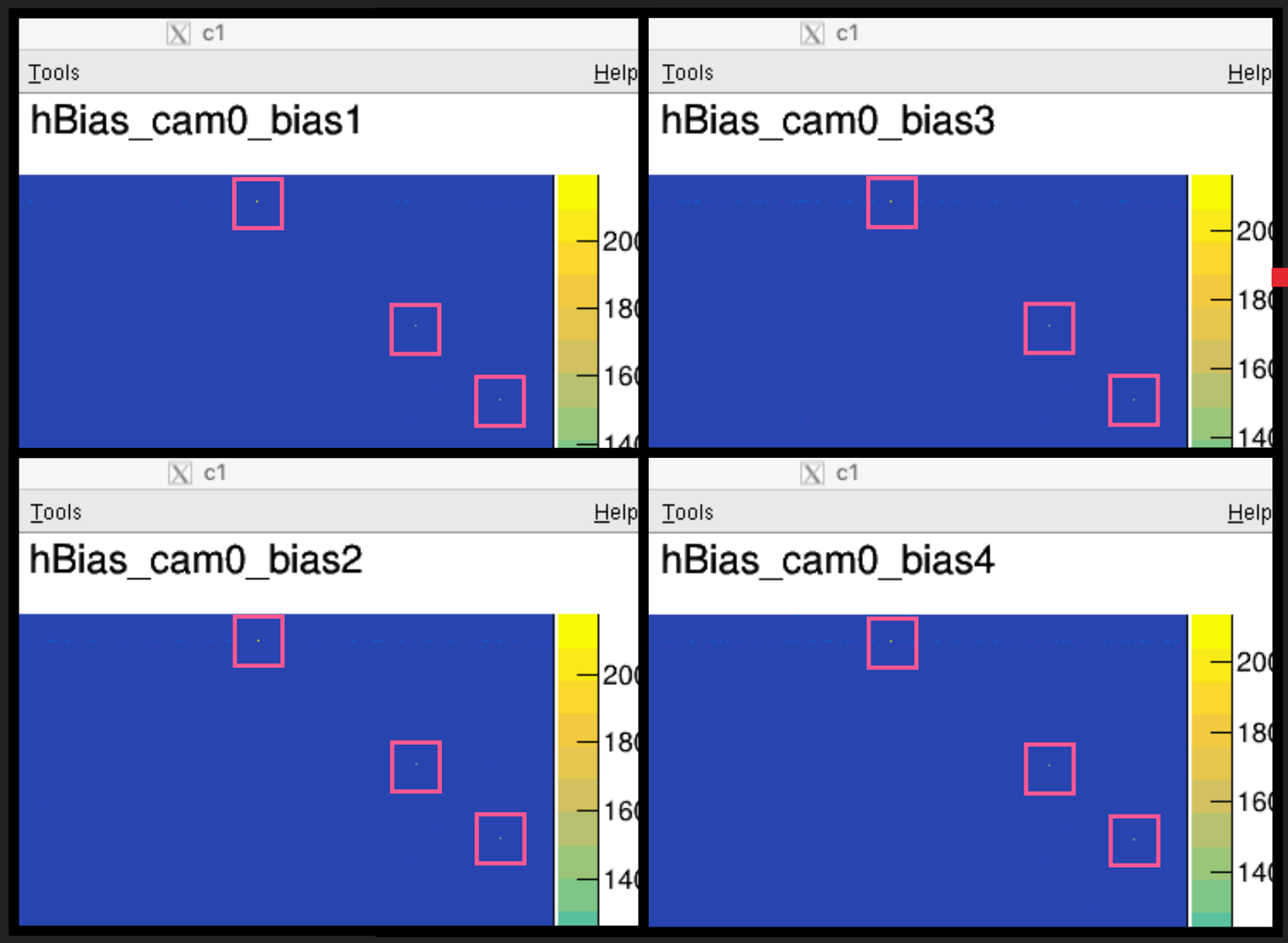
ZACHARY CHEN-WISHART 22/03/2019

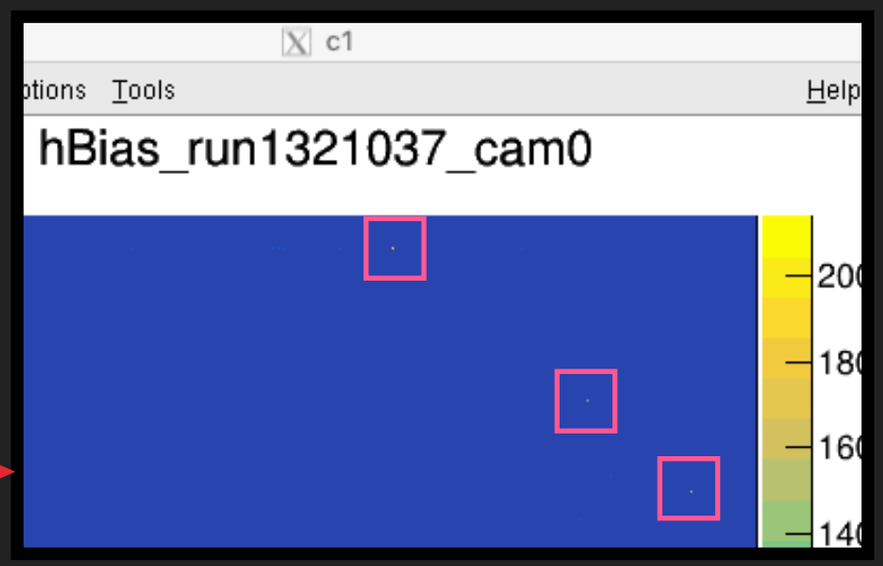
BIAS FRAME ANALYSIS

BIAS FRAMES ANALYSIS – UPDATE

- Been working on the bias frames to look into why the average ADU seems to be approximately 2!
- Added some more info to be saved from LightSumSquare and written some macros to look further into this: Results to follow

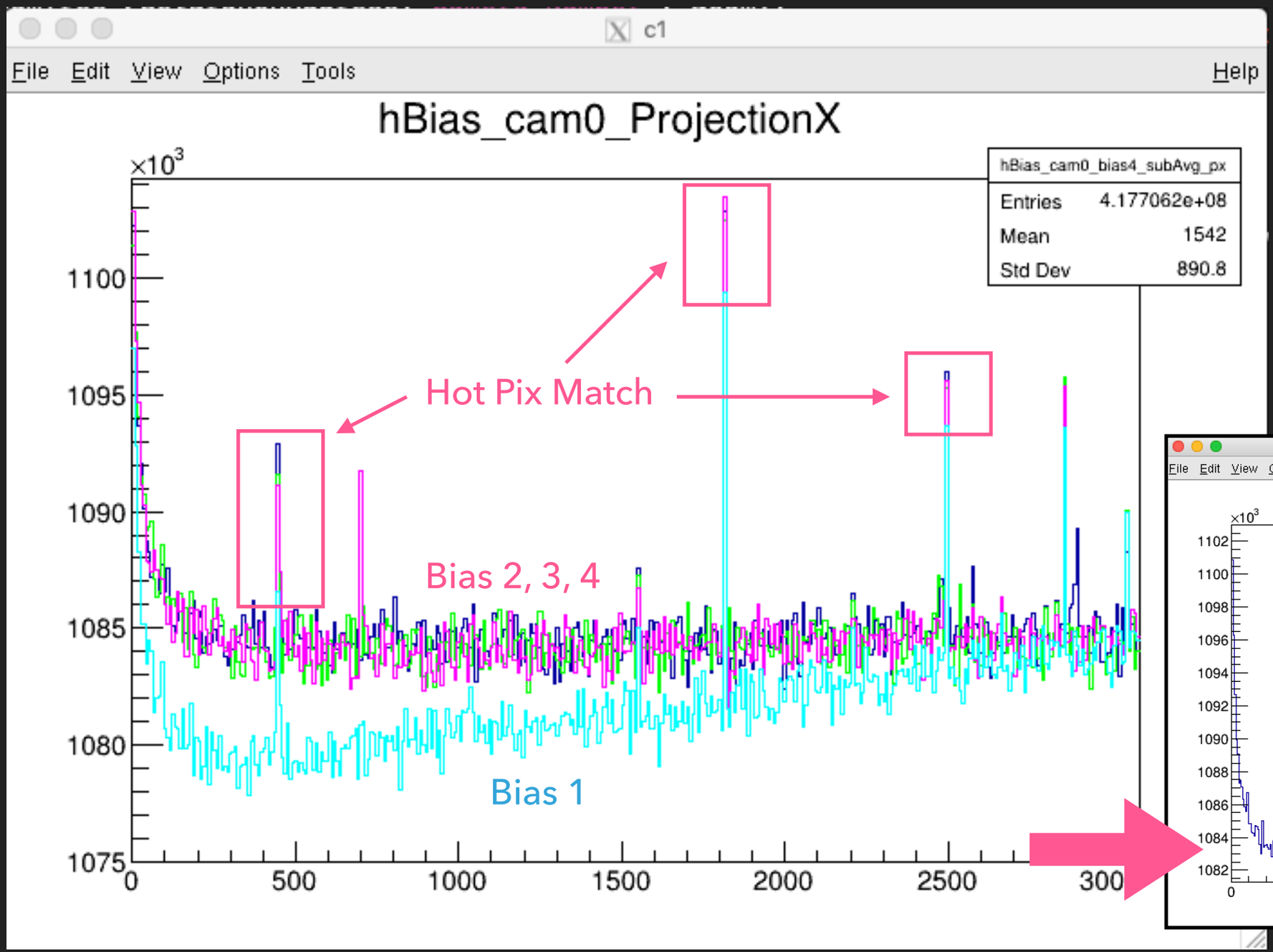
BIAS FRAMES: CAM NUMBER SANITY CHECK



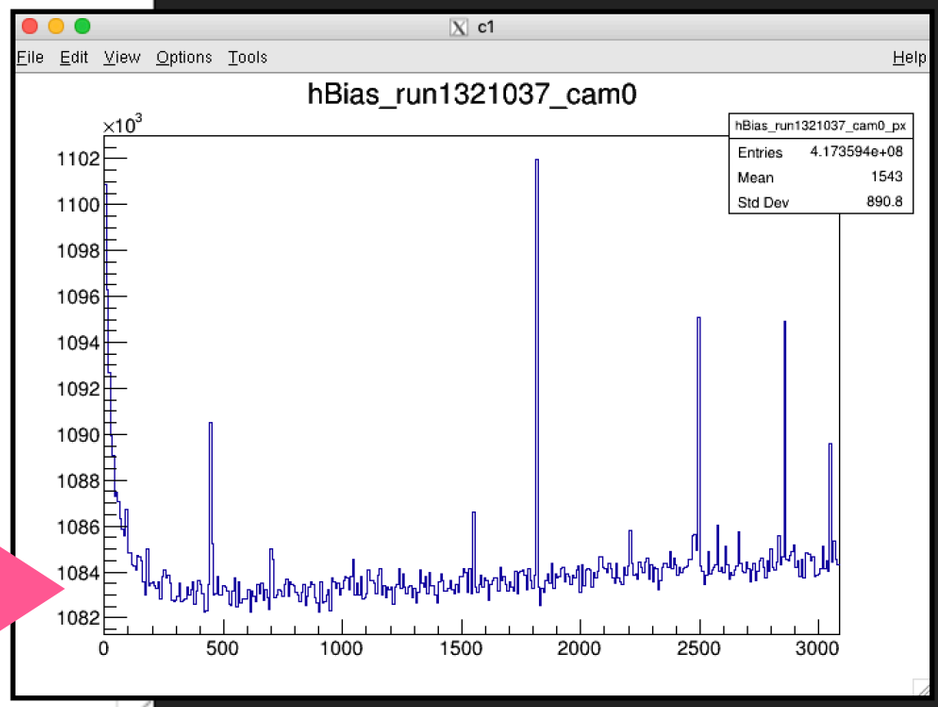


- Using hot pixels to sanity check the correct bias frames are being averred together
- We can see that this is being done right and effects are produced from mismatching

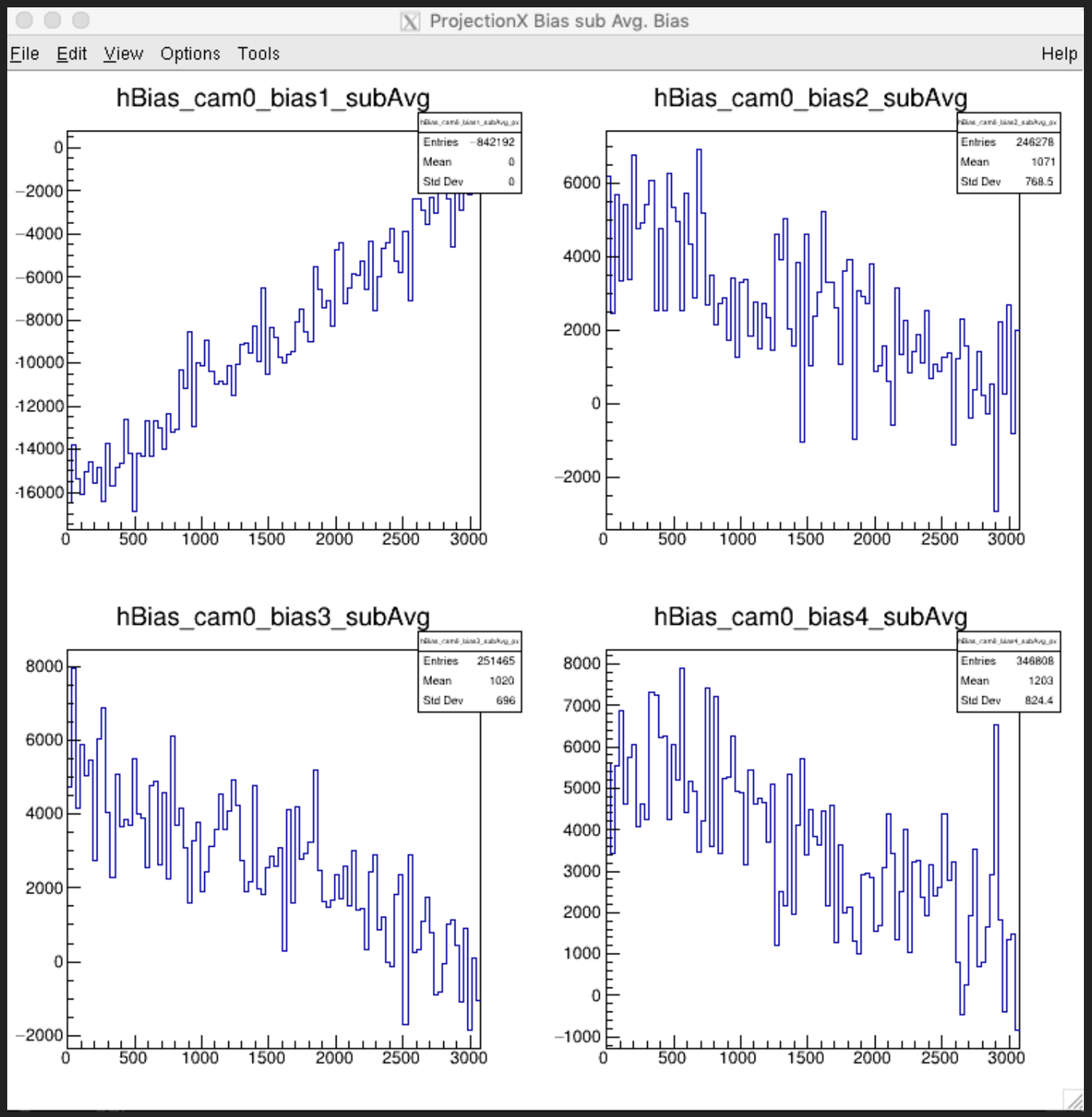
BIAS FRAMES: BIAS 1, 2, 3 AND 4 PROJECTIONX() OVERLAY



- Bias 1 has a +ve gradient while 2, 3 & 4 remain relatively flat -> this produces an avg. bias frame with a slight gradient



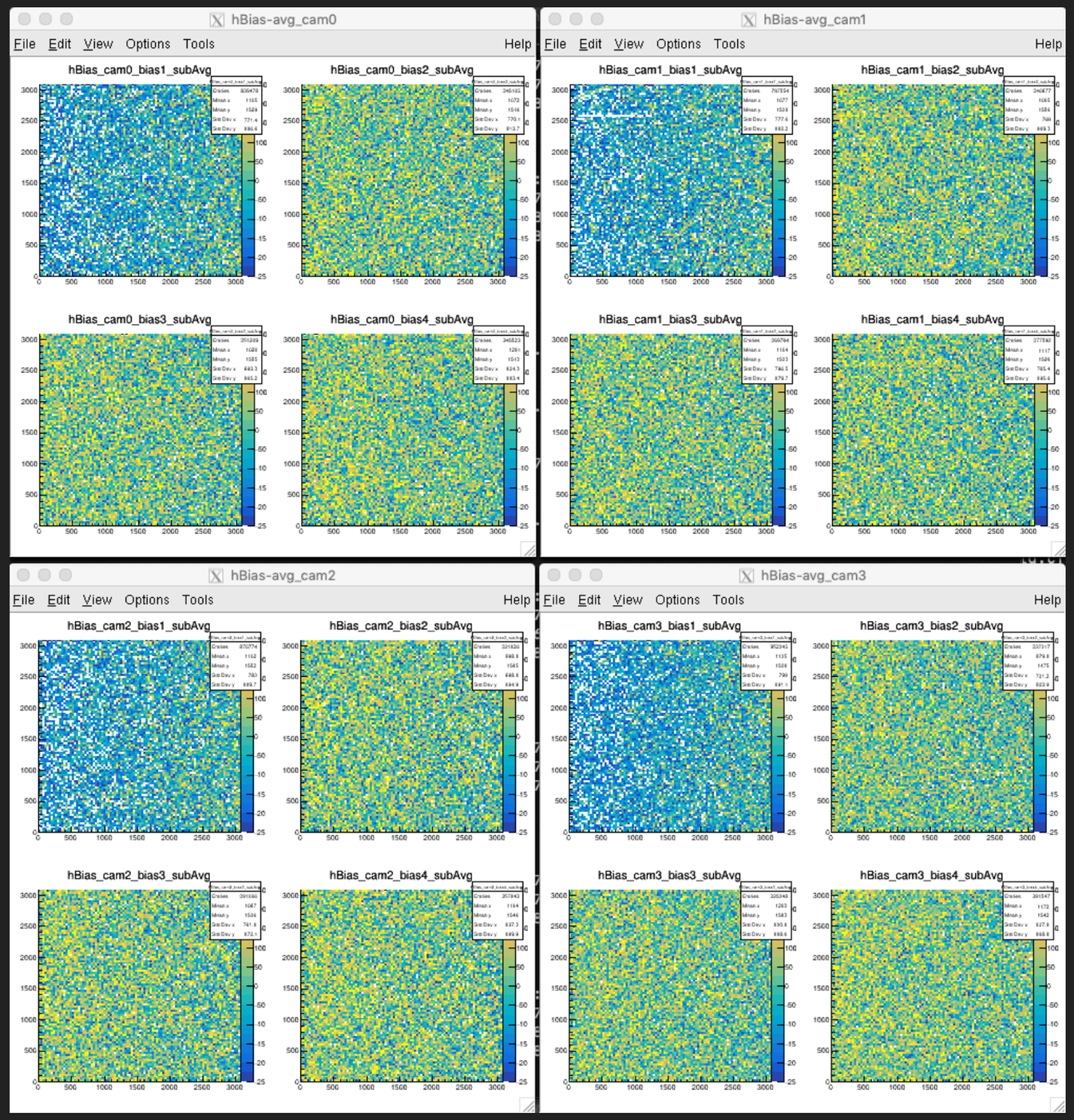
BIAS FRAMES: ALL 4 BIAS ~ BIAS SUB AVG BIAS: PROJECTIONX



Lightsumsquareoutput_R1321037.root

- Subtracting the average bias frame from the bias frames therefore gives us a:
  - +ve gradient for Bias 1 - Avg. Bias
  - and -ve gradient for Bias 2, 3 and 4 - Avg. Bias
- This can be seen in the Projections in X and the full TH2Ds

BIAS FRAMES: ALL 4 BIAS ~ BIAS SUB AVG BIAS



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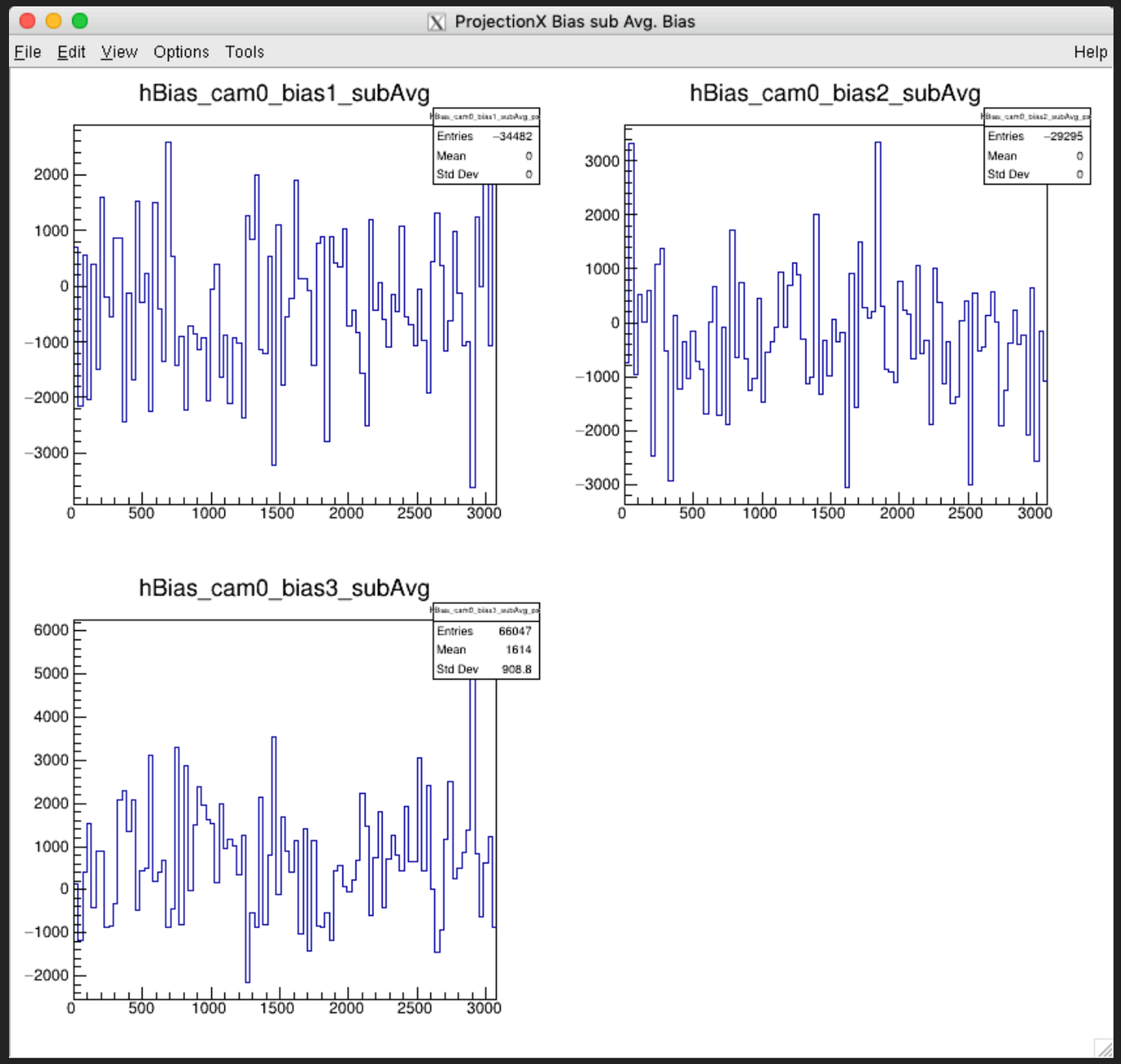
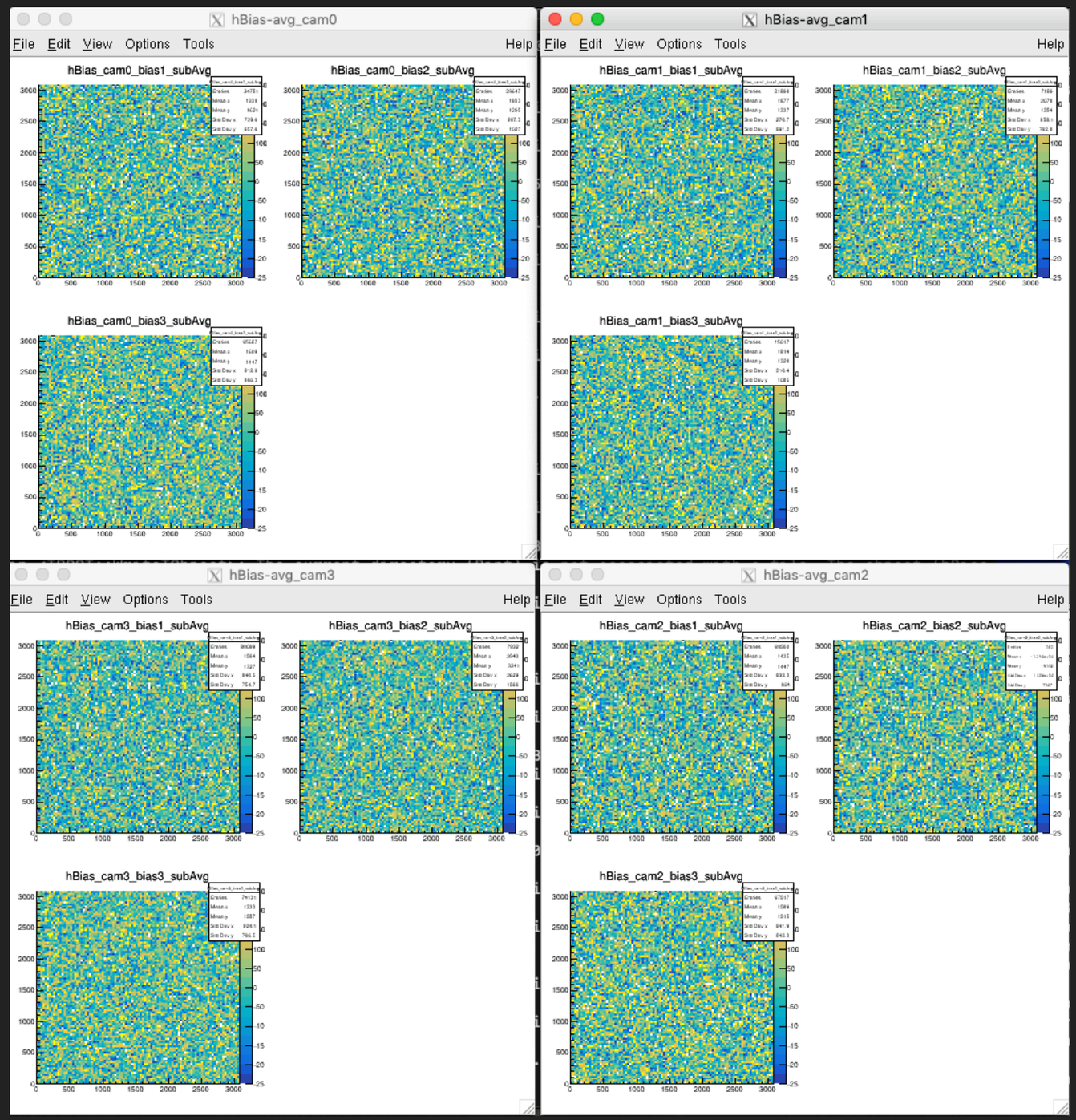
BIAS FRAMES: LAST 3 BIAS ~ BIAS SUB AVG BIAS: PROJECTIONX

Lightsumsquareoutput_R1321037.root



- If we omit Bias 1 so that the average consists just Bias 2, 3 and 4 (now labeled 1, 2 and 3) we see comparatively flat bias - average bias in the x projections and full TH2Ds

BIAS FRAMES: LAST 3 BIAS ~ BIAS SUB AVG BIAS



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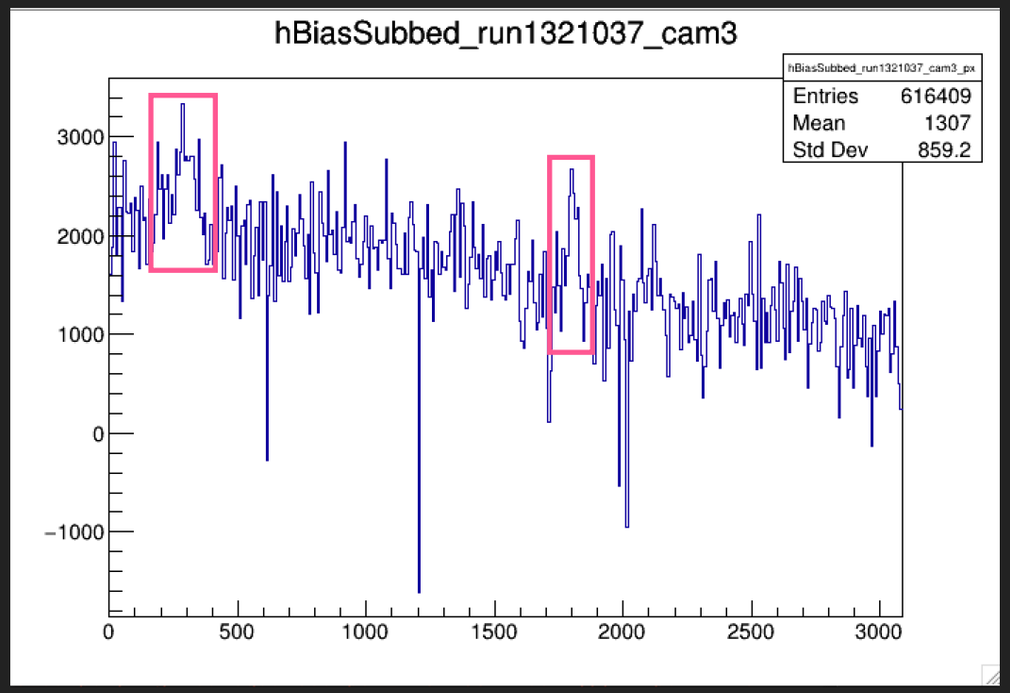
BIAS FRAMES: LAST 3 BIAS ~ BIAS SUB AVG BIAS

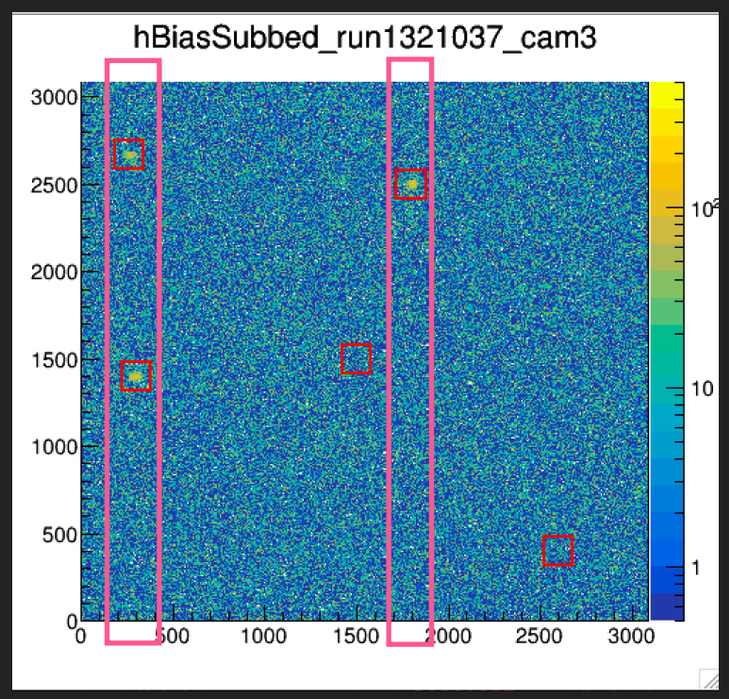
- For the bias - avg bias x projections we now have sensible mean Y values which sum to approx 0
- We still see some patterns w.r.t. bias number: for the mean and avg per pix we see Bias1 < Bias2 < Bias3 but this effect is order of magnitude smaller than compared to the previous run where Bias 1 was included

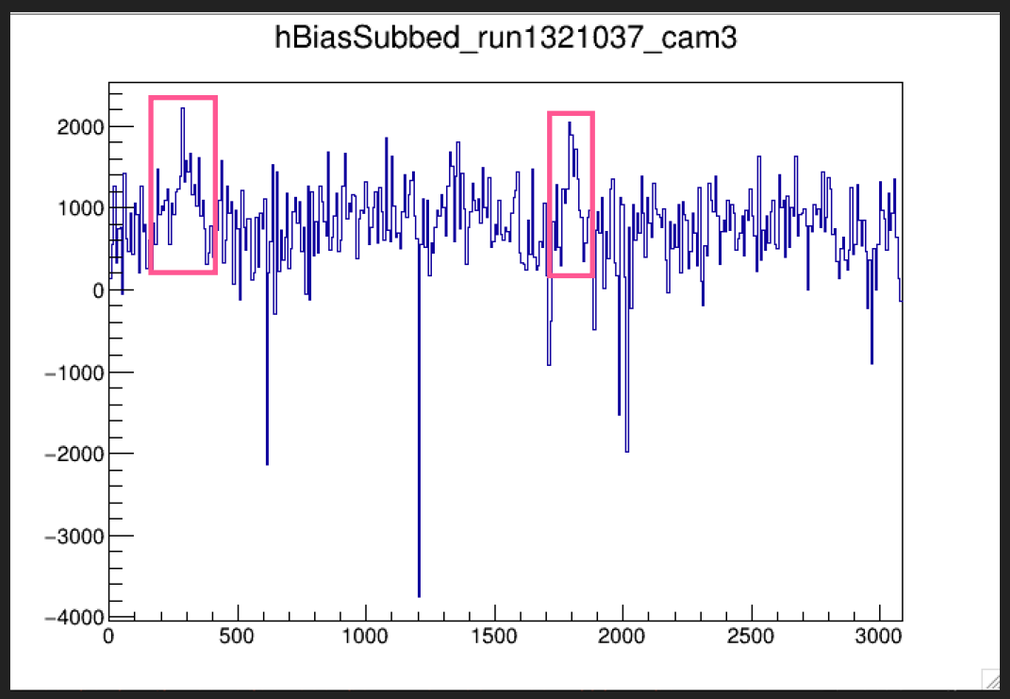
```
<<<<Bias Frames>>>>
<<<Camera 0>>>
Average Per Pix: 2817.61 RMS: 890.78 Mean: 1.08478e+06

<<<Camera 1>>>
Average Per Pix: 2761.04 RMS: 890.79 Mean: 1.063e+06

<<<Camera 2>>>
Average Per Pix: 2879.66 RMS: 890.757 Mean: 1.10867e+06

<<<Camera 3>>>
Average Per Pix: 3547.14 RMS: 890.766 Mean: 1.36565e+06

<<<<Bias - Avg. Bias>>>>
<<<Camera 0>>>
<bias 1>: Average Per Pix: -0.232637  RMS: 719.473 Mean: -89.5654
<bias 2>: Average Per Pix: -0.197643  RMS: 981.869 Mean: -76.0926
<bias 3>: Average Per Pix: 0.445588   RMS: 905.292 Mean: 171.552

<<<Camera 1>>>
<bias 1>: Average Per Pix: -0.152181  RMS: 359.562 Mean: -58.5896
<bias 2>: Average Per Pix: 0.0412009  RMS: 831.392 Mean: 15.8623
<bias 3>: Average Per Pix: 0.113065   RMS: 306.132 Mean: 43.5299

<<<Camera 2>>>
<bias 1>: Average Per Pix: -0.462836  RMS: 939.023 Mean: -178.192
<bias 2>: Average Per Pix: 0.00427166 RMS: 18043.6 Mean: 1.64459
<bias 3>: Average Per Pix: 0.456915   RMS: 953.23  Mean: 175.912

<<<Camera 3>>>
<bias 1>: Average Per Pix: -0.543533  RMS: 836.812 Mean: -209.26
<bias 2>: Average Per Pix: 0.0632203  RMS: 2357.84 Mean: 24.3398
<bias 3>: Average Per Pix: 0.493559   RMS: 909.474 Mean: 190.02
```

LIGHT SUM SQUARE: PROJECTIONX OF SUMMED RUN

- This show the difference between the ProjectionX of the bias subtracted summed run before and after removing bias 1
- We can see that LightSumSquared will have a much easier time in the second case







NEXT STEPS

- Continue work on light sum square gain analysis:
  - I have rewritten LightSumSquare to run off Wills SparkKilled files from the SparkKilledApp -> This now has full functionality and runs much faster
- Finish testing the cam index fix and bias frame changes (omitting bias 1)
- Obtain/make SparkKilled files to run over; then
- Rerun original analysis with the new version LightSumSquare and with the bias frame fix applied