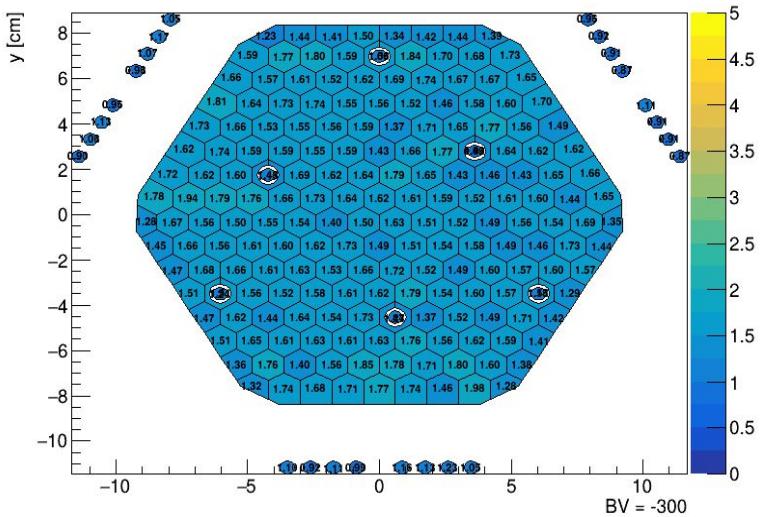
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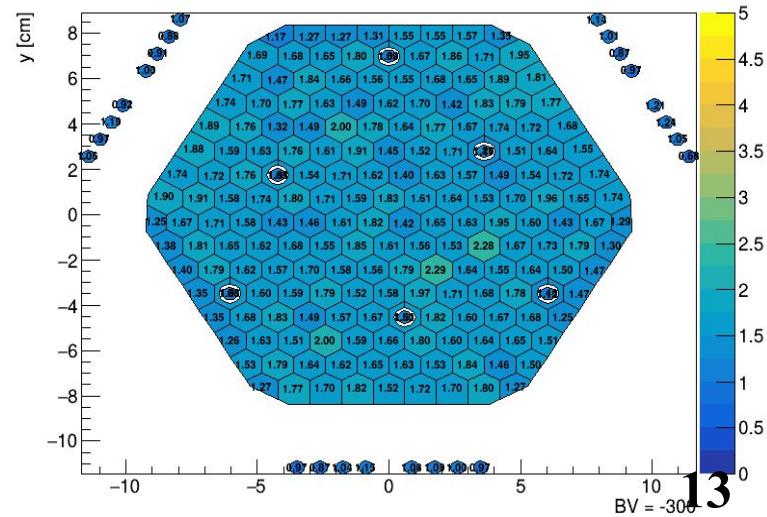
Total_Noise Map for Module 3



Total_Noise Map for Module 4

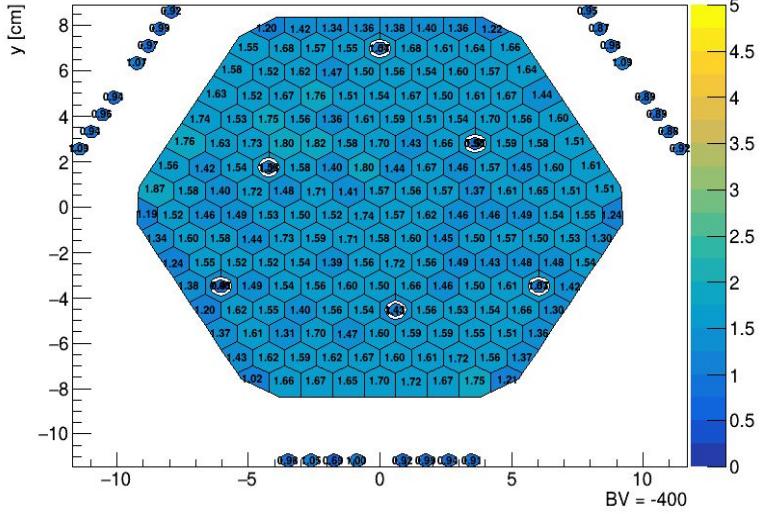


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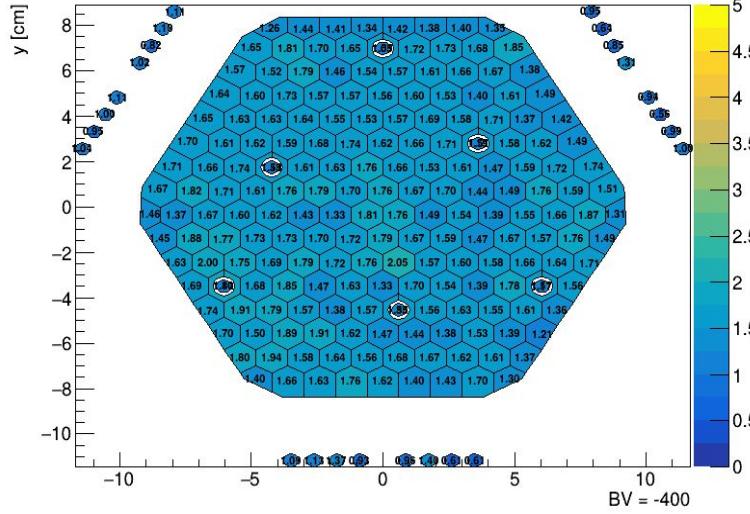


-400V

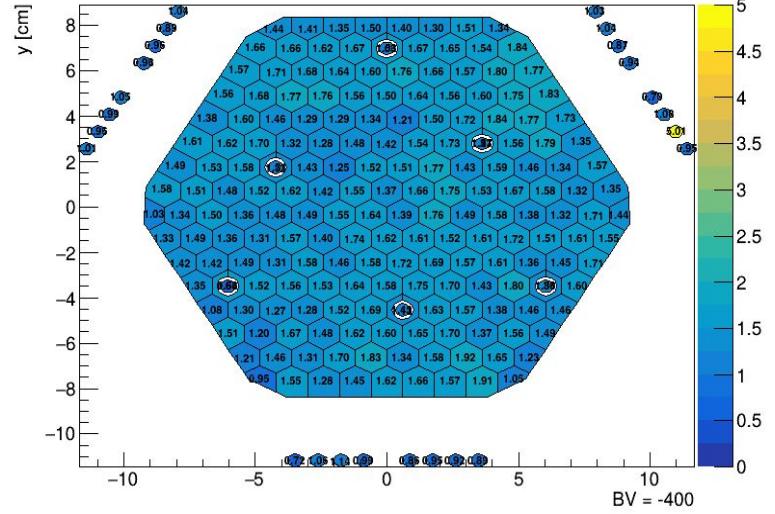
Total_Noise Map for Module 0



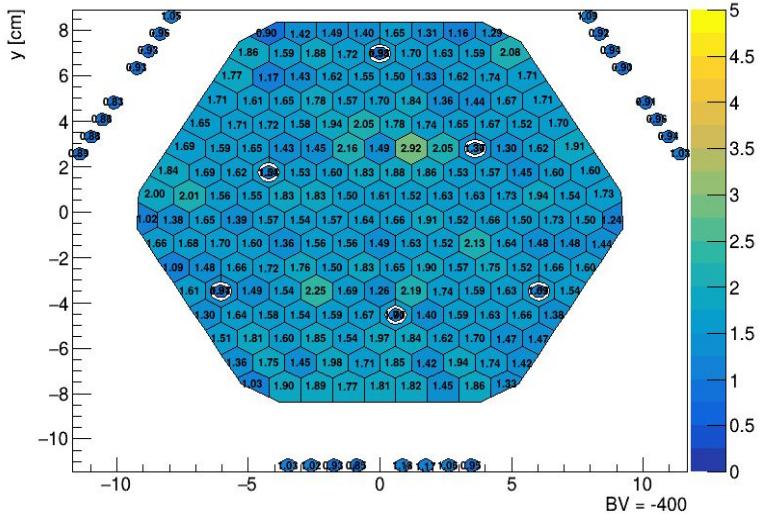
Total_Noise Map for Module 1



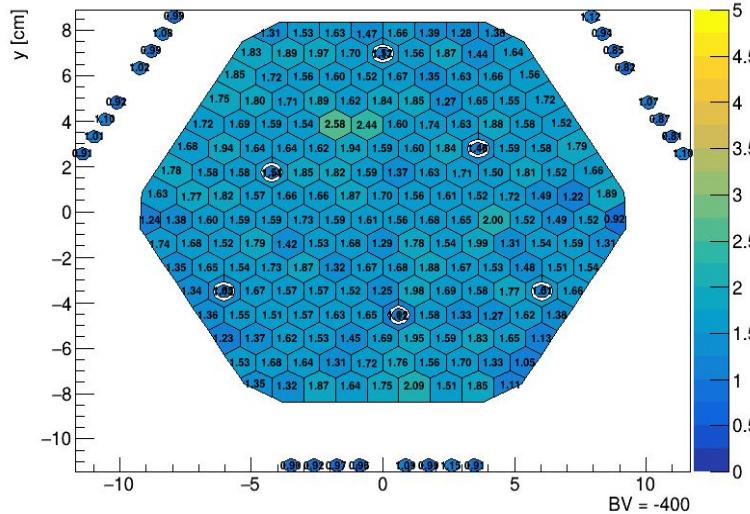
Total_Noise Map for Module 2



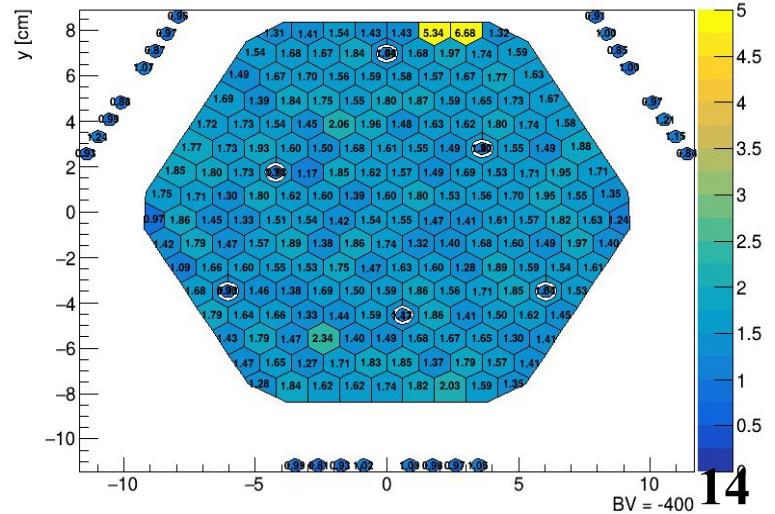
Total_Noise Map for Module 3



Total_Noise Map for Module 4

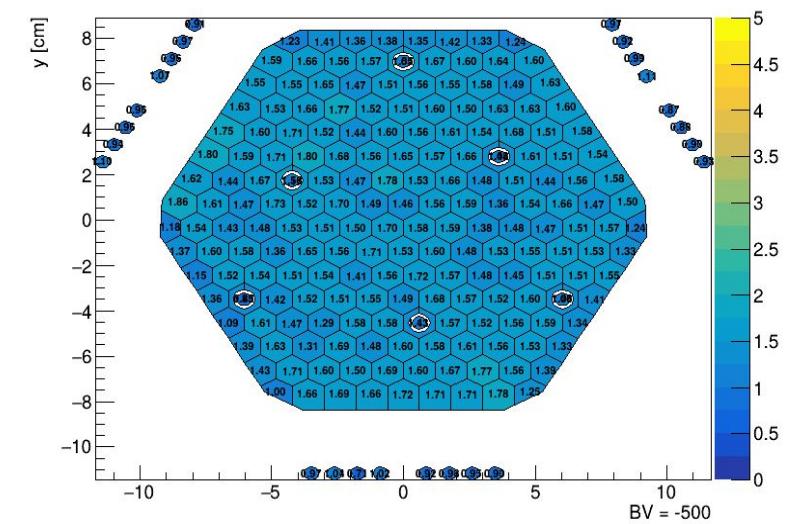


Total_Noise Map for Module 5

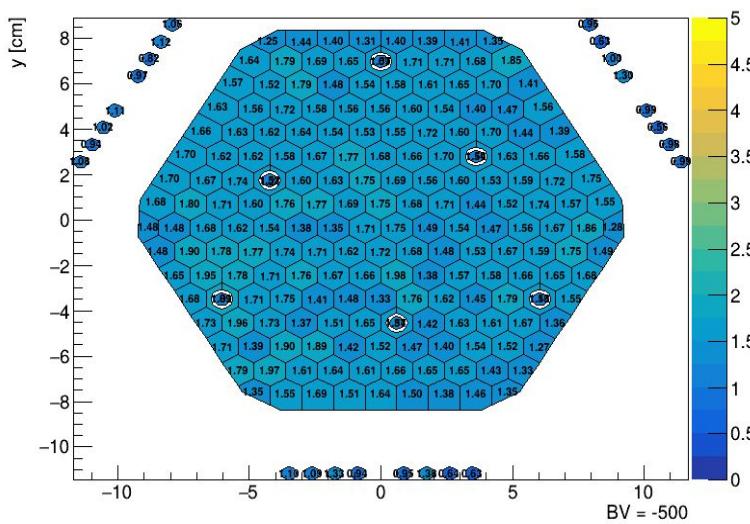


-500V

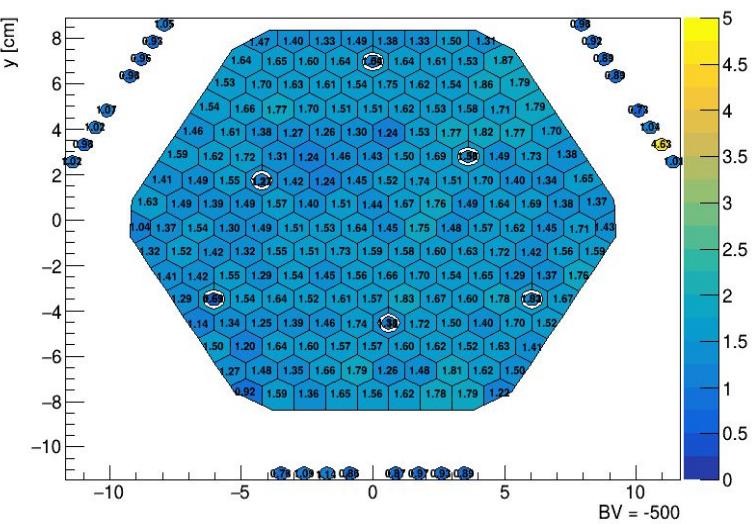
Total_Noise Map for Module 0



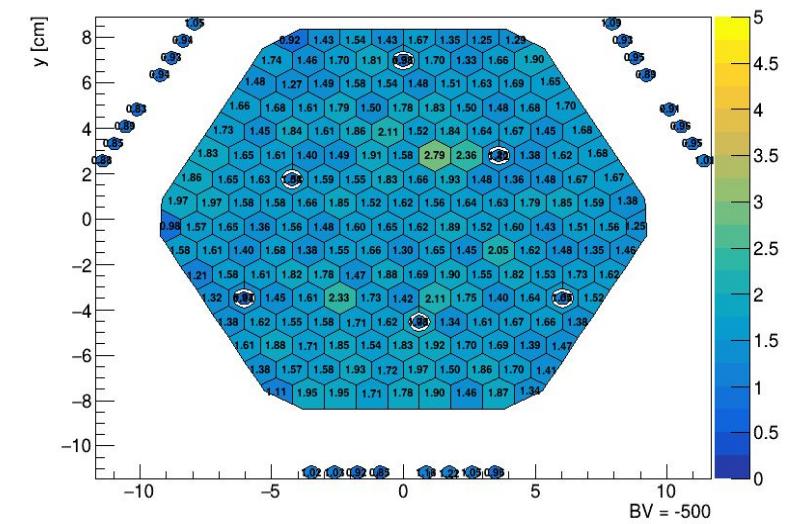
Total_Noise Map for Module 1



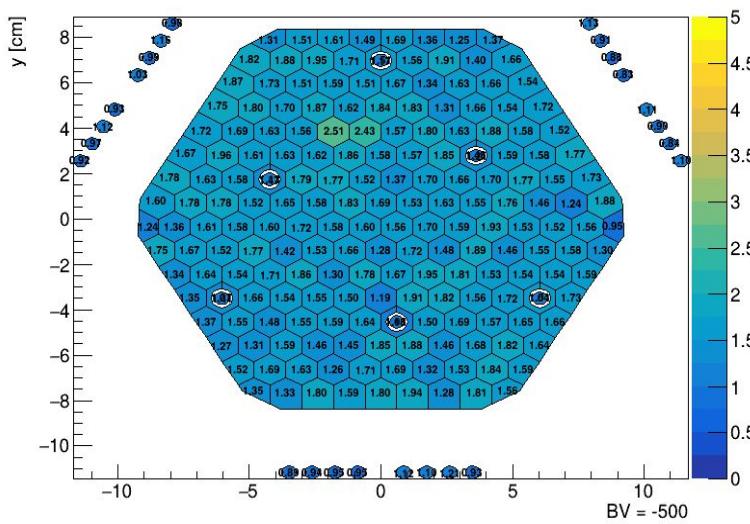
Total_Noise Map for Module 2



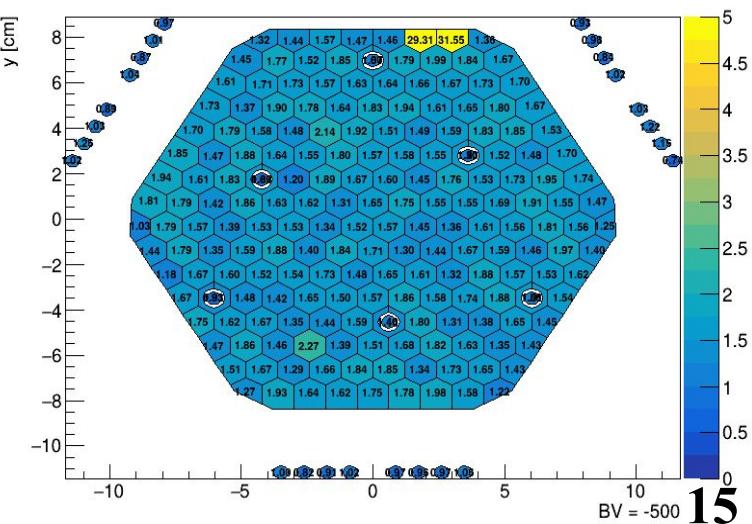
Total_Noise Map for Module 3



Total_Noise Map for Module 4



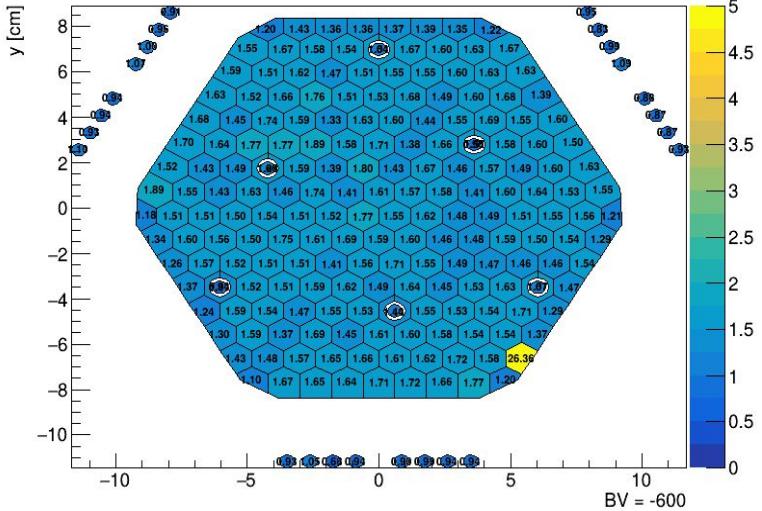
Total_Noise Map for Module 5



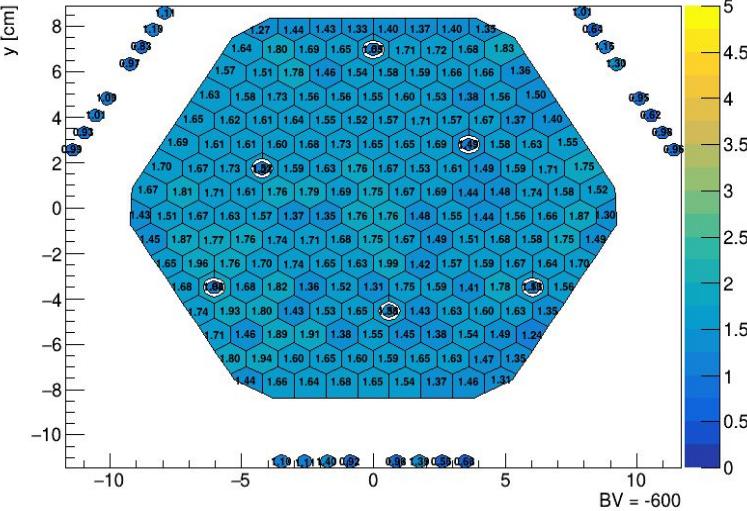
15

-600V

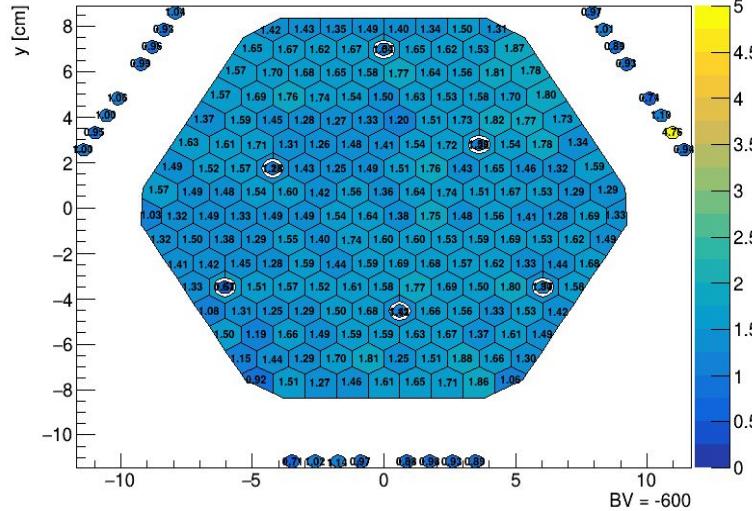
Total_Noise Map for Module 0



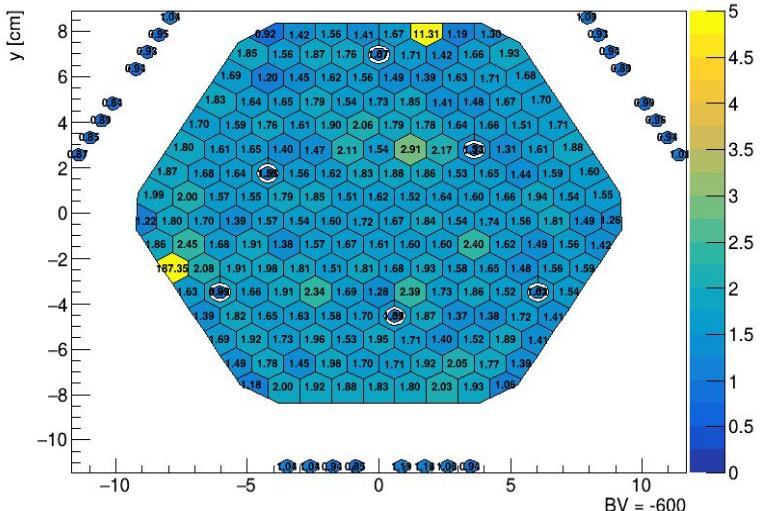
Total_Noise Map for Module 1



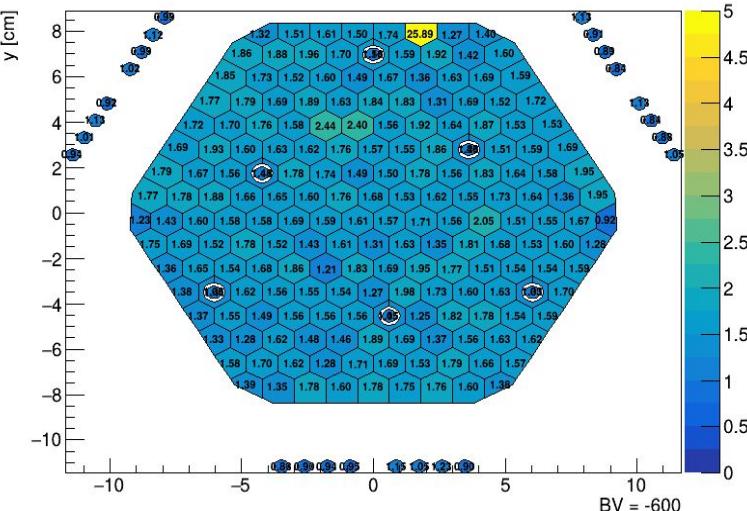
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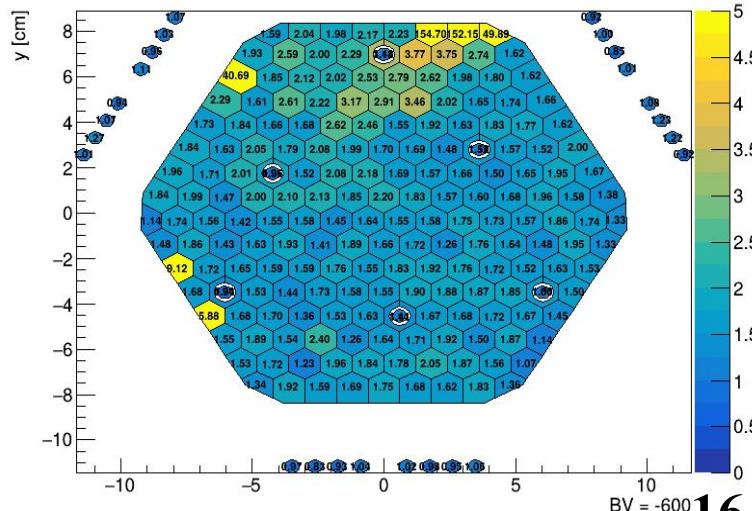
Total_Noise Map for Module 3



Total_Noise Map for Module 4

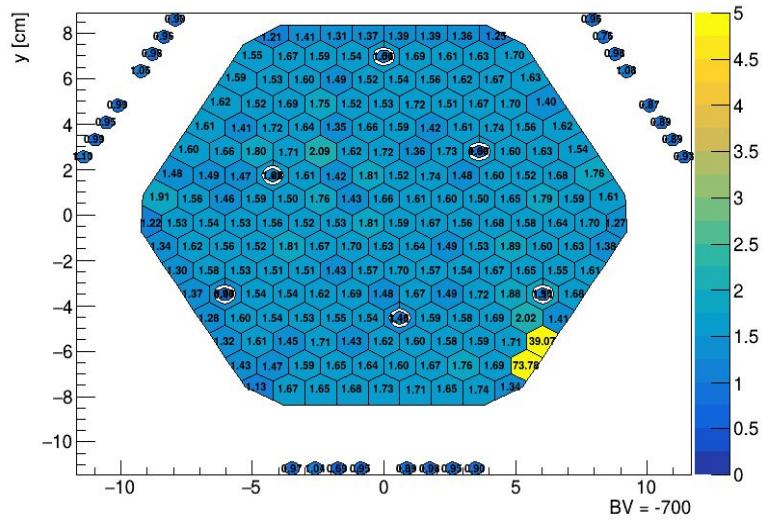


Total_Noise Map for Module 5

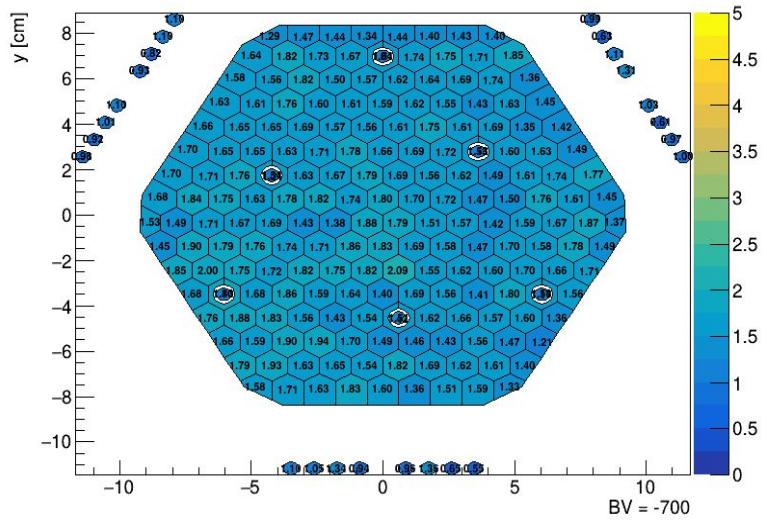


-700V

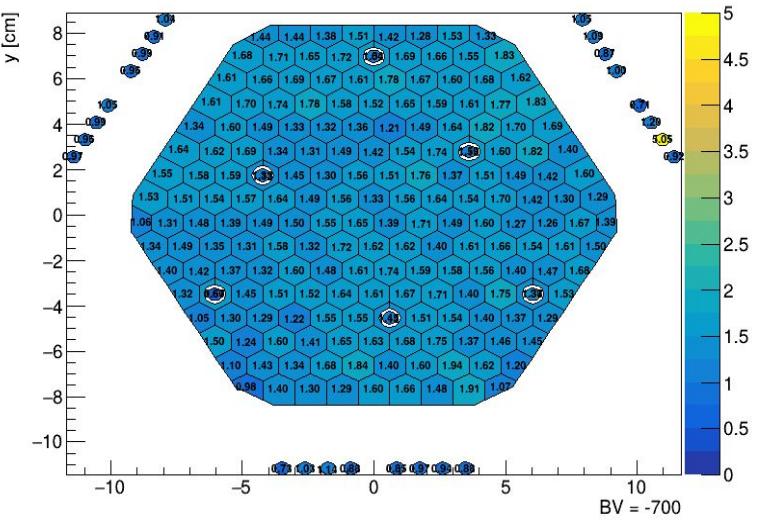
Total_Noise Map for Module 0



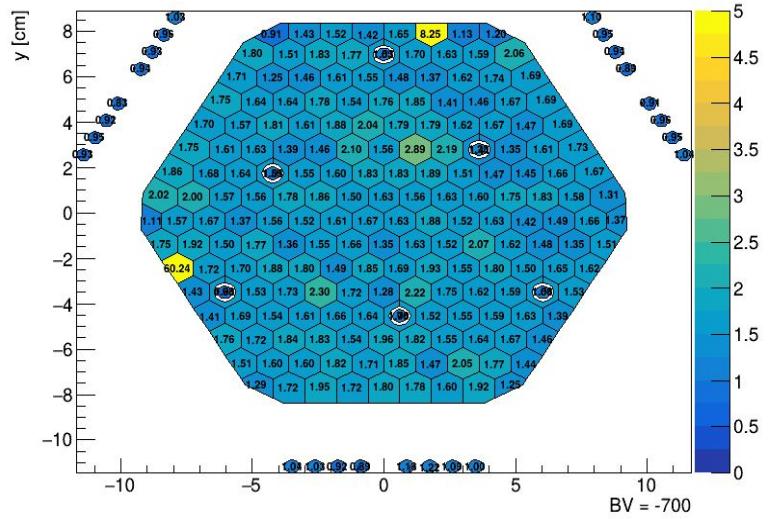
Total_Noise Map for Module 1



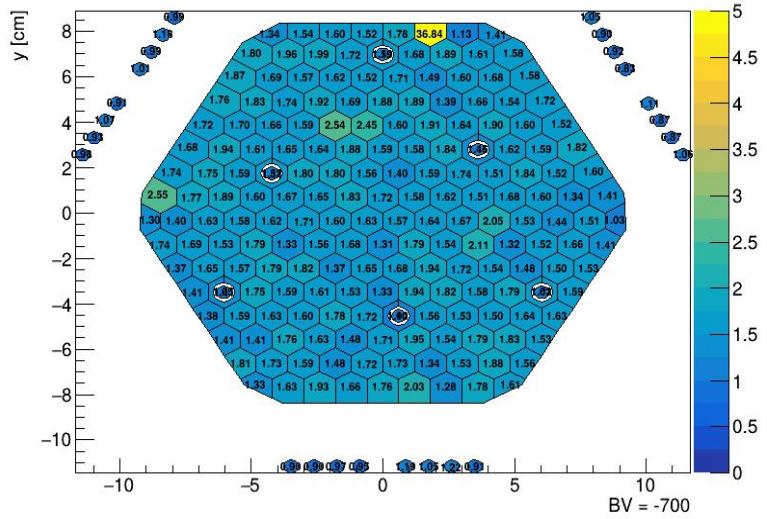
Total_Noise Map for Module 2



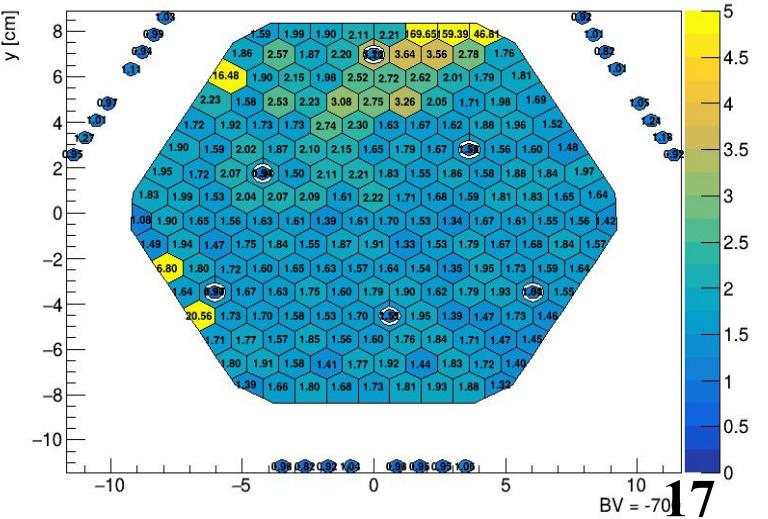
Total_Noise Map for Module 3



Total_Noise Map for Module 4



Total_Noise Map for Module 5



Leakage Current

Bias (V)	Layer 1 leakage current	Layer 2&3 leakage current
-130	170 nA	1.2 μA
-300	440 nA	2 μA
-400	551 nA	4.4 μA
-500	750 nA	27 μA
-600	1 μA	665 μA
-700	22 μA	360 μA

Bias Voltage Layer 1



Bias Current Layer 1



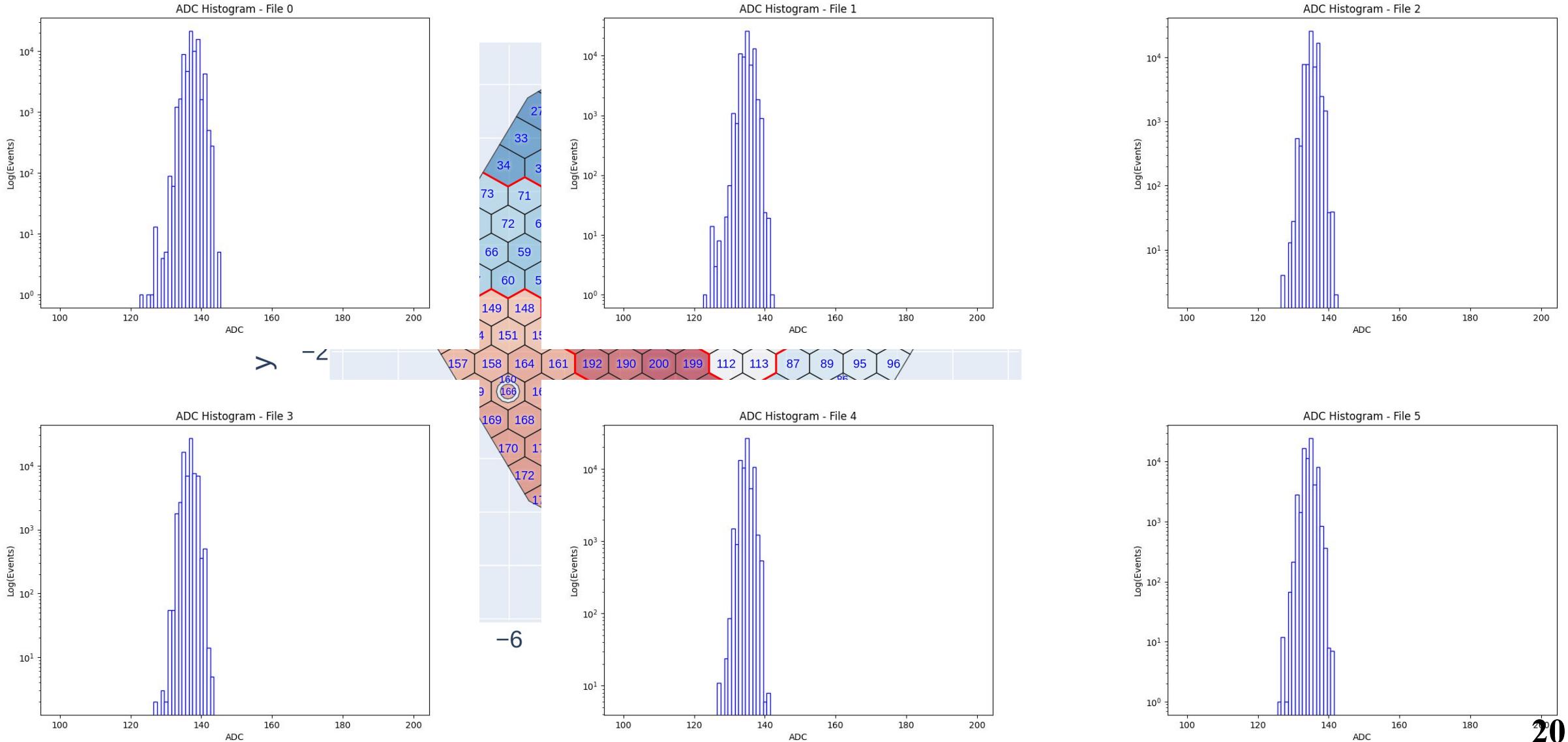
Bias Voltage Layer 2 & 3



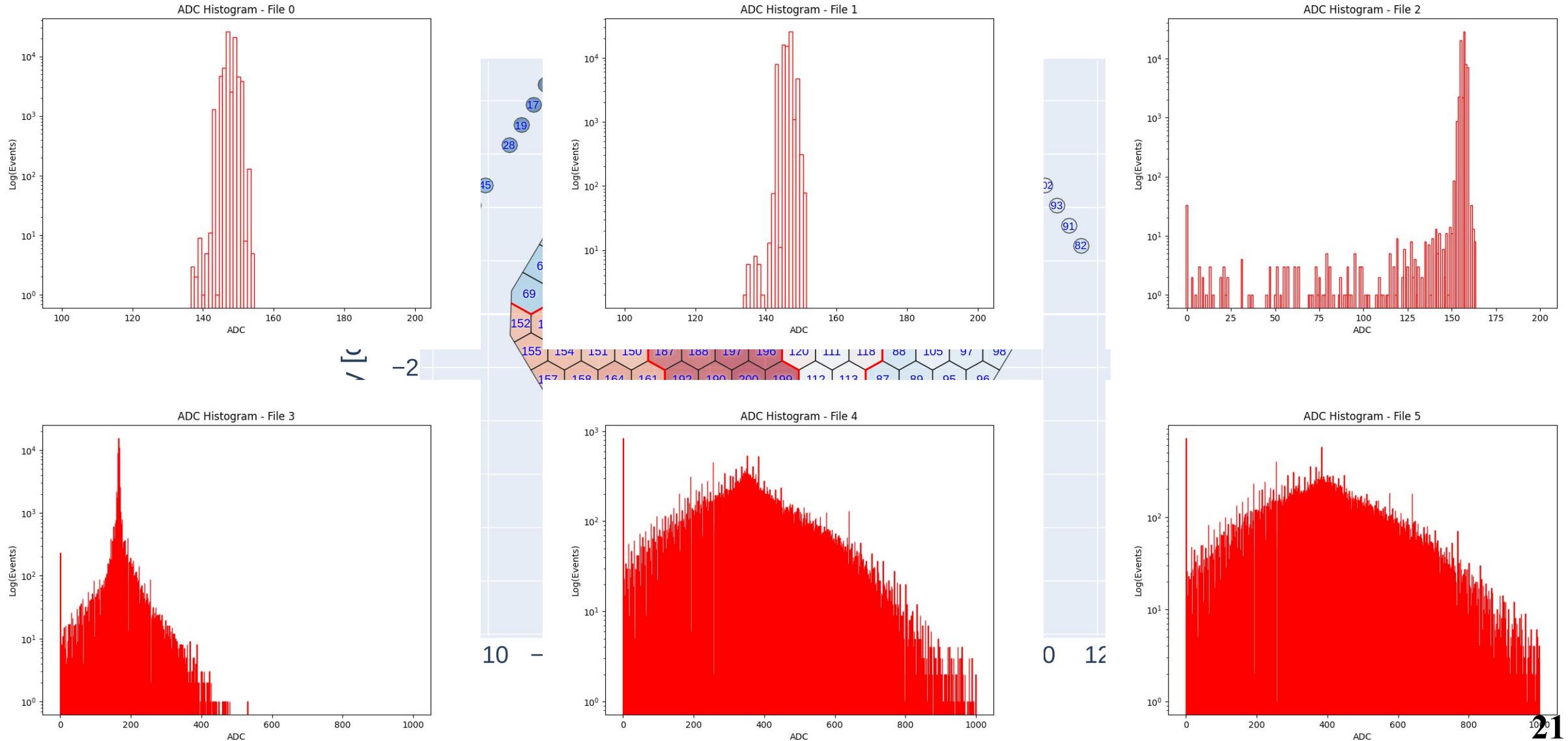
Bias Current Layer 2 & 3



Normal Channel (module 0)



Noisy Channel (Module 5)



Summary

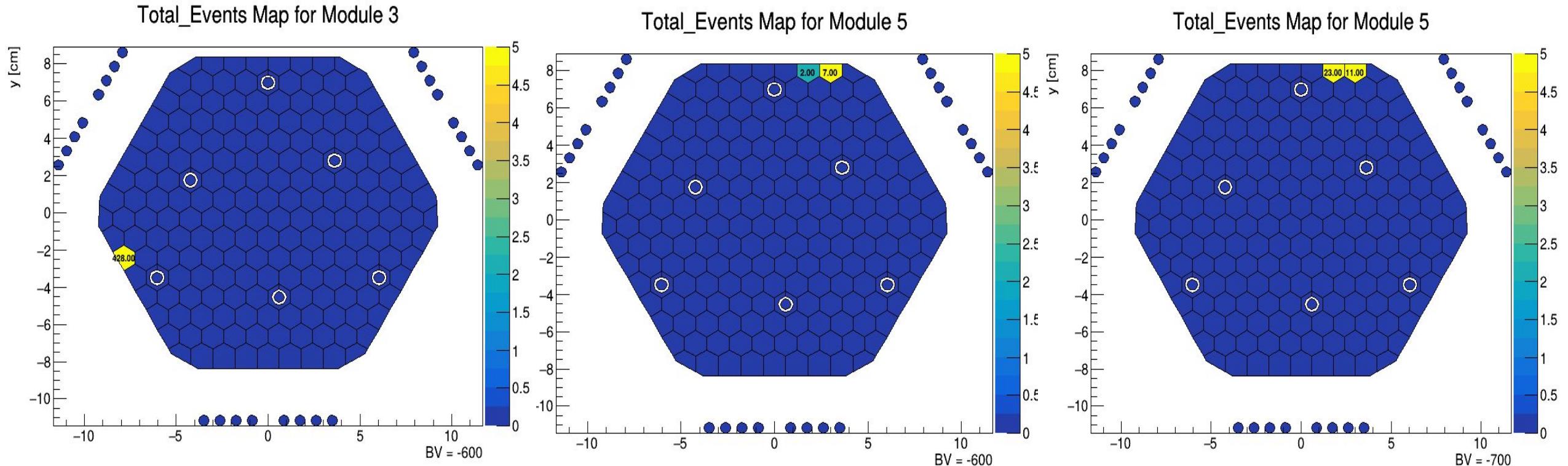
- We showed hexaplots of noise and pedestals at different bias voltage.
- At high voltage, noisy channels appear at the periphery.
- We find correlation between gluing pattern and the noise, but such correlation becomes less apparent at higher bias voltage.

Future Plan

- Investigate pedestal runs taken with Zero Suppression.

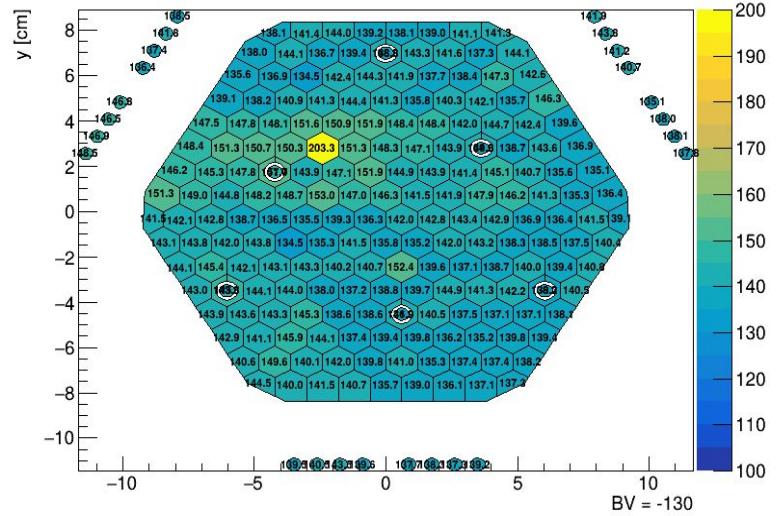
Appendix

Number of nonzero TOT events

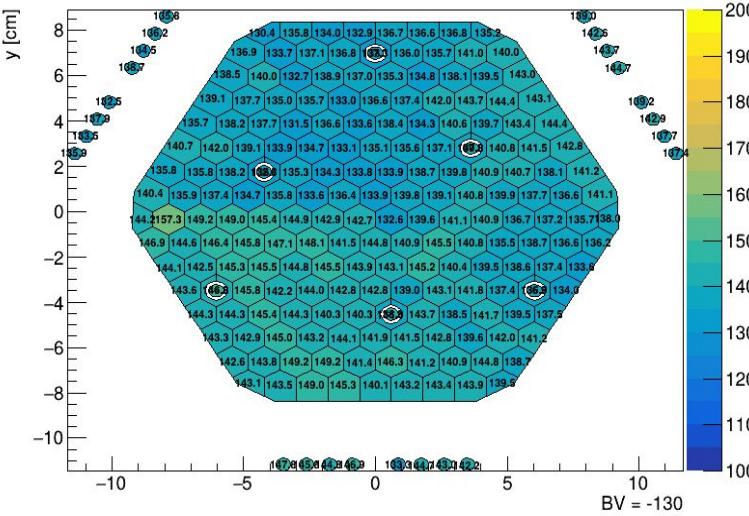


Pedestals Hexaplots: -130V

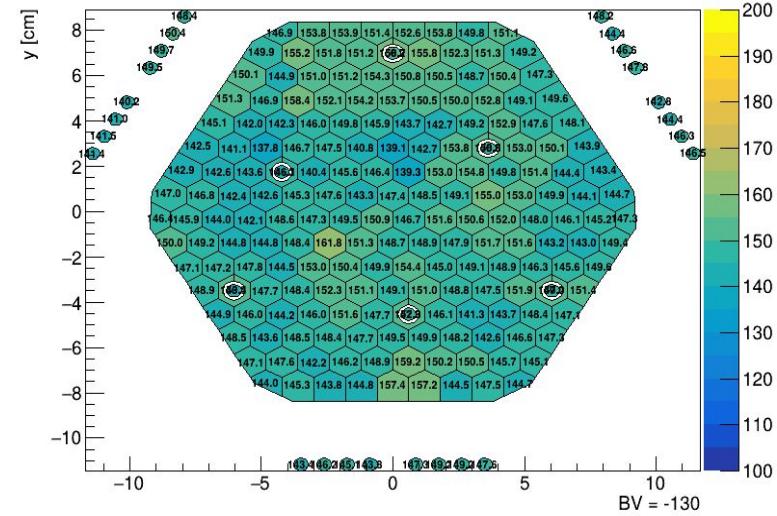
Pedestals Map for Module 0



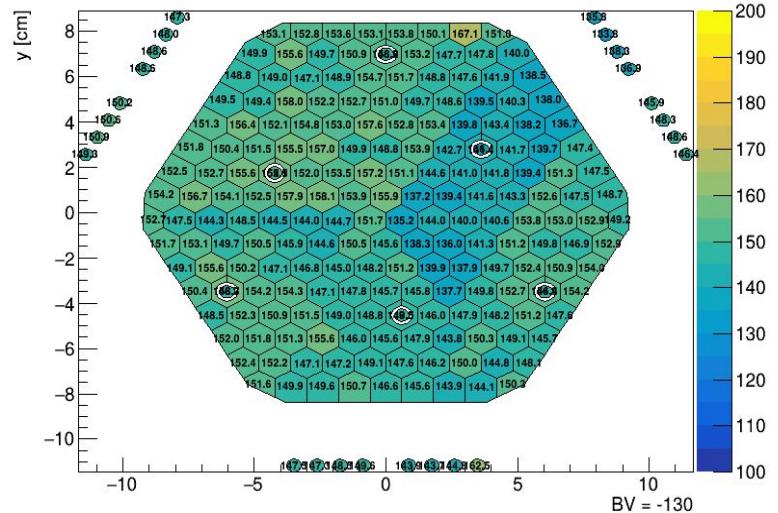
Pedestals Map for Module 1



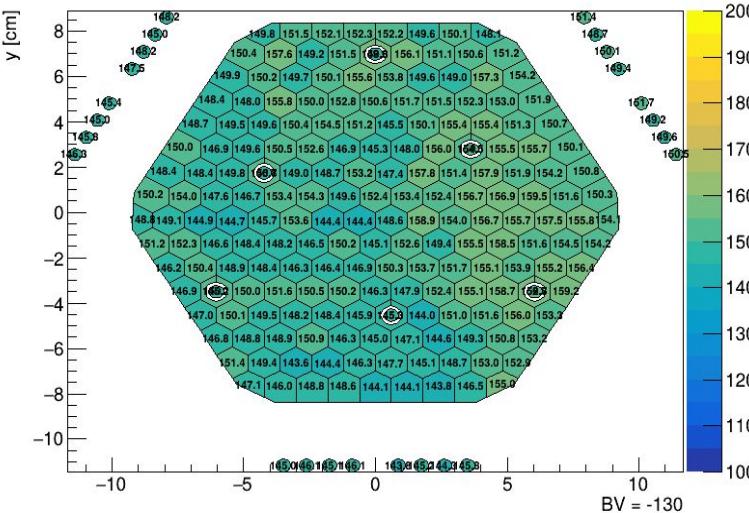
Pedestals Map for Module 2



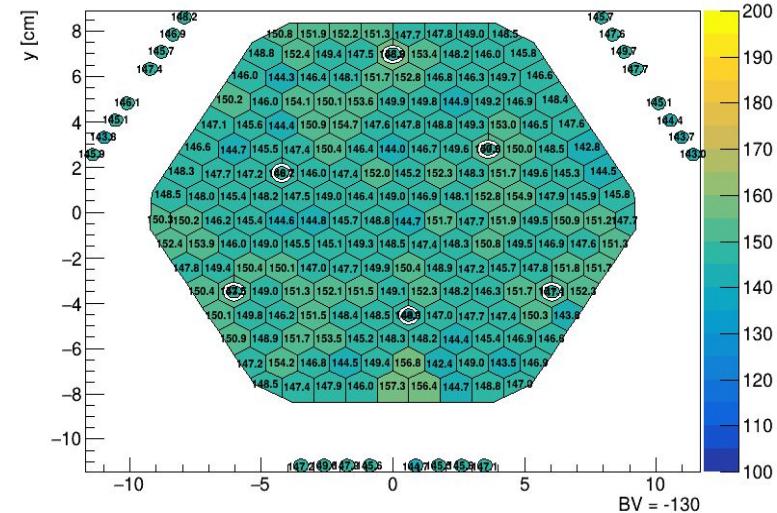
Pedestals Map for Module 3



Pedestals Map for Module 4

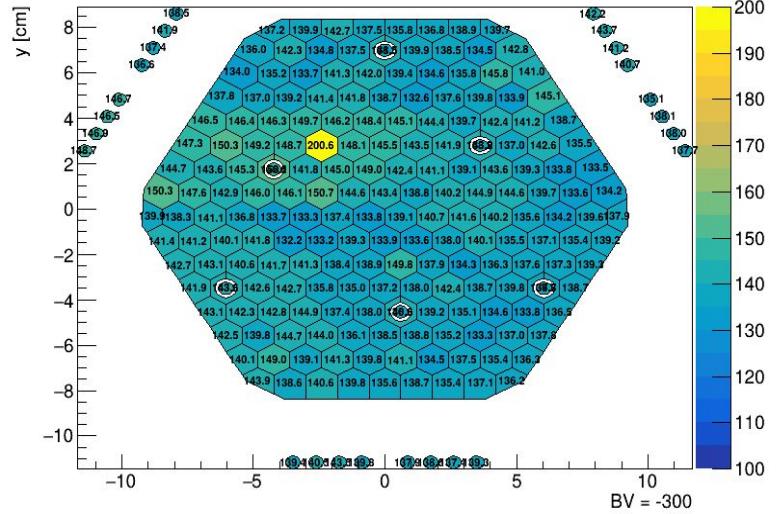


Pedestals Map for Module 5

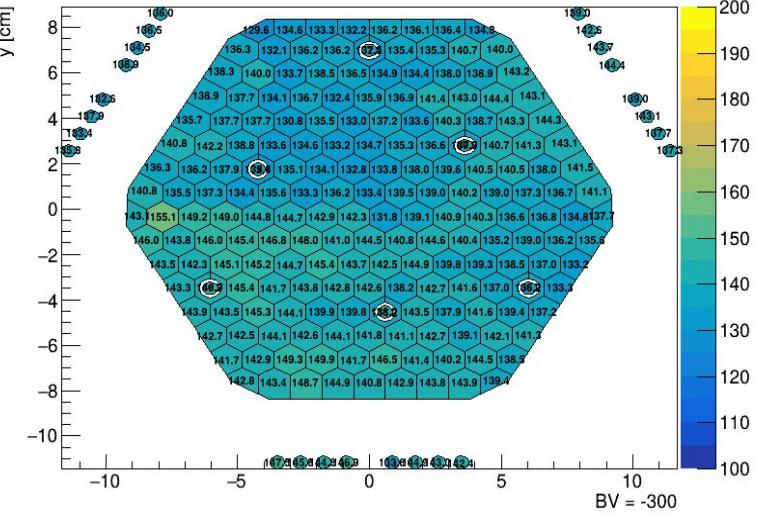


Pedestals Hexaplots: -300V

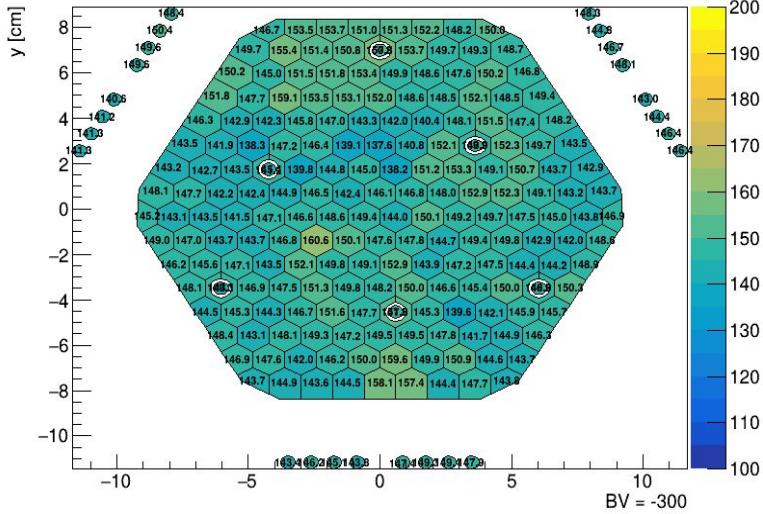
Pedestals Map for Module 0



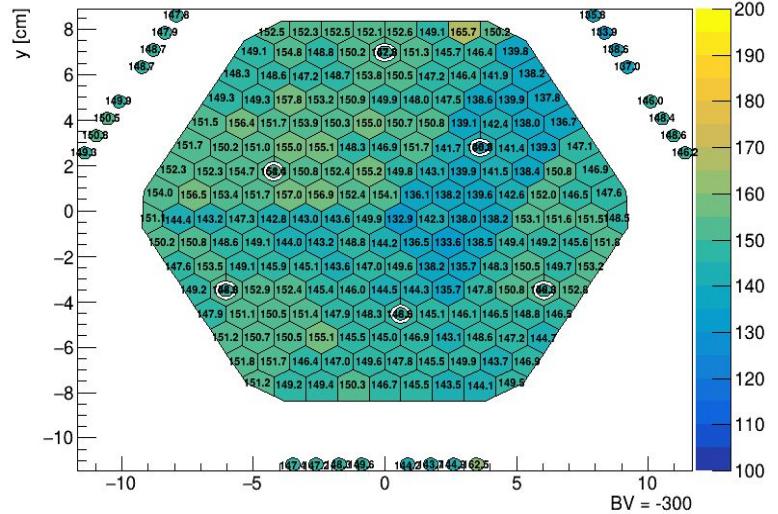
Pedestals Map for Module 1



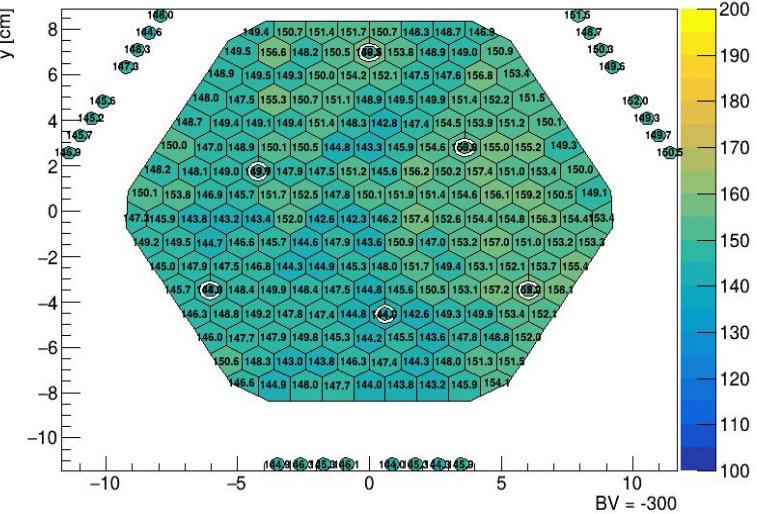
Pedestals Map for Module 2



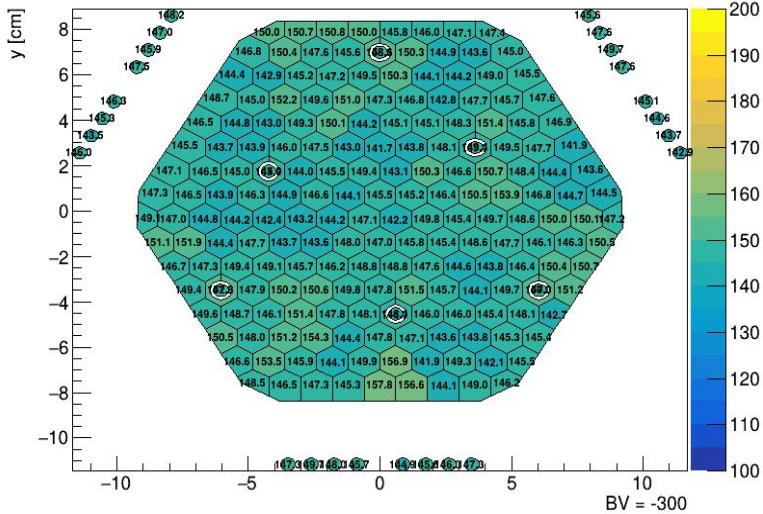
Pedestals Map for Module 3



Pedestals Map for Module 4

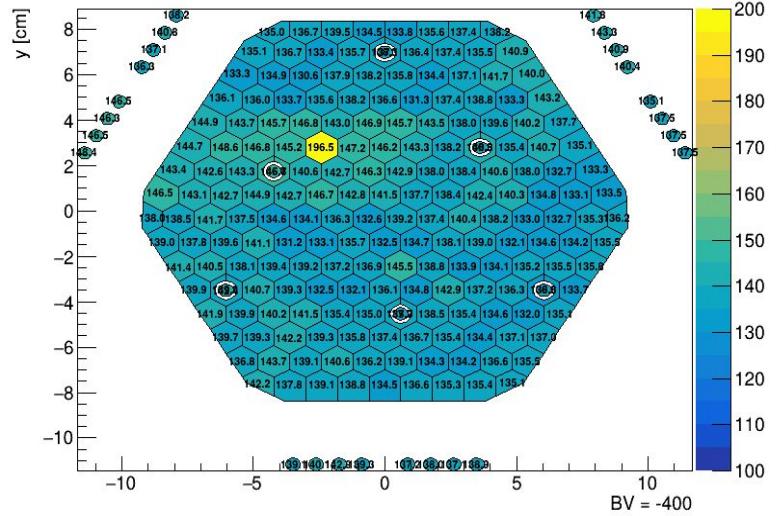


Pedestals Map for Module 5

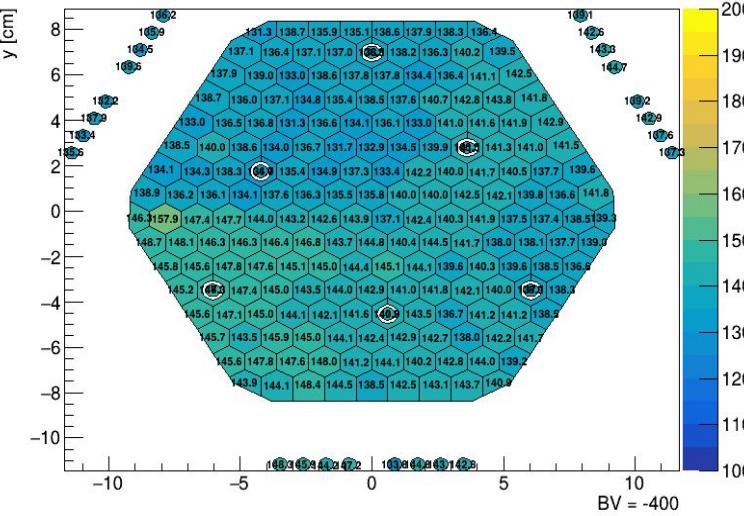


Pedestals Hexaplots: -400V

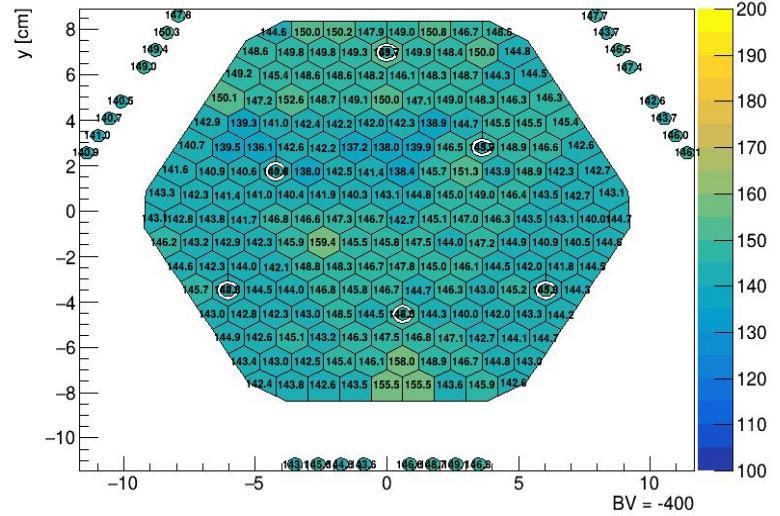
Pedestals Map for Module 0



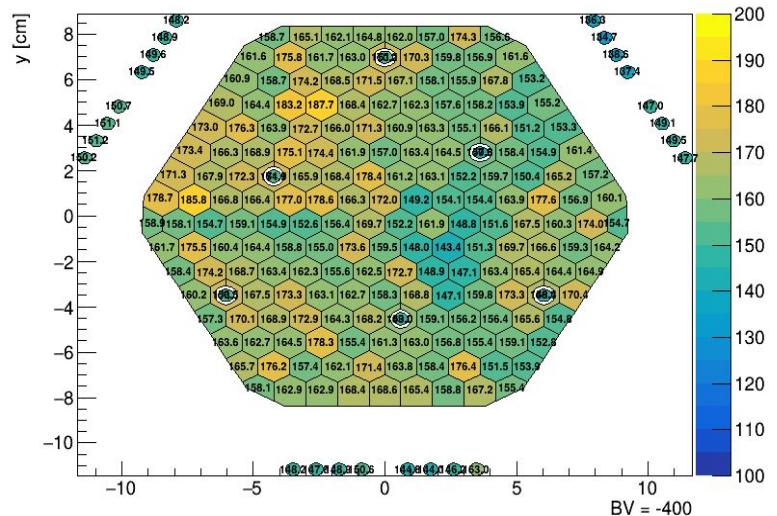
Pedestals Map for Module 1



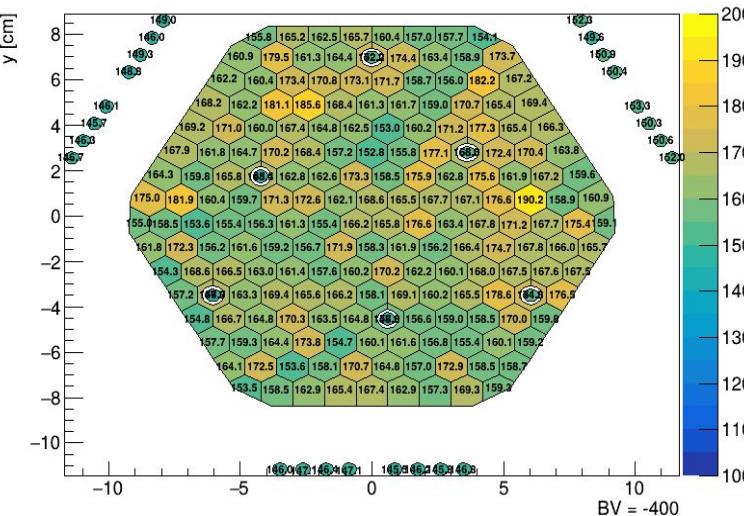
Pedestals Map for Module 2



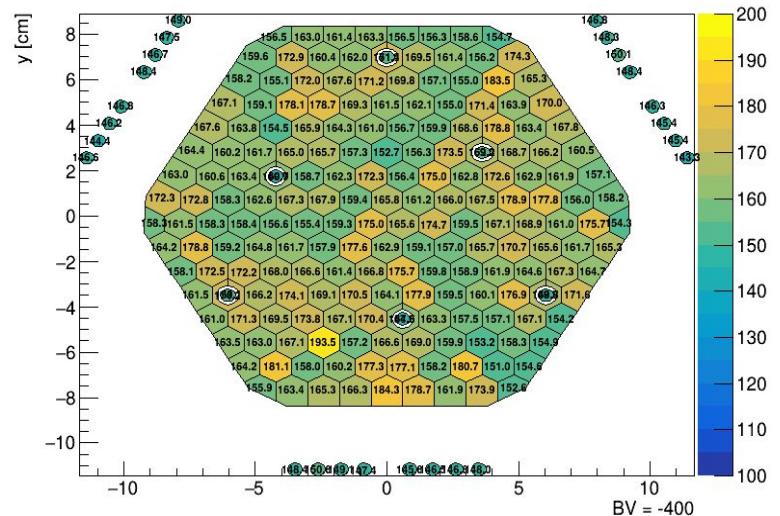
Pedestals Map for Module 3



Pedestals Map for Module 4

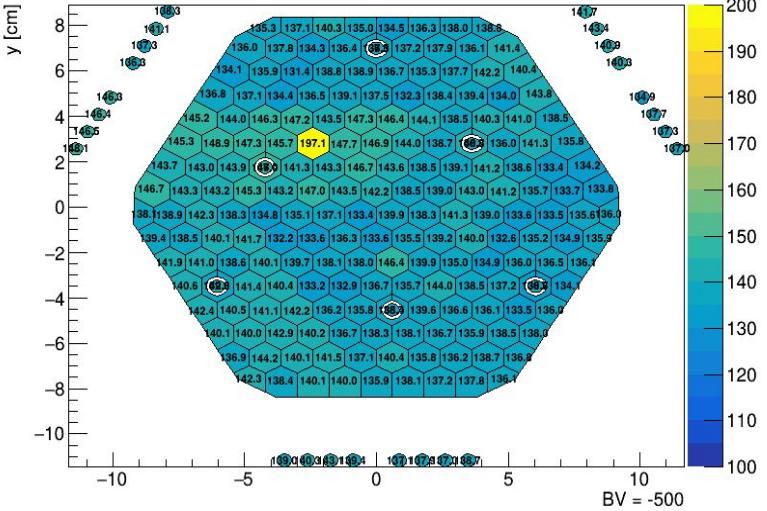


Pedestals Map for Module 5

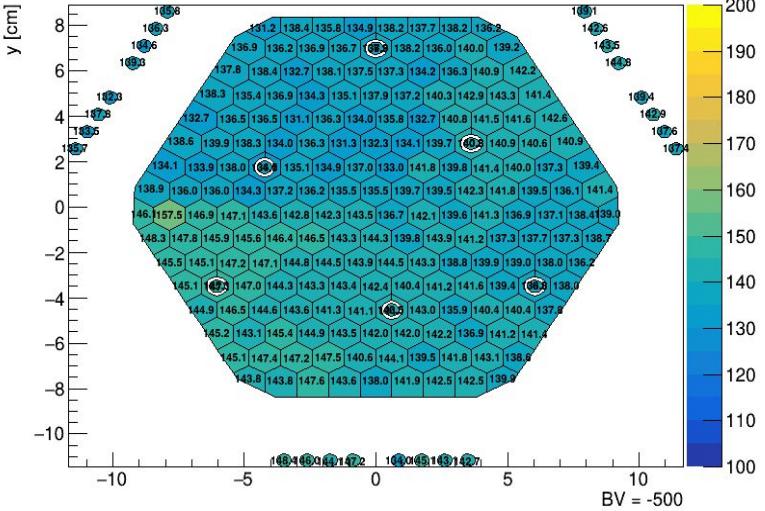


Pedestals Hexaplots: -500V

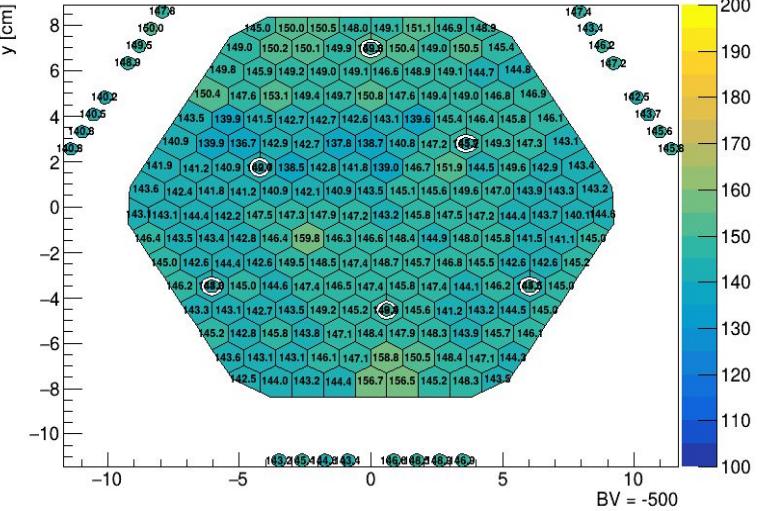
Pedestals Map for Module 0



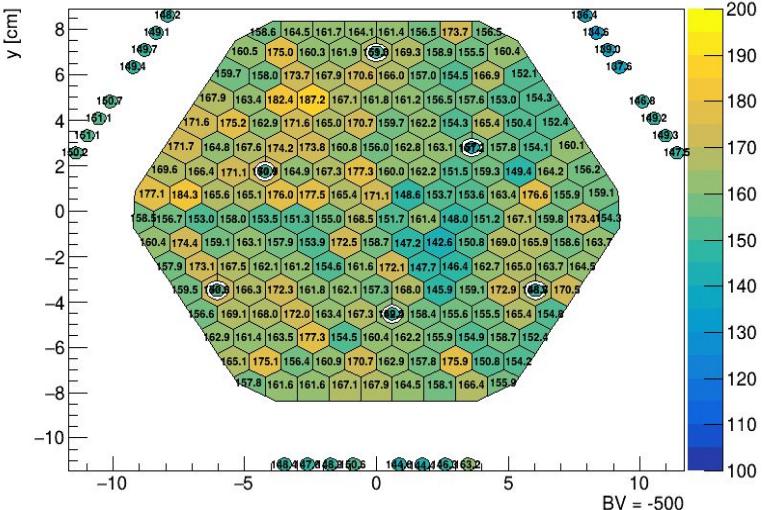
Pedestals Map for Module 1



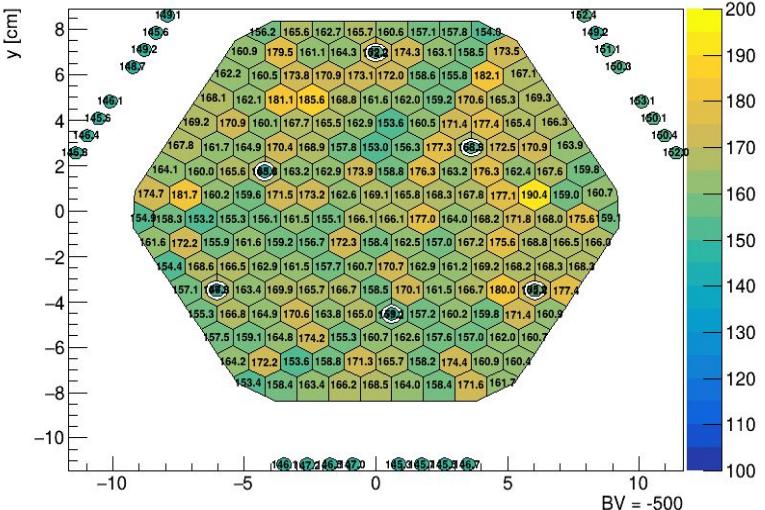
Pedestals Map for Module 2



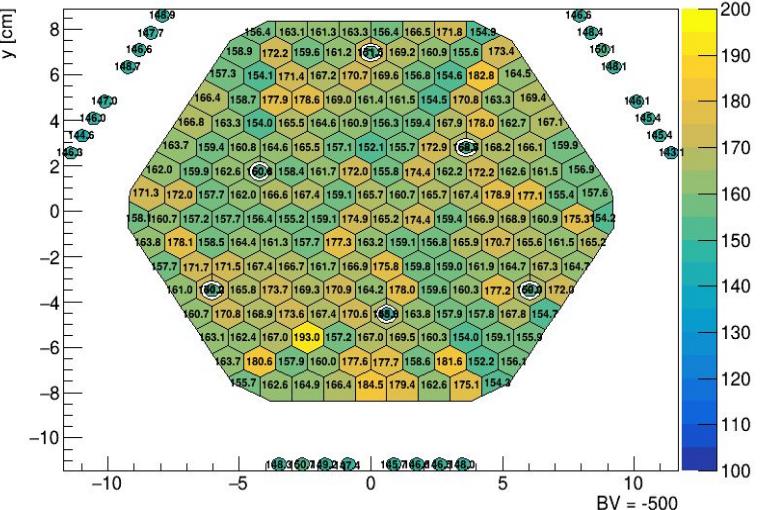
Pedestals Map for Module 3



Pedestals Map for Module 4

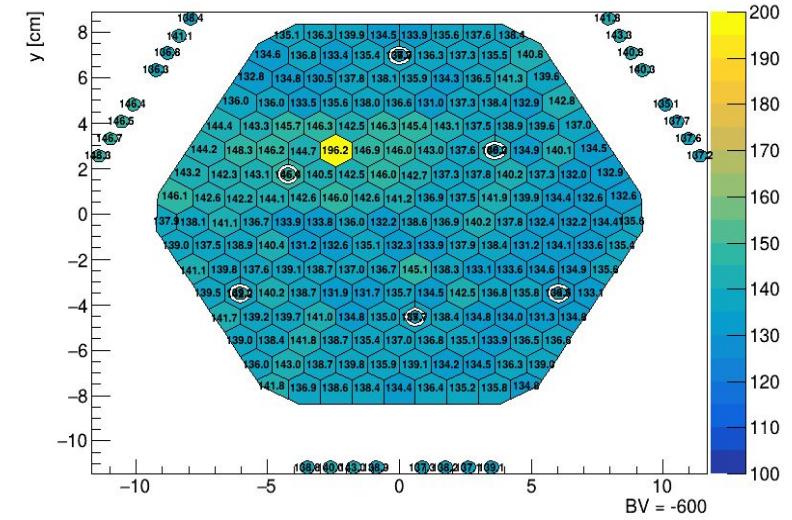


Pedestals Map for Module 5

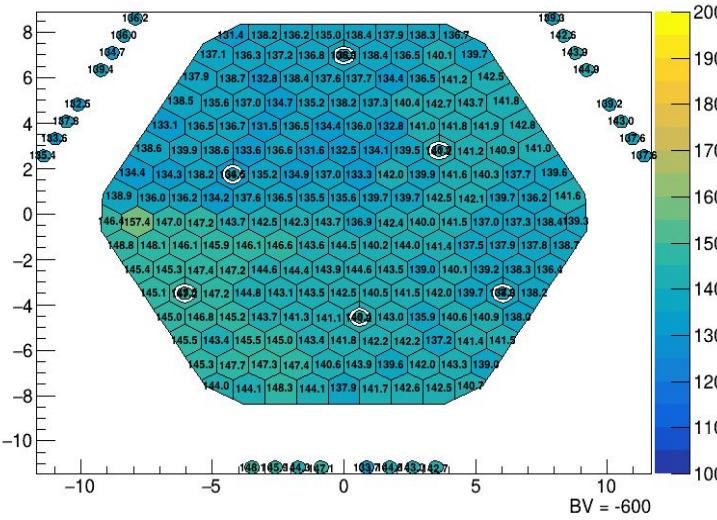


Pedestals Hexaplots: -600V

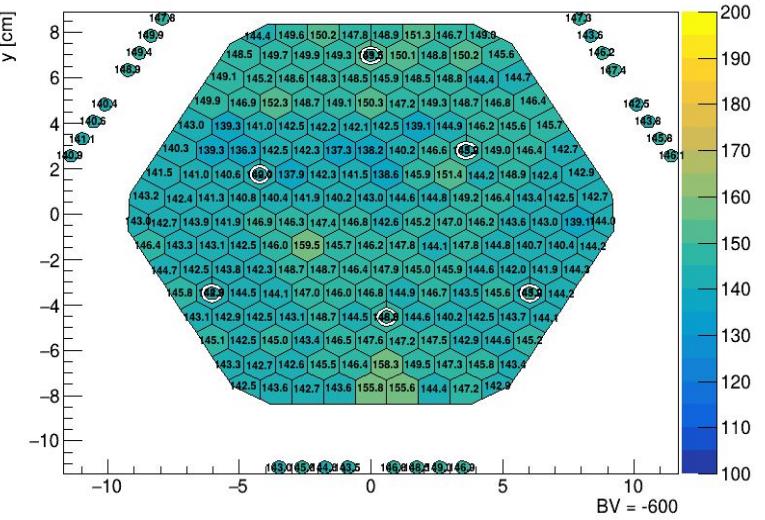
Pedestals Map for Module 0



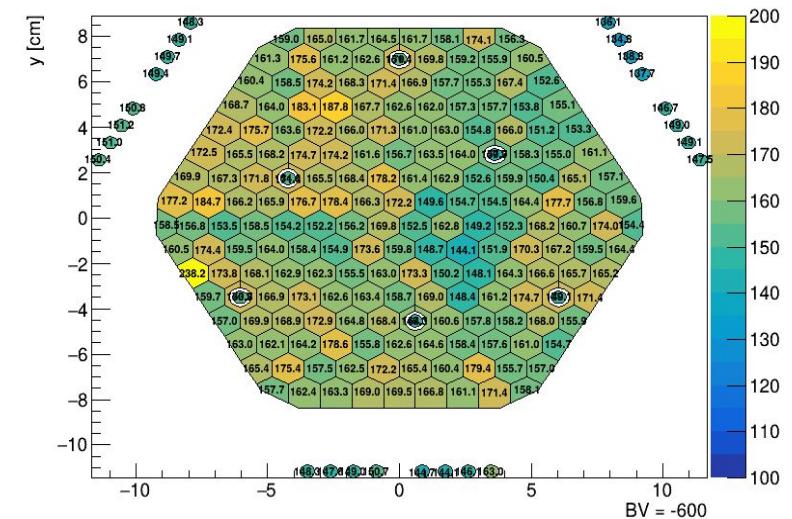
Pedestals Map for Module 1



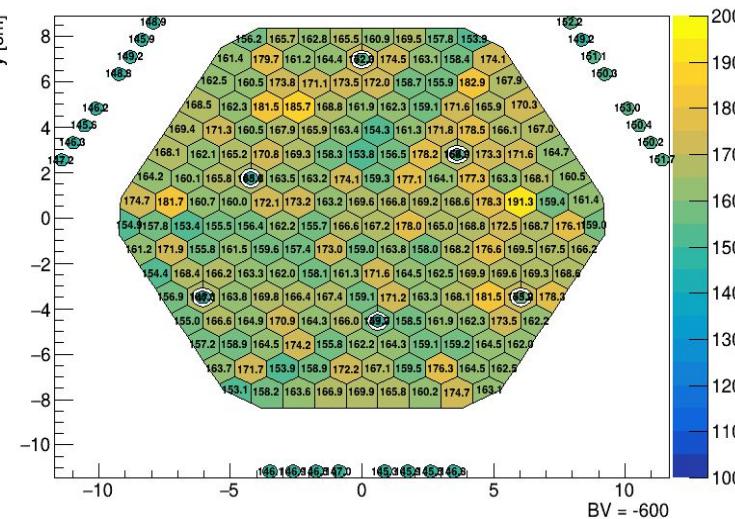
Pedestals Map for Module 2



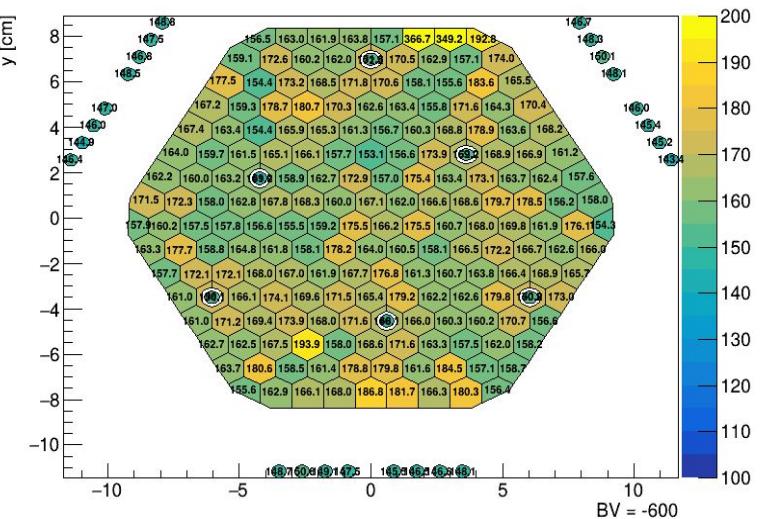
Pedestals Map for Module 3



Pedestals Map for Module 4

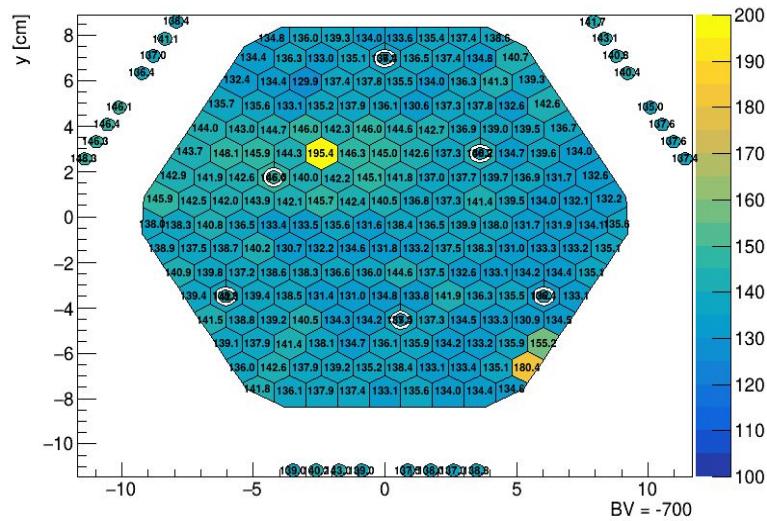


Pedestals Map for Module 5

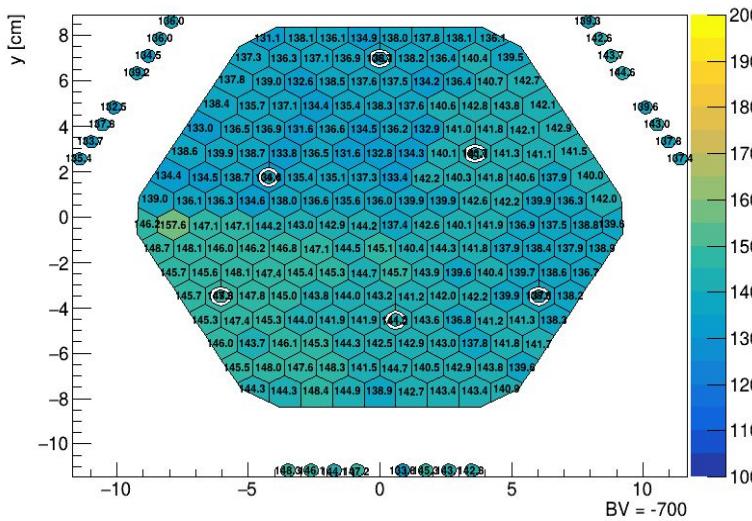


Pedestals Hexaplots: -700V

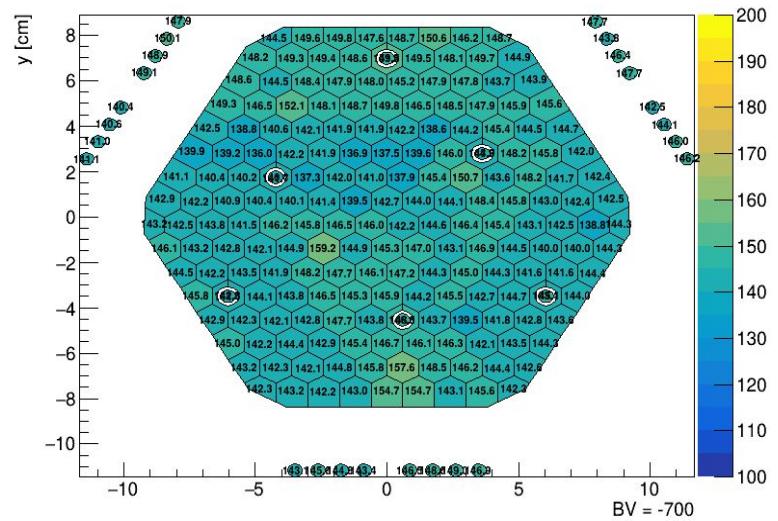
Pedestals Map for Module 0



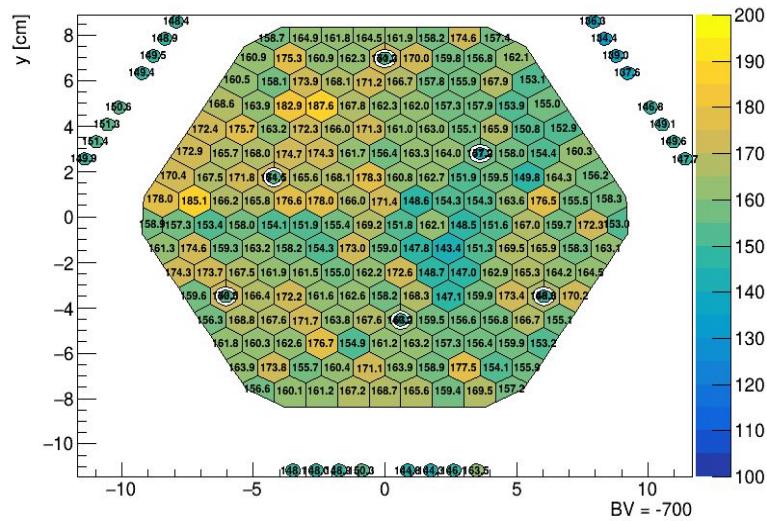
Pedestals Map for Module 1



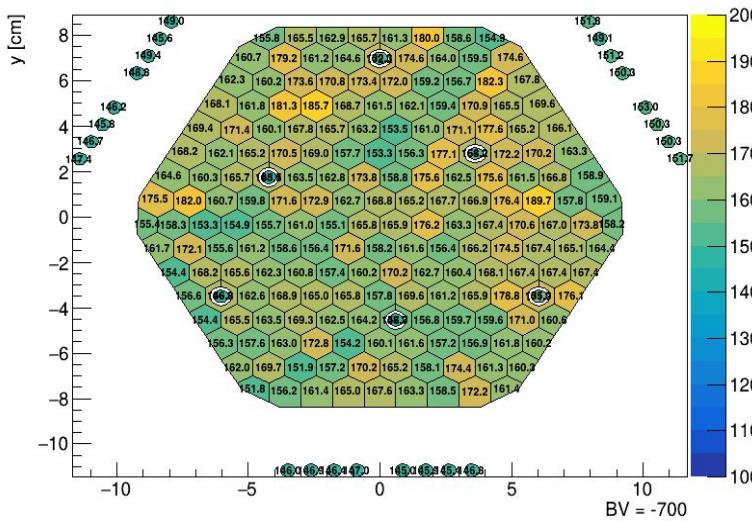
Pedestals Map for Module 2



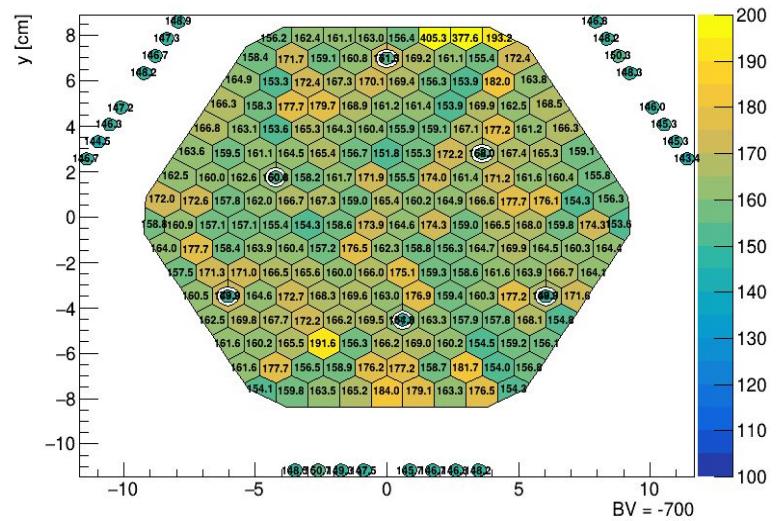
Pedestals Map for Module 3



Pedestals Map for Module 4



Pedestals Map for Module 5

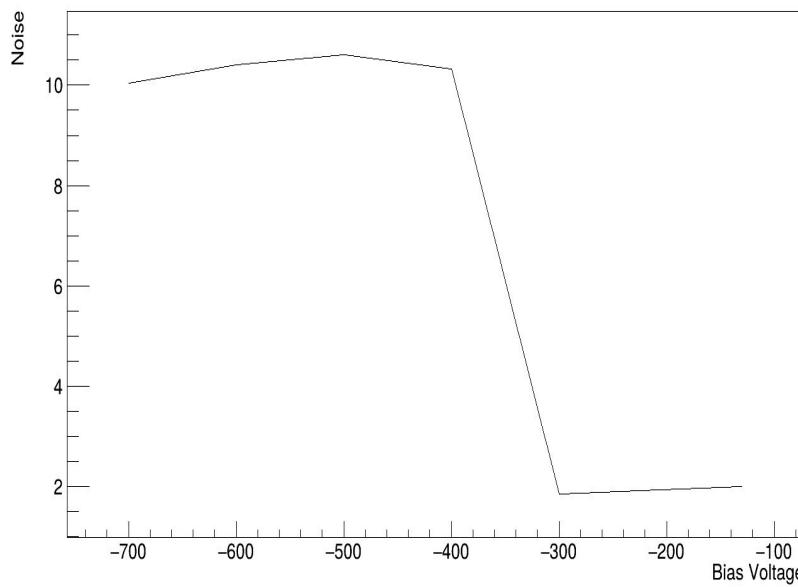


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- We observed different behaviors of channel noises under different bias voltages
- Want: Identify which channels have larger breakdown and find ways for improvement

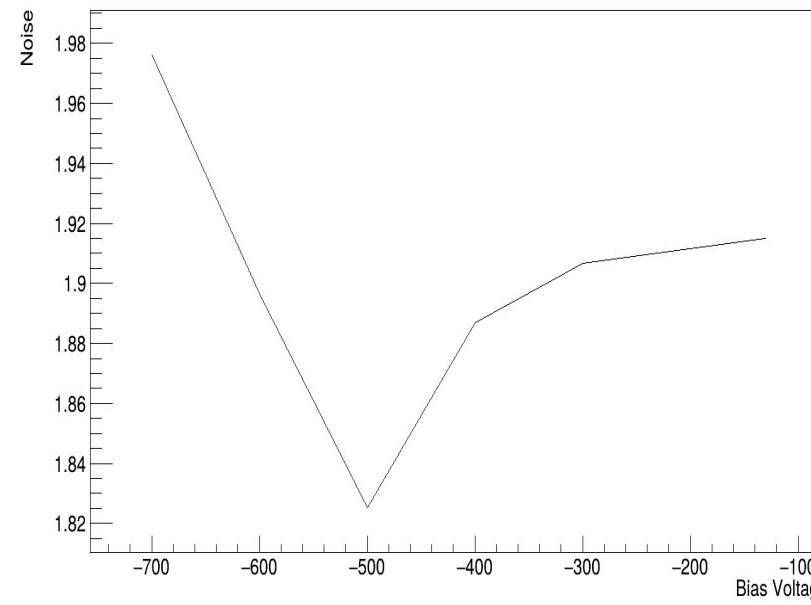
(With Breakdown)

B_to_N_for_mod_3_ch_73



(Without Breakdown)

B_to_N_for_mod_0_ch_171



(Ideal Behavior)

B_to_N_for_mod_1_ch_21

