Update on RD53B single core threshold map

Weekly instrumentation meeting 10/2/2020 (week 5, 2020 Fall)

Summary:

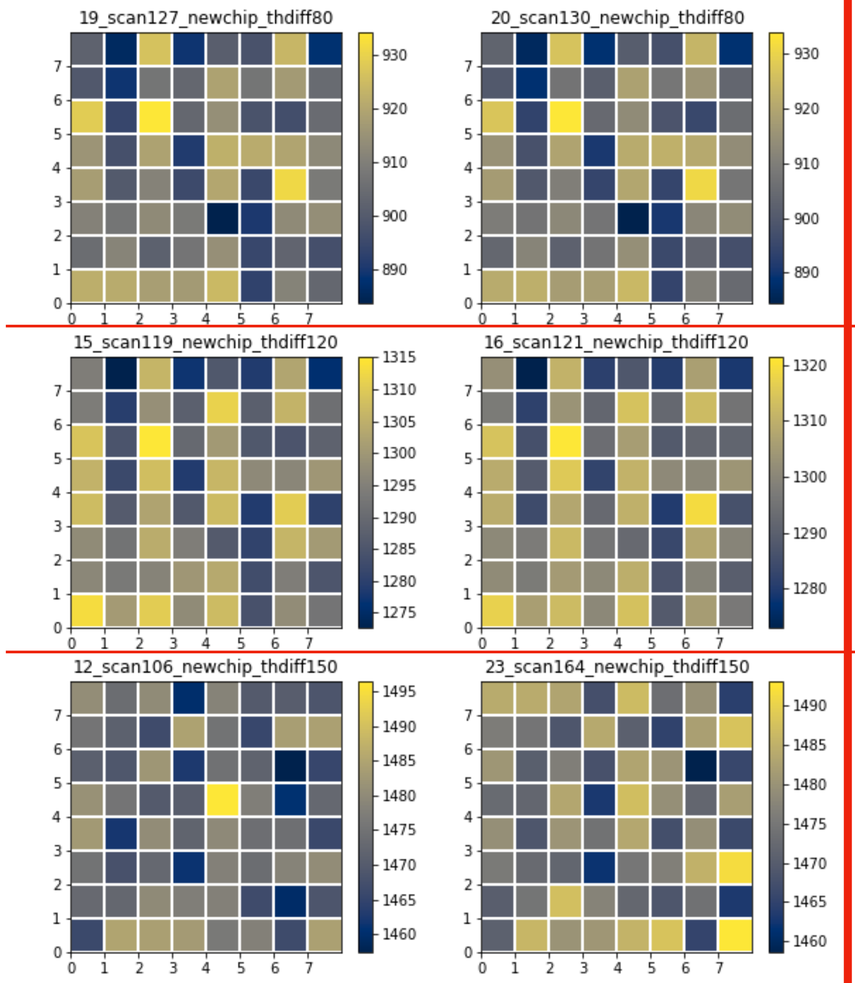
- Revisit single core threshold maps at different DiffTh values
  - Examine single core threshold maps with different timing parameters
- Examine all cores threshold maps with different timing parameters
- Present all cores average noise map with high noises

Robin Junwen Xiong

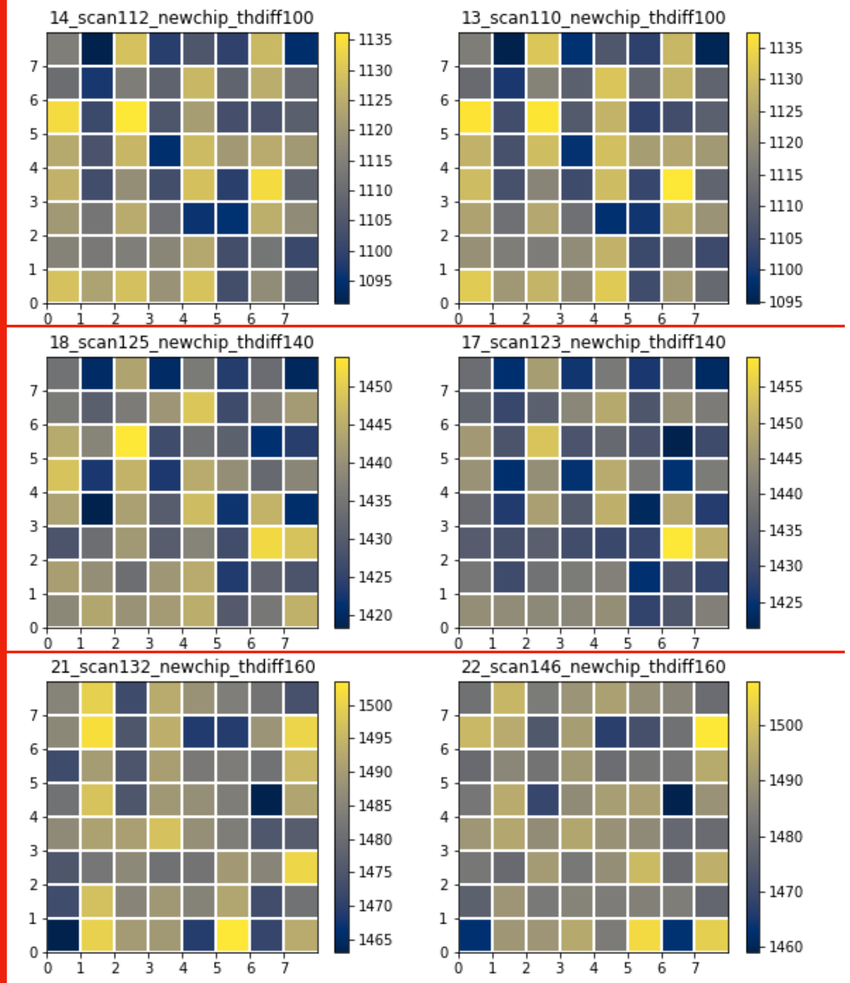
RD53B ptot_thresholdscan for the second chip

- Vary DiffTh1L/M/R from 80 to 160 (DiffTh2=0)
  - The pattern on the core threshold map seems to change after DiffTh is above 140.

DiffTh = 80, 120, 150



DiffTh = 100, 140, 160

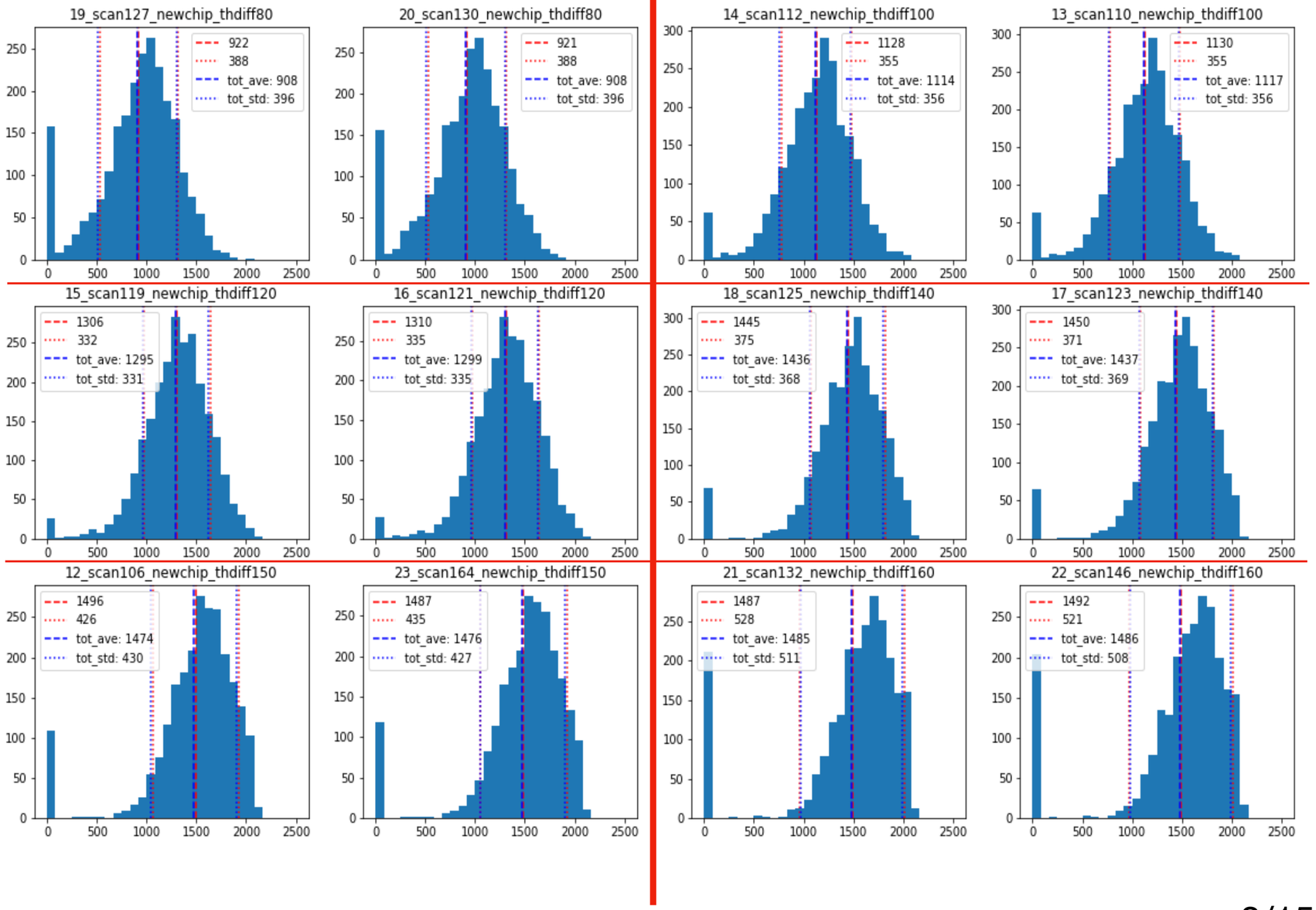


RD53B ptot_thresholdscan for the second chip

- Vary DiffTh1L/M/R from 80 to 160 (DiffTh2=0)
  - The pattern on the core threshold map seems to change after DiffTh is above 140.
  - This might be because the average threshold of each pixel location was not accurate because of zero thresholds and the cutoff at around 2000e$^-$.

Histograms of thresholds at 4-4 pixel location

DiffTh = 80, 120, 150 | **DiffTh = 100, 140, 160**

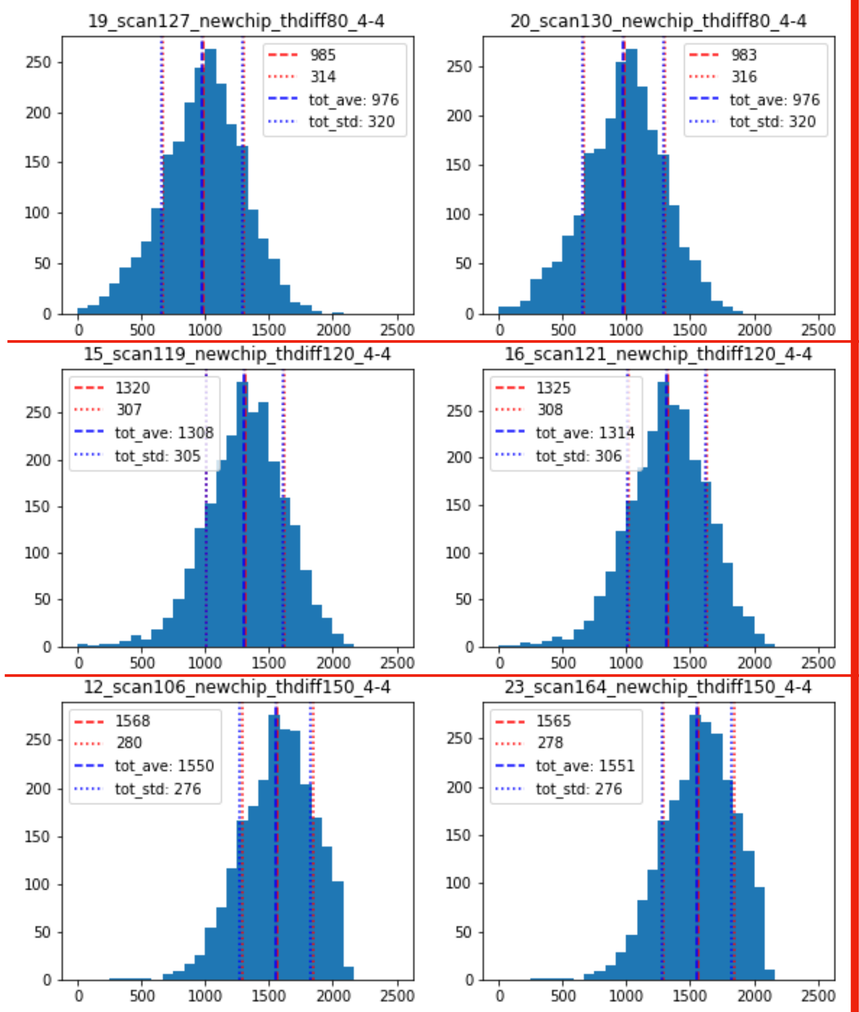


RD53B ptot_thresholdscan for the second chip

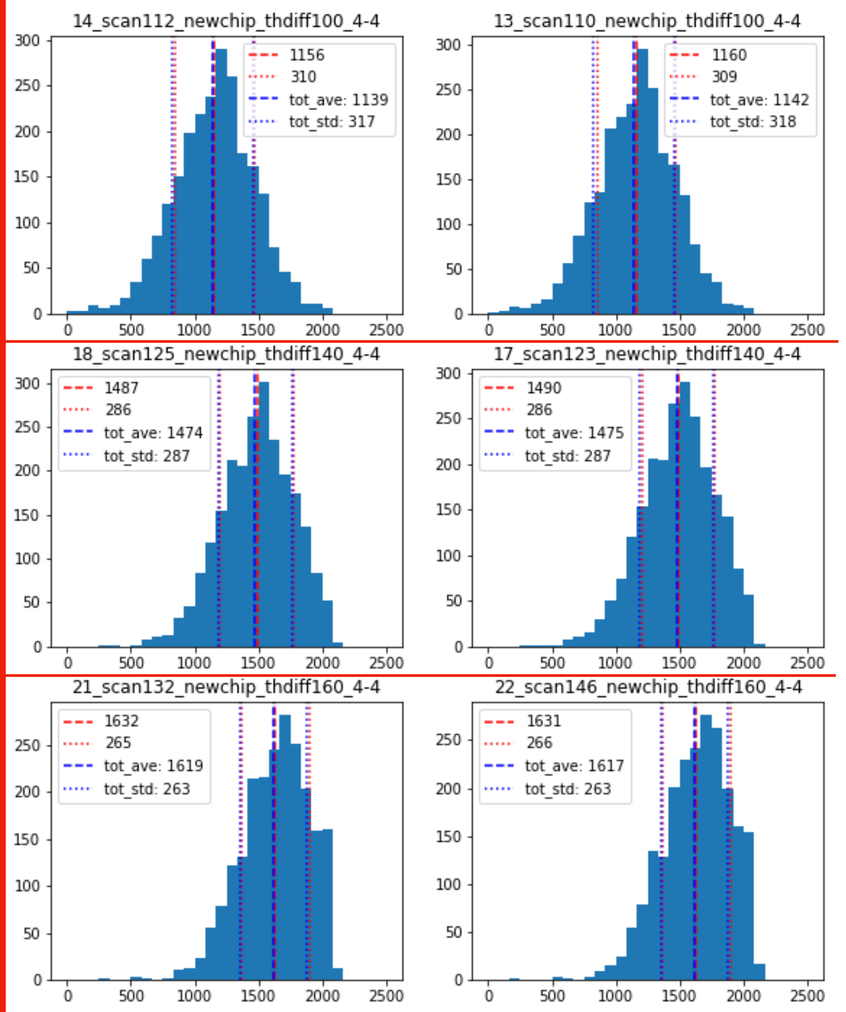
- Vary DiffTh1L/M/R from 80 to 160 (DiffTh2=0)
- Manually remove the zero thresholds
  - The cutoff still affects the median threshold at high DiffTh values.

Histograms of thresholds at 4-4 pixel location

DiffTh = 80, 120, 150



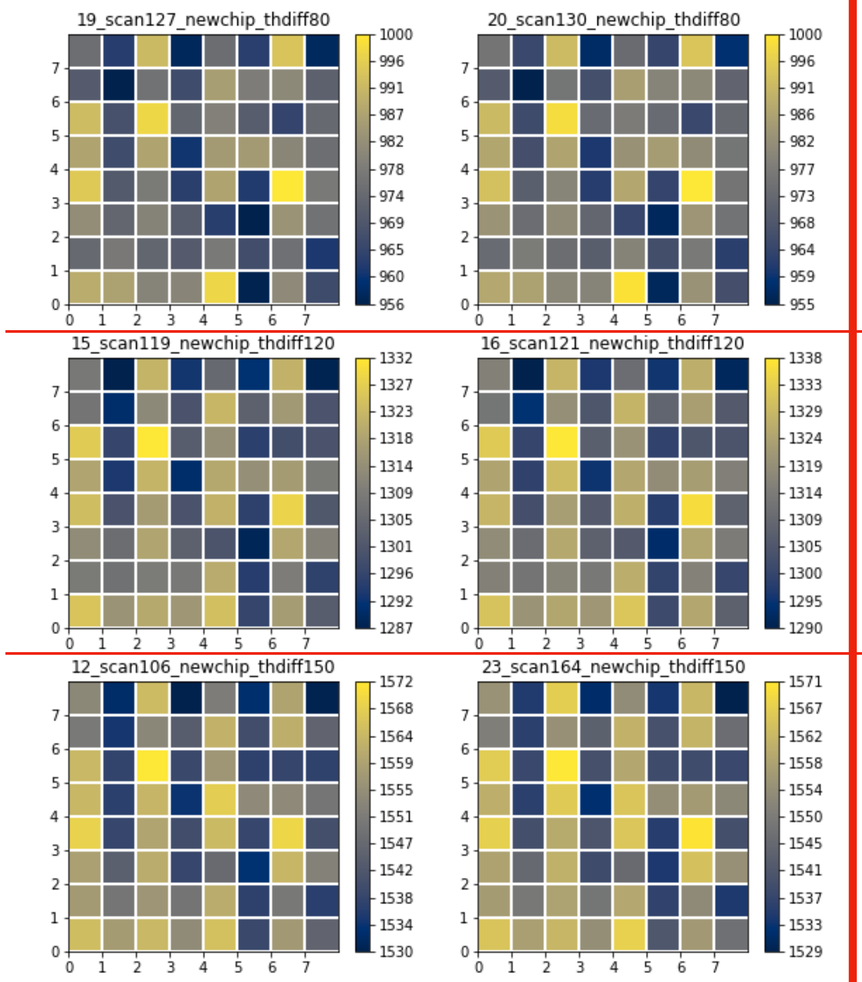
DiffTh = 100, 140, 160



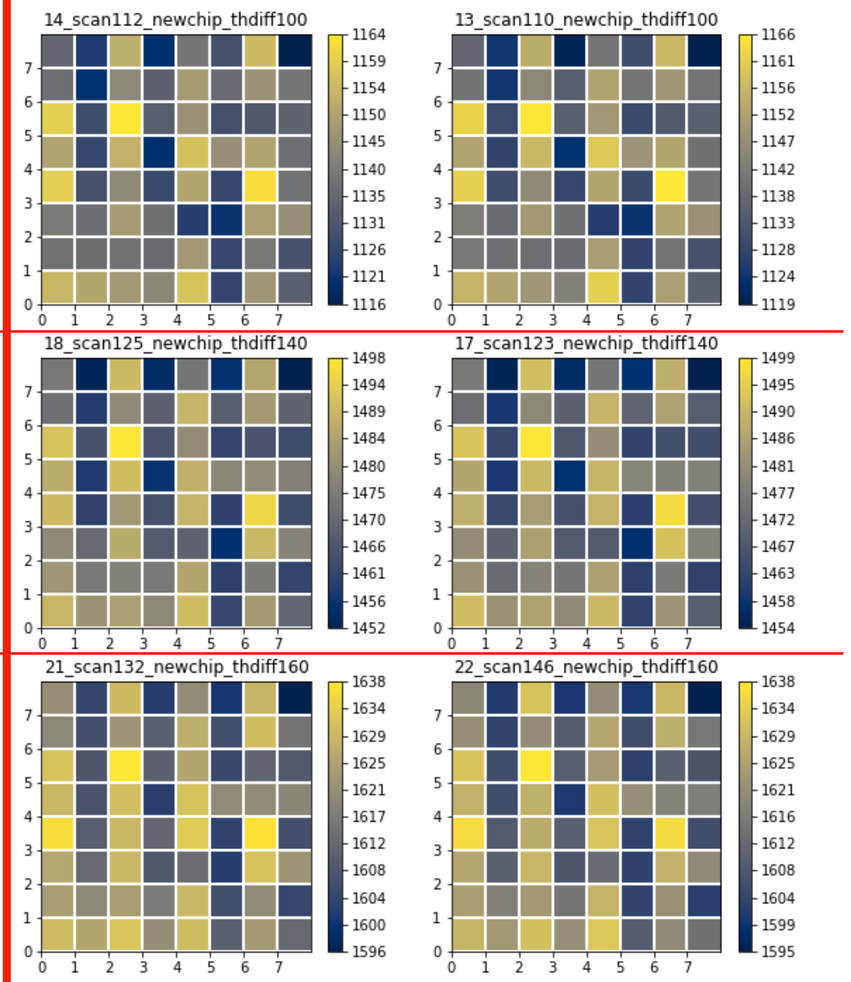
RD53B ptot_thresholdscan for the second chip

- Vary DiffTh1L/M/R from 80 to 160 (DiffTh2=0)
- Manually remove the zero thresholds
  - The cutoff still affects the median threshold at high DiffTh values.
  - The pattern seems to be identical at all threshold values.
  - And, the pattern still differs from the pattern seen on the first chip.

DiffTh = 80, 120, 150



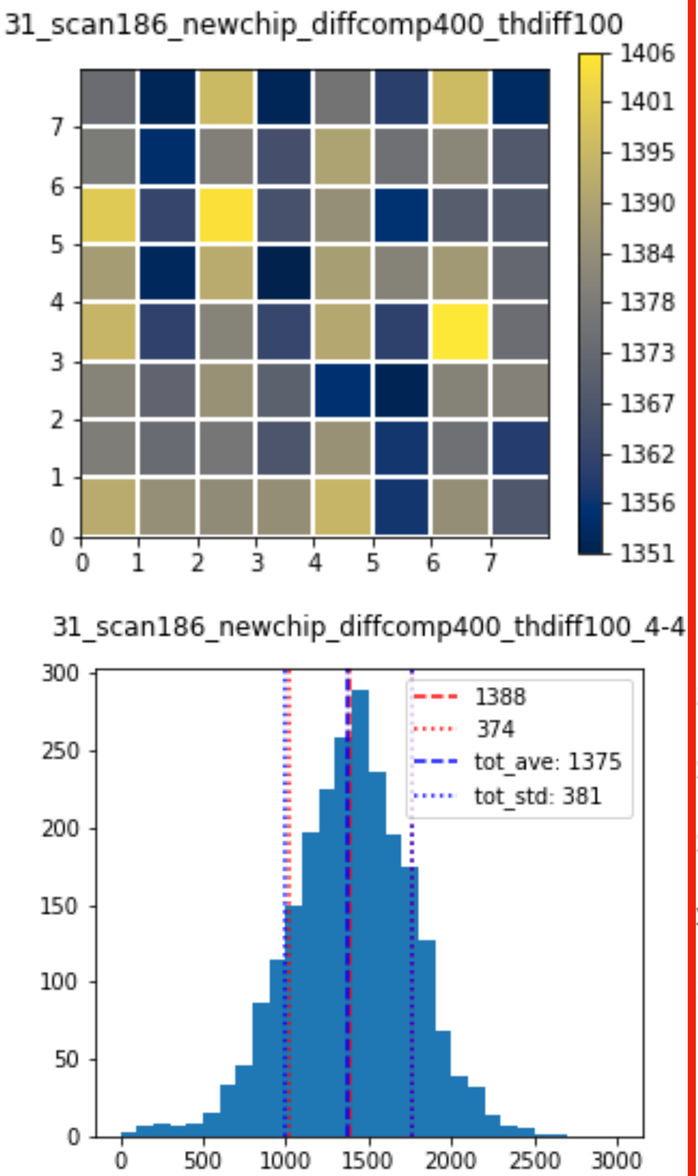
DiffTh = 100, 140, 160



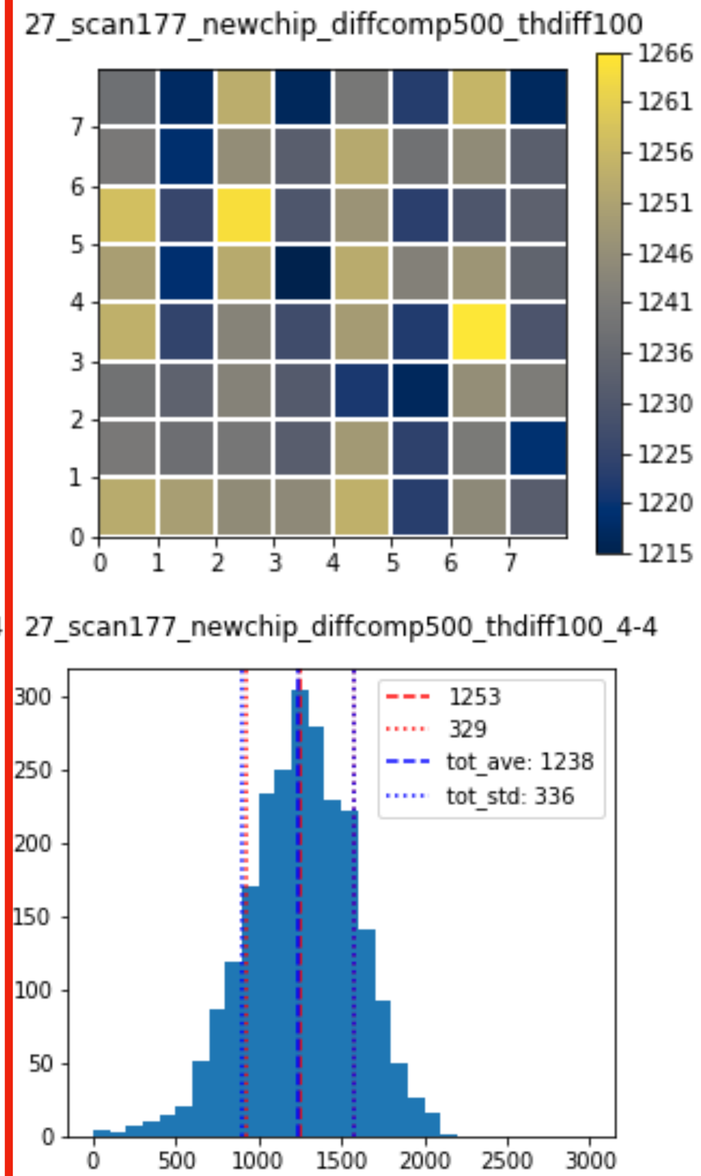
Single core threshold map and timing parameters

- Fix DiffTh1L/M/R to be 100 (DiffTh2=0)
  - Change DiffComp = 400, 500
  - Keep DiffPreComp = 300
  - Note I increased InjVcalDiff max from 200 (for the scan on the right) to 250 (for the scan on the left). This way, the threshold limit is at about 2500e$^-$.
- The mean thresholds increase by about 130e$^-$ over the chip for the DiffComp=400 scan
  - But the pattern stays roughly the same.

DiffComp = 400



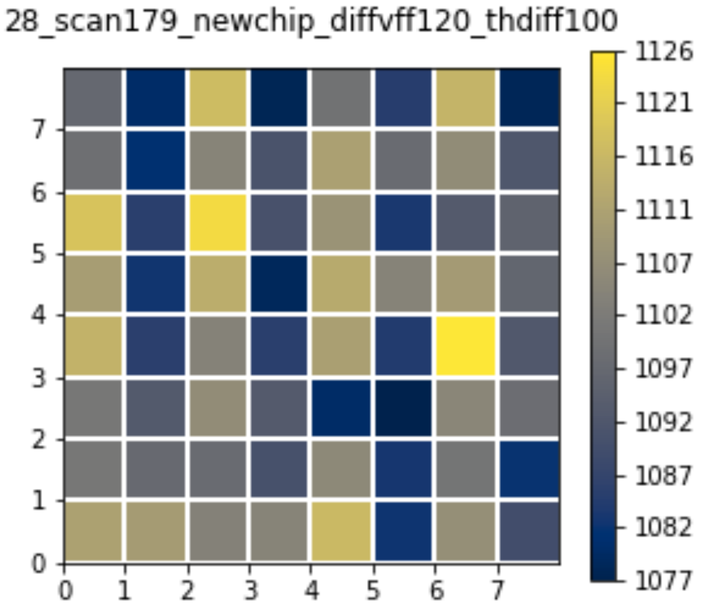
DiffComp = 500

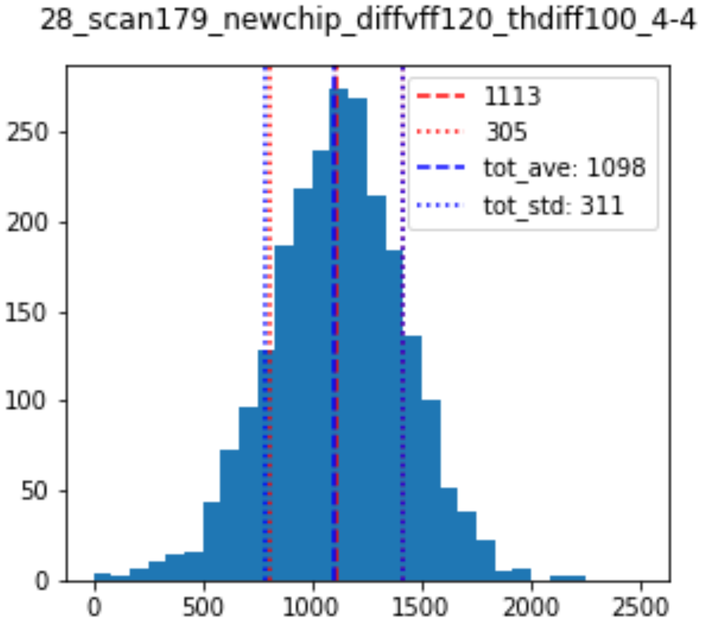


Single core threshold map and timing parameters

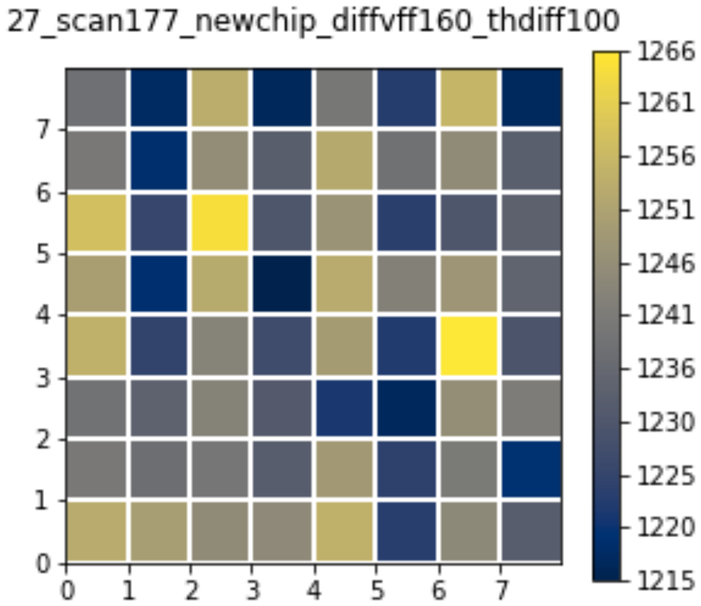
- Fix DiffTh1L/M/R to be 100 (DiffTh2=0)
  - DiffComp = 500; DiffPreComp = 300
  - Change DiffVff = 120, 160
- Again, the mean thresholds decrease by 100 e^- over the chip for the DiffVff=120 scan
  - But the pattern stays roughly the same.

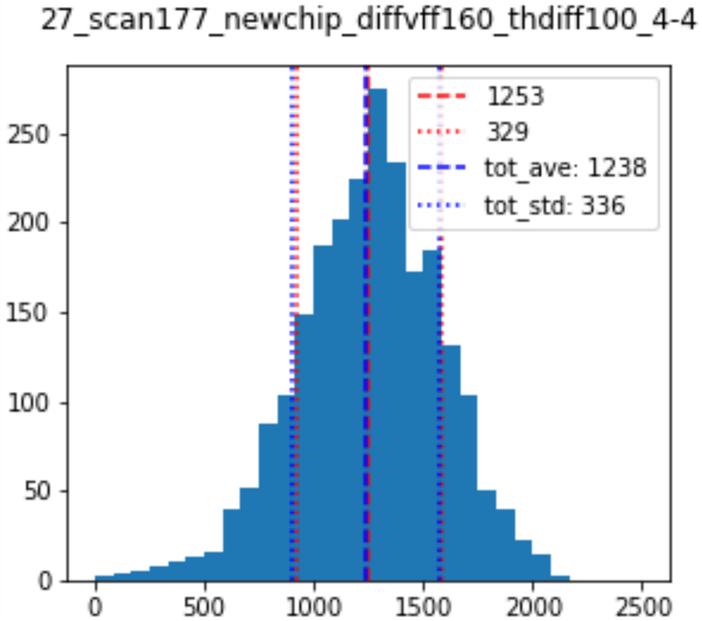
DiffVff = 120





DiffVff = 160

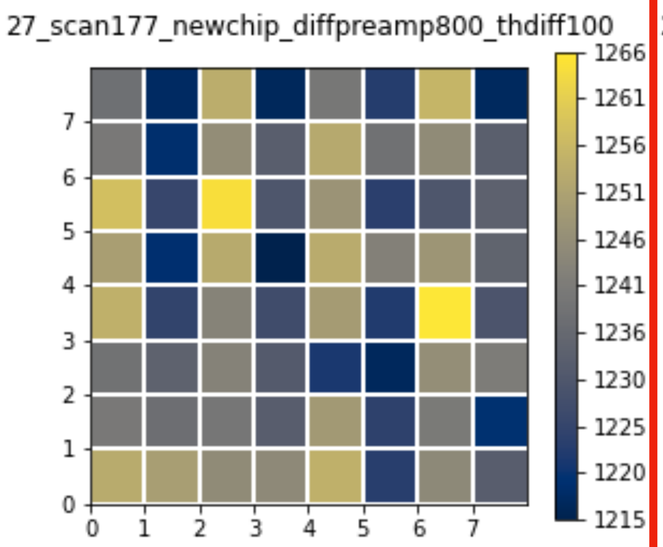


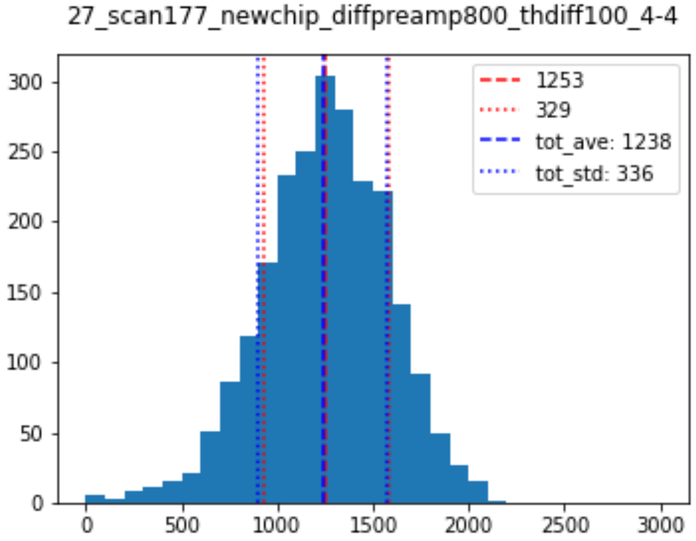


Single core threshold map and timing parameters

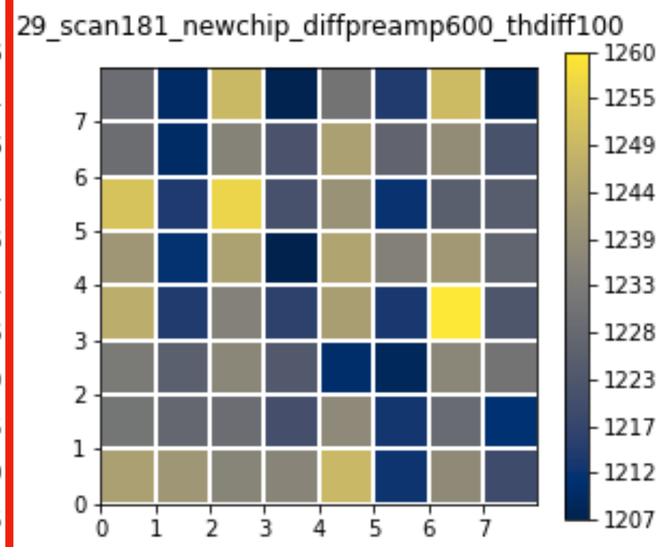
- Fix DiffTh1L/M/R to be 100 (DiffTh2=0)
  - DiffComp = 500; DiffPreComp = 300
  - DiffVff = 160
  - Change DiffPreamp(L/M/R/T/TL/TR) = 600, 800
- Again, the mean thresholds decrease by ~10e$^-$ over the chip for the DiffPreamp=600 scan
  - But the pattern stays roughly the same.

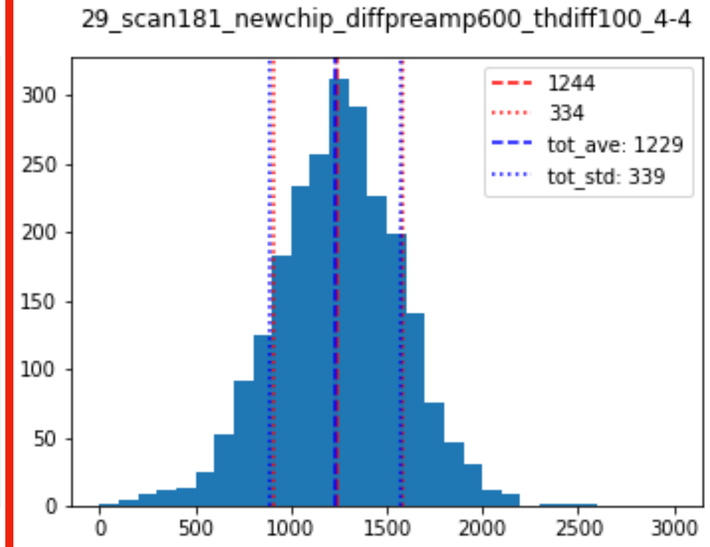
DiffPreamp = 800





DiffPreamp = 600

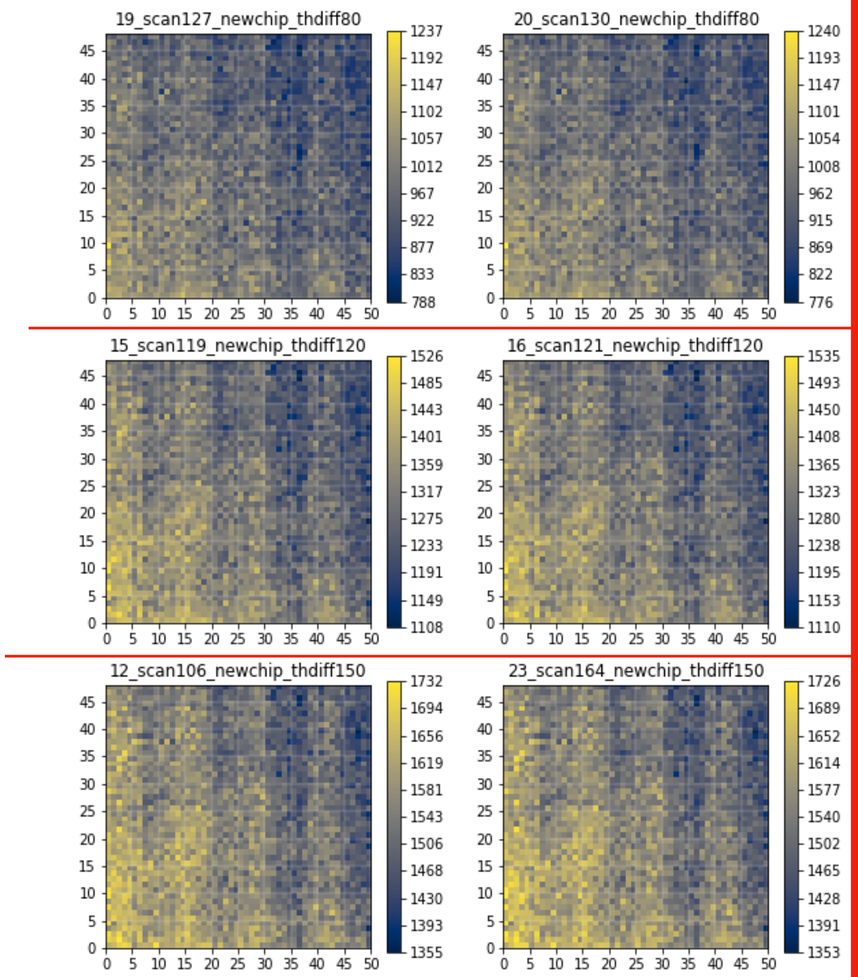




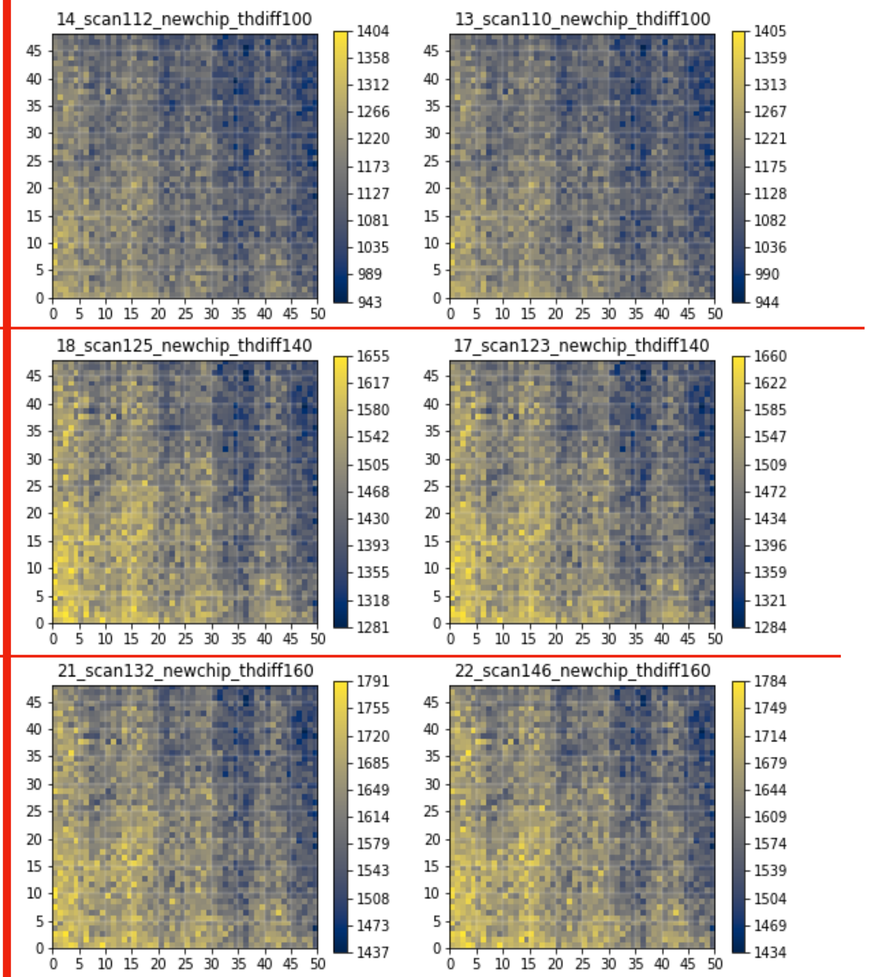
All cores average threshold map

- Average the thresholds of 64 pixels in a core
  - Plot the average thresholds of all 2400 cores in a map
- Interestingly, the 2400 core average thresholds of all scans seem to have a stripe pattern.

DiffTh = 80, 120, 150



DiffTh = 100, 140, 160

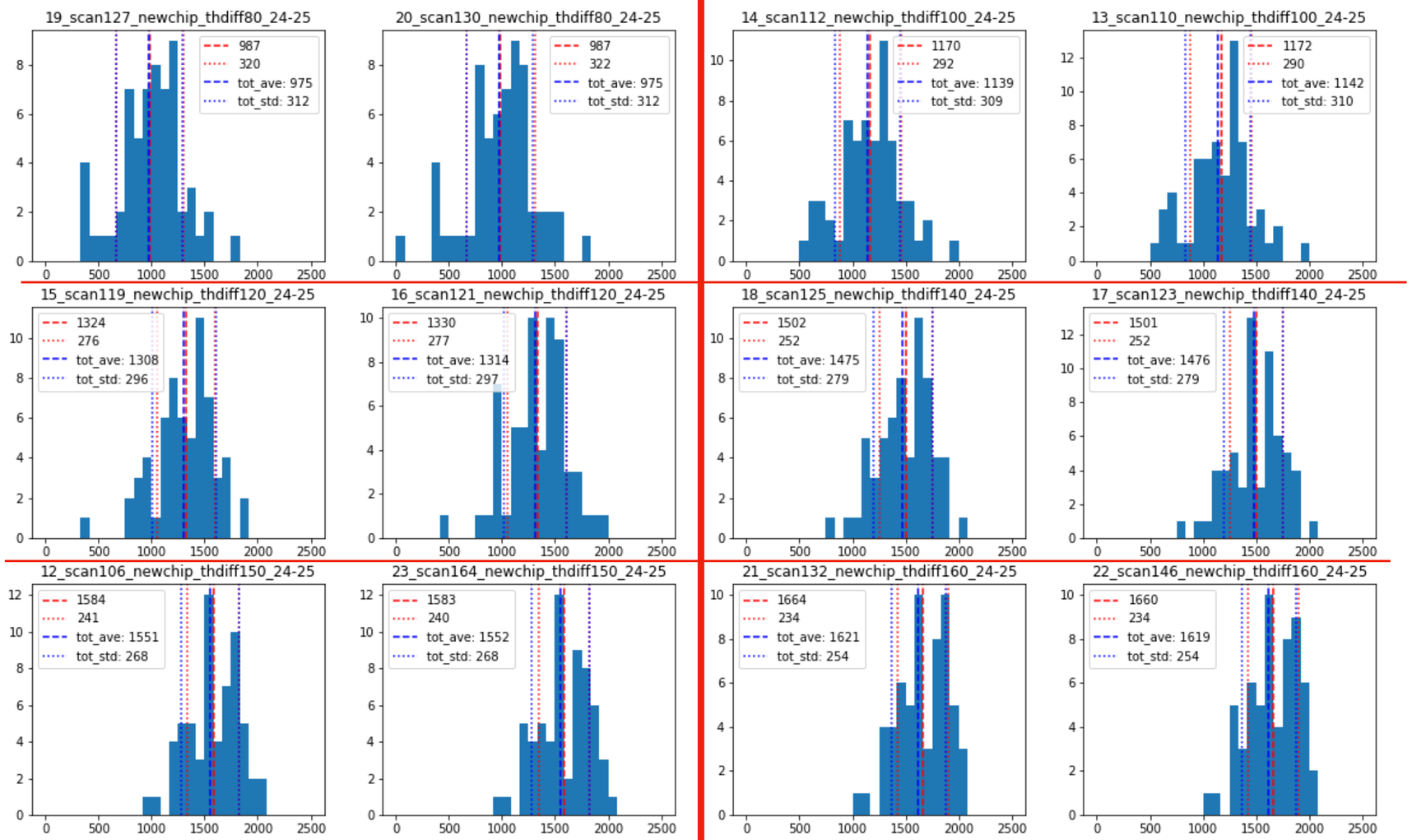


All cores average threshold map

- Average the thresholds of 64 pixels in a core
  - Plot the average thresholds of all 2400 cores in a map
- Interestingly, the 2400 core average thresholds of all scans seem to have a stripe pattern.
  - The stripe pattern seems more pronounced at higher DiffTh. But, the threshold cutoff at 2000e$^-$ for these scans make the mean less accurate.

Histograms of thresholds of the 24-25 core

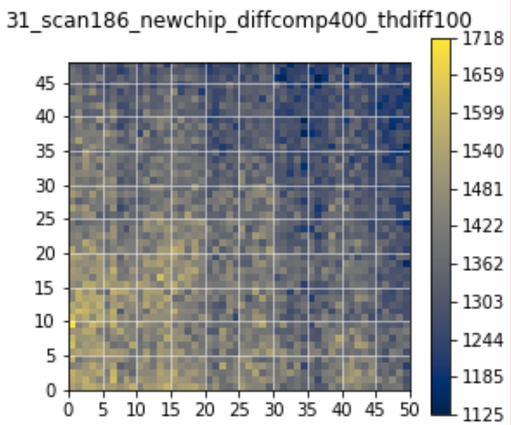
DiffTh = 80, 120, 150 | **DiffTh = 100, 140, 160**

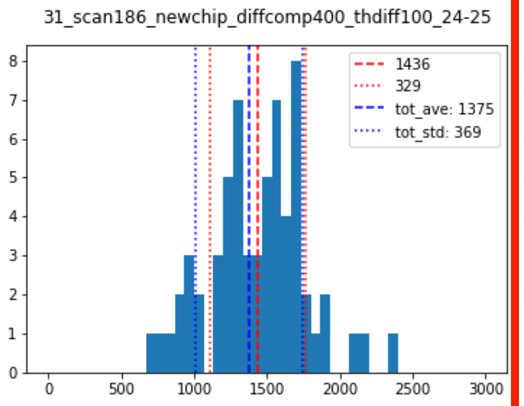


All cores threshold map and timing parameters

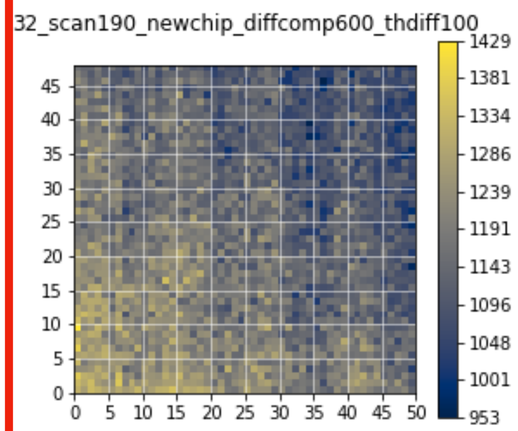
- Fix DiffTh1L/M/R to be 100 (DiffTh2=0)
  - Change DiffComp = 400, 500, 600
  - Keep DiffPreComp = 300
- The mean thresholds are about 1436, 1266, and 1196e$^-$.
  - But the stripe pattern stays roughly the same.

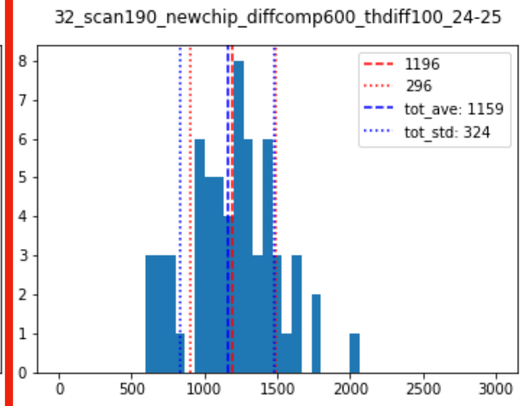
DiffComp = 400



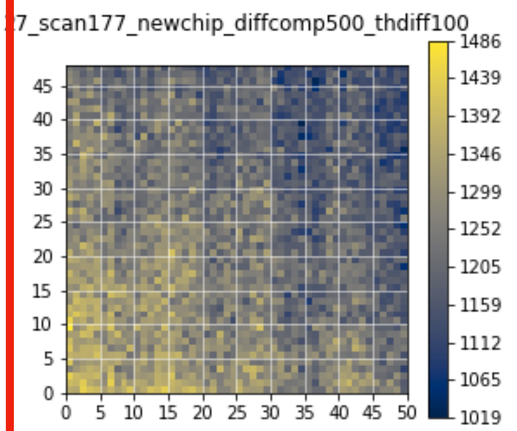


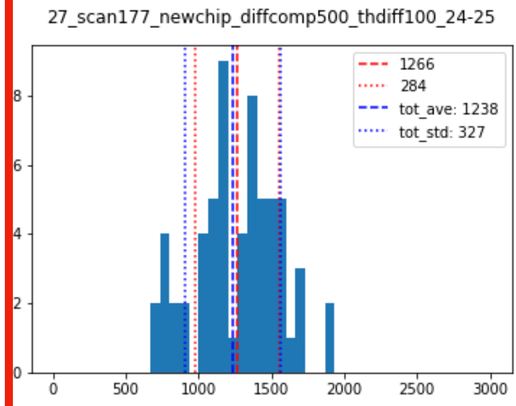
DiffComp = 600





DiffComp = 500

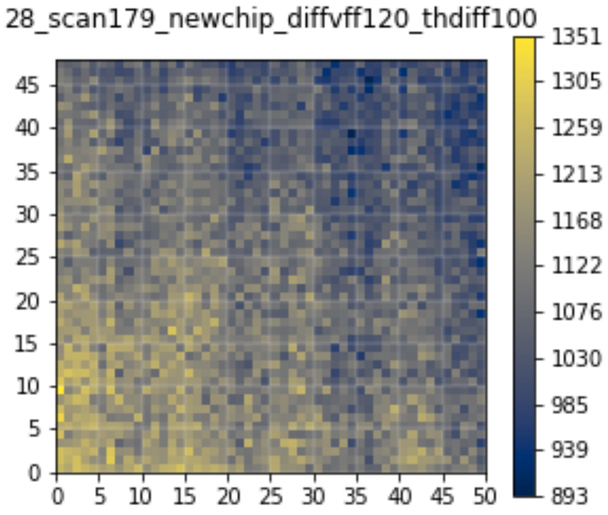


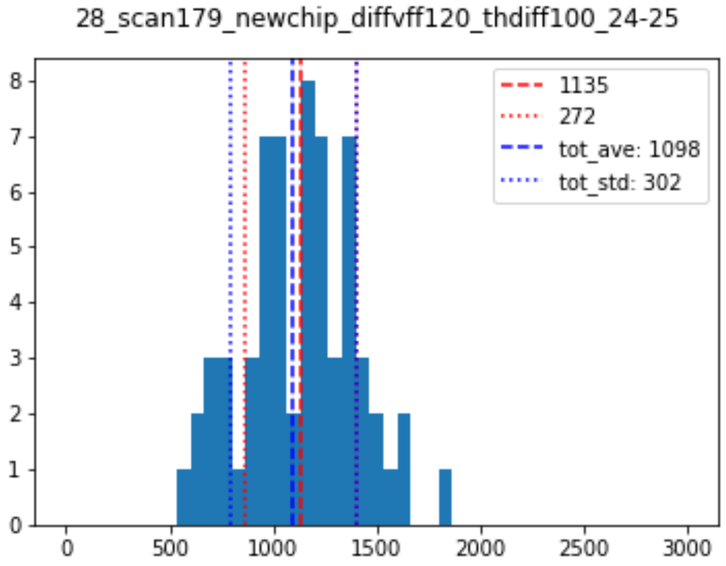


Single core threshold map and timing parameters

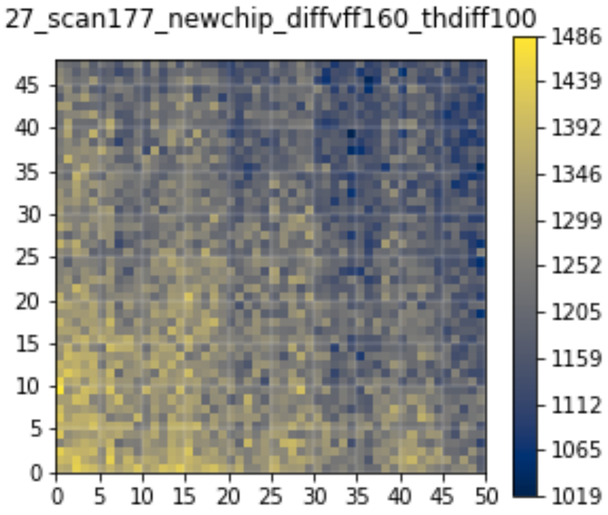
- Fix DiffTh1L/M/R to be 100 (DiffTh2=0)
  - DiffComp = 500; DiffPreComp = 300
  - Change DiffVff = 120, 160
- The mean thresholds around 1135, 1266e$^-$.
  - But the stripe pattern stays roughly the same.

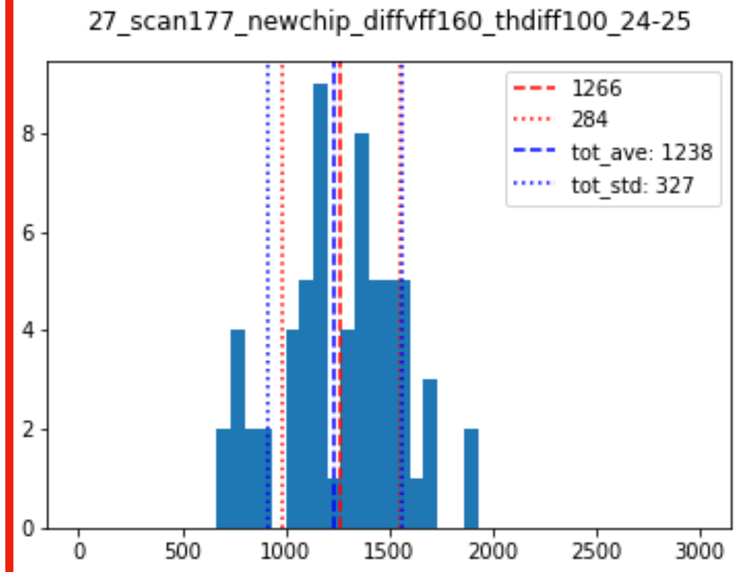
DiffVff = 120





DiffVff = 160

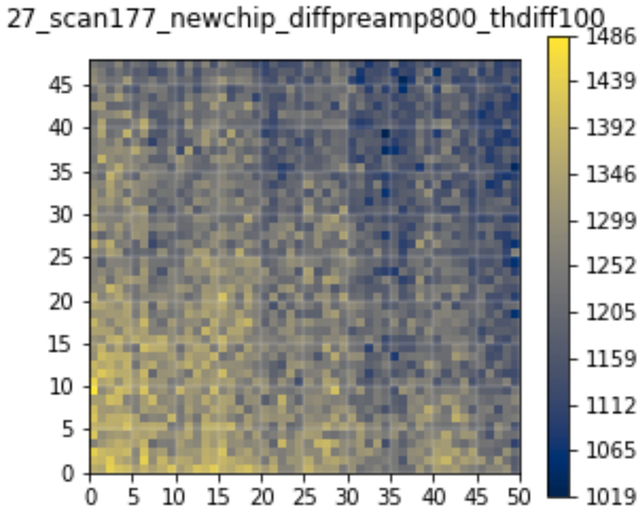


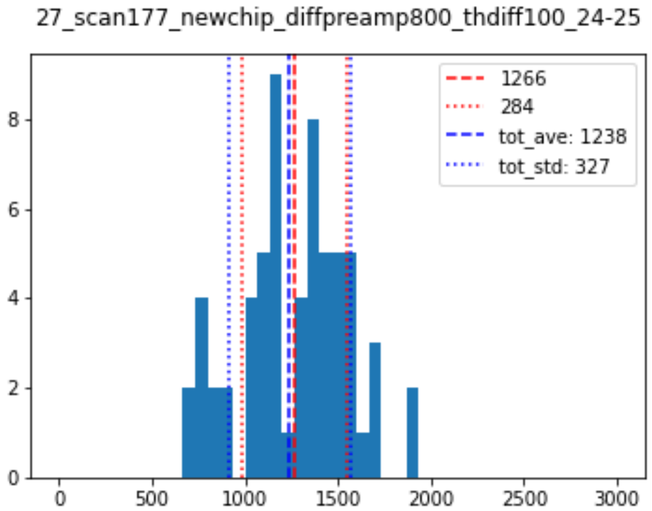


Single core threshold map and timing parameters

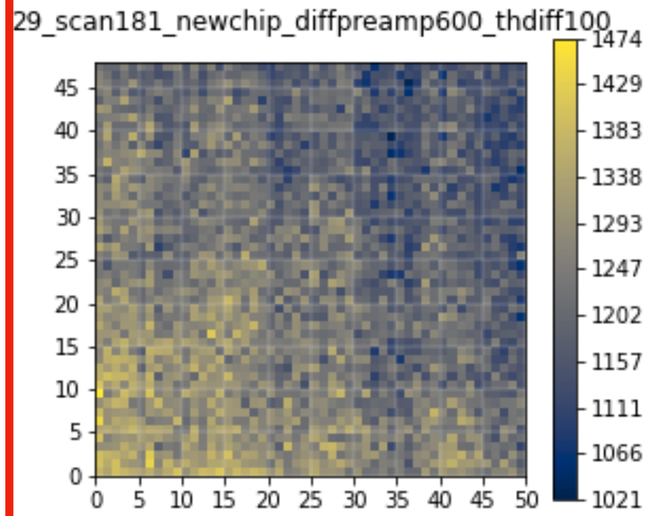
- Fix DiffTh1L/M/R to be 100 (DiffTh2=0)
  - DiffComp = 500; DiffPreComp = 300
  - DiffVff = 160
  - Change DiffPreamp(L/M/R/T/TL/TR) = 600, 800
- The mean thresholds are roughly the same for the scans.
  - And, the stripe pattern stays roughly the same.

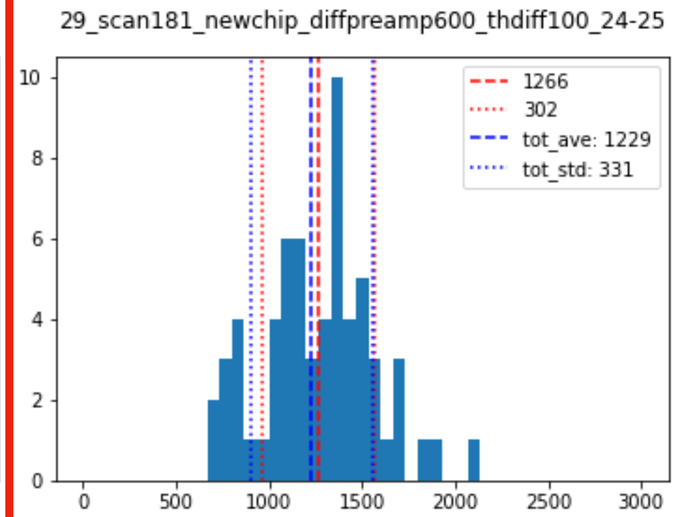
DiffPreamp = 800





DiffPreamp = 600

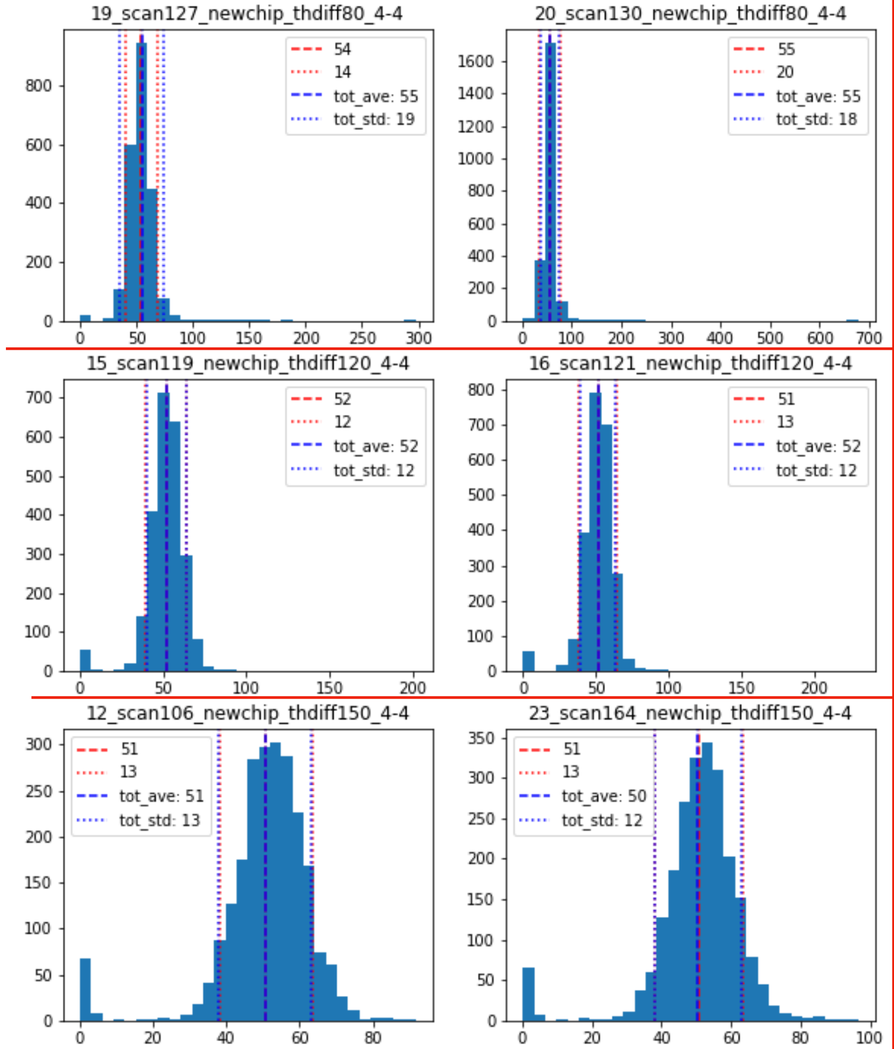




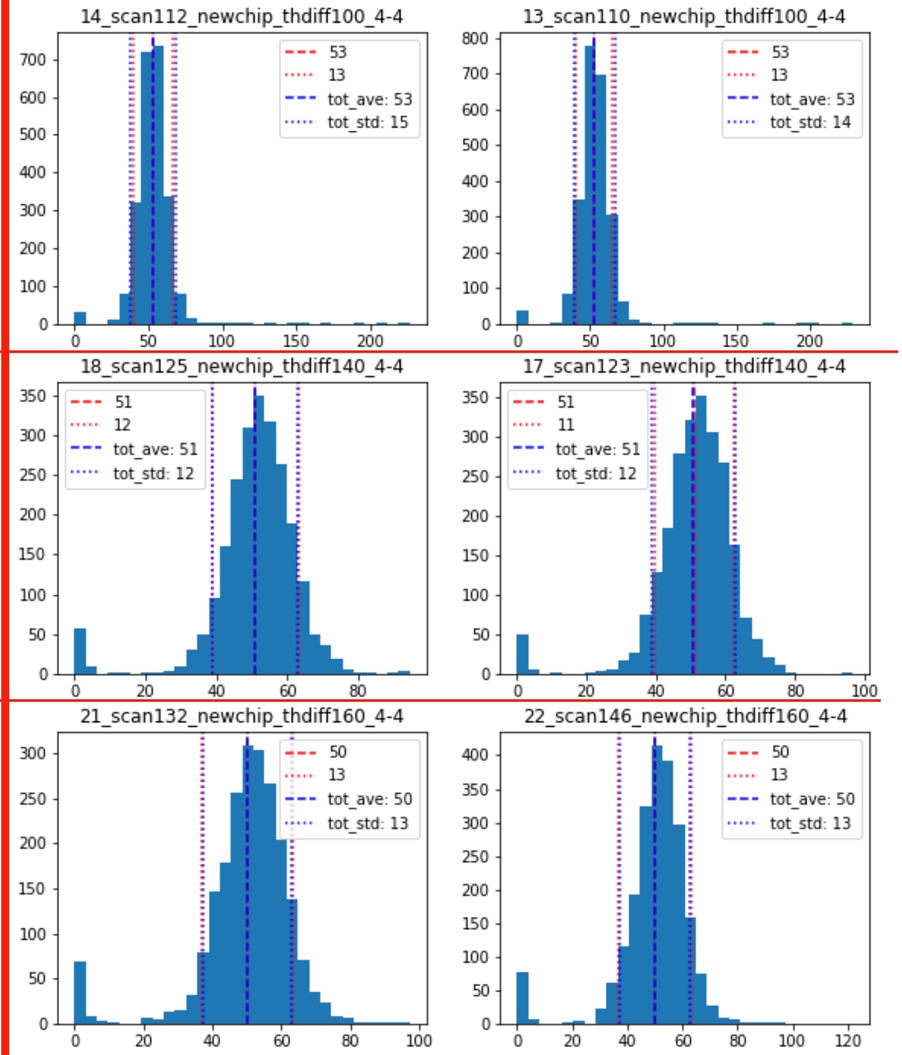
RD53B ptot_thresholdscan for the second chip

- And, there are some high noises at some pixel locations
  - Especially for low DiffTh values.

DiffTh = 80, 120, 150



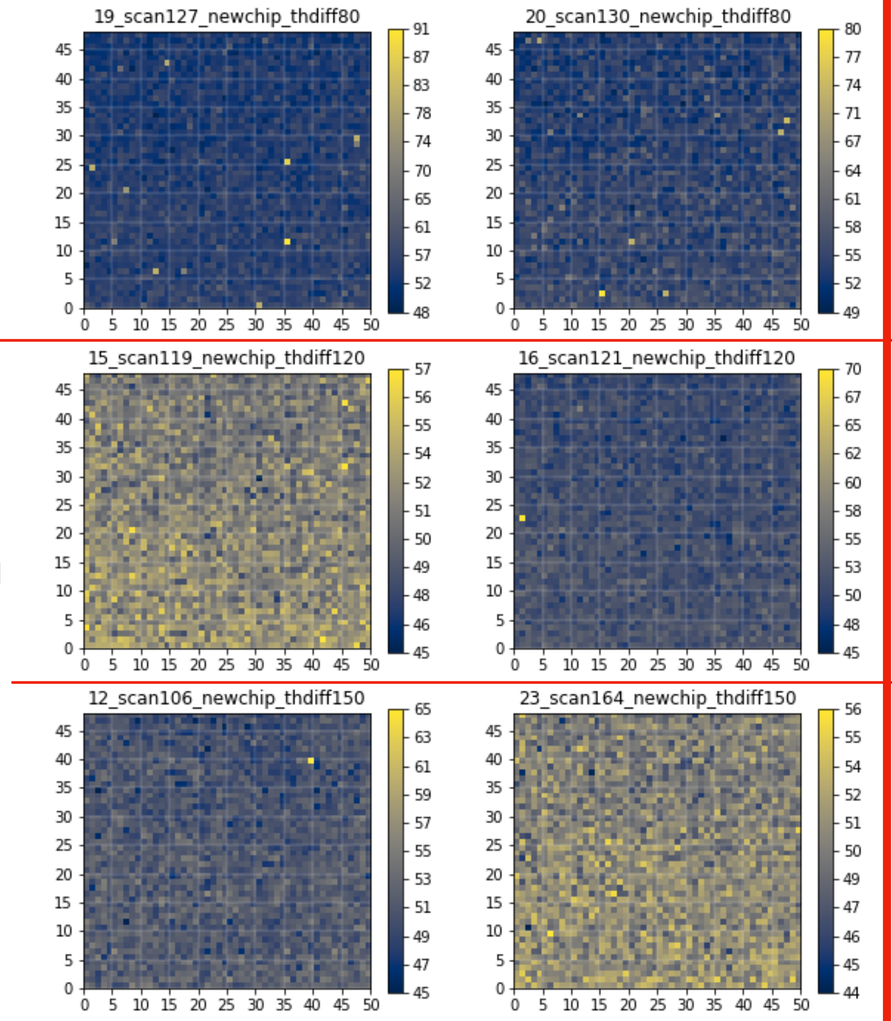
DiffTh = 100, 140, 160



RD53B ptot_thresholdscan for the second chip

- And, there are some high noises at some pixel locations
  - Especially for low DiffTh values.
- From the all cores average noise maps, the high noises at some cores stand out from the other cores.

DiffTh = 80, 120, 150



DiffTh = 100, 140, 160