

# Pixel Non-Uniformity Study

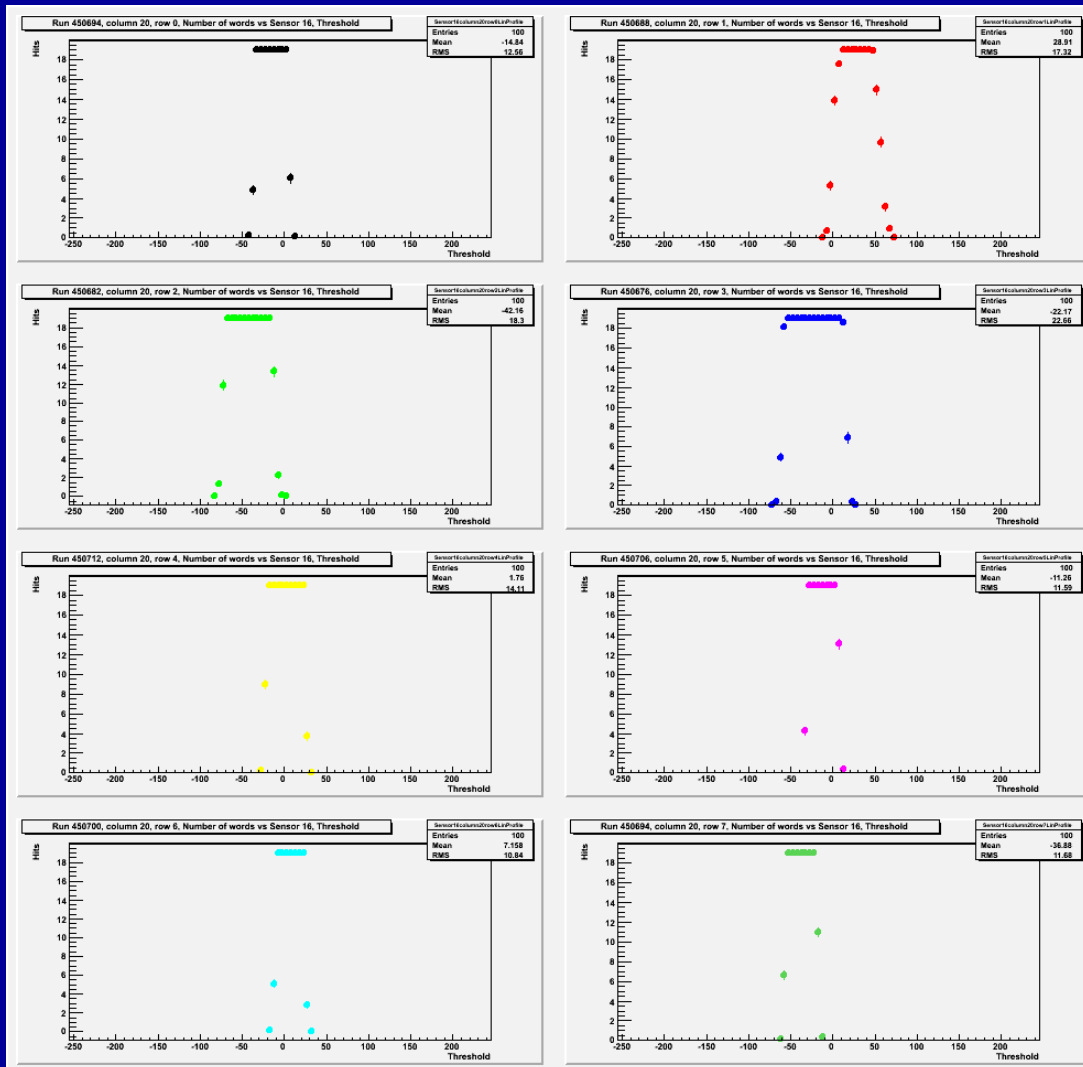
Owen Miller

23/04/2008

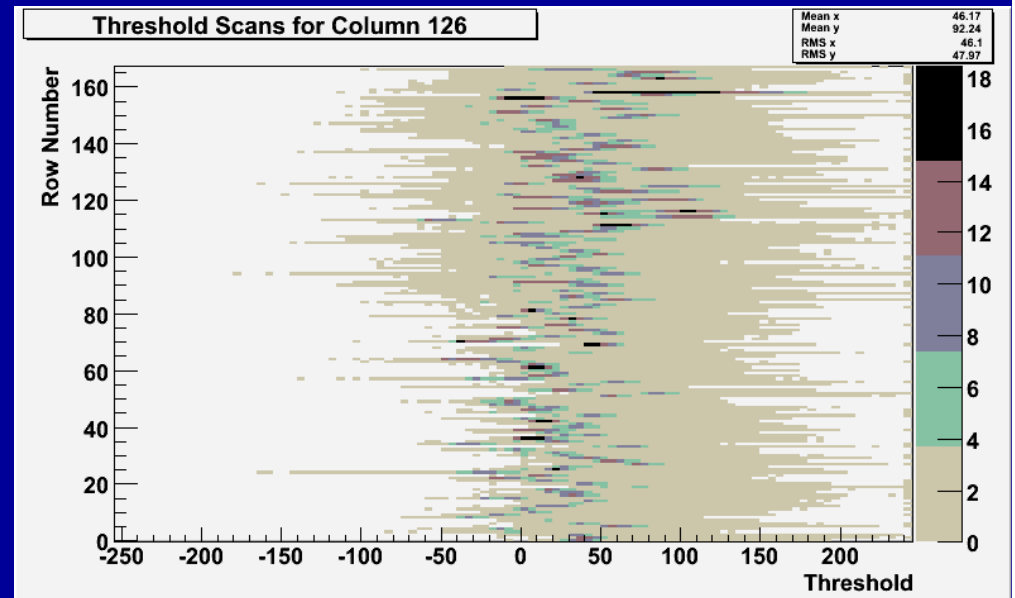
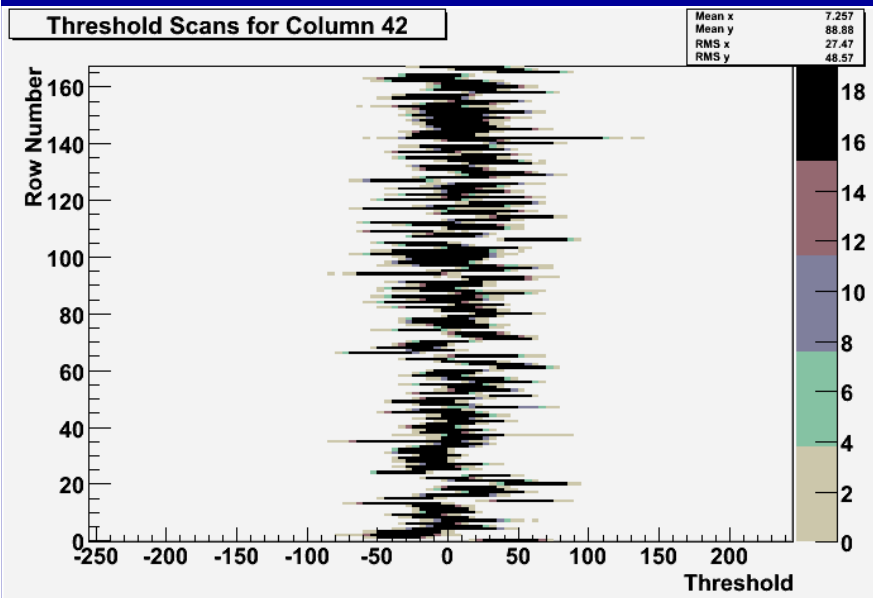
# 1. Pixel Non-Uniformity

- Pixels do not seem to behave uniformly with the same threshold settings.
- This non-uniformity is visible on threshold scans (shown in the next few slides).
- This is probably a contributing factor to the low efficiency demonstrated by the sensor so far.
- Hopefully by understanding and correcting this behaviour we can improve the sensor efficiency in future.

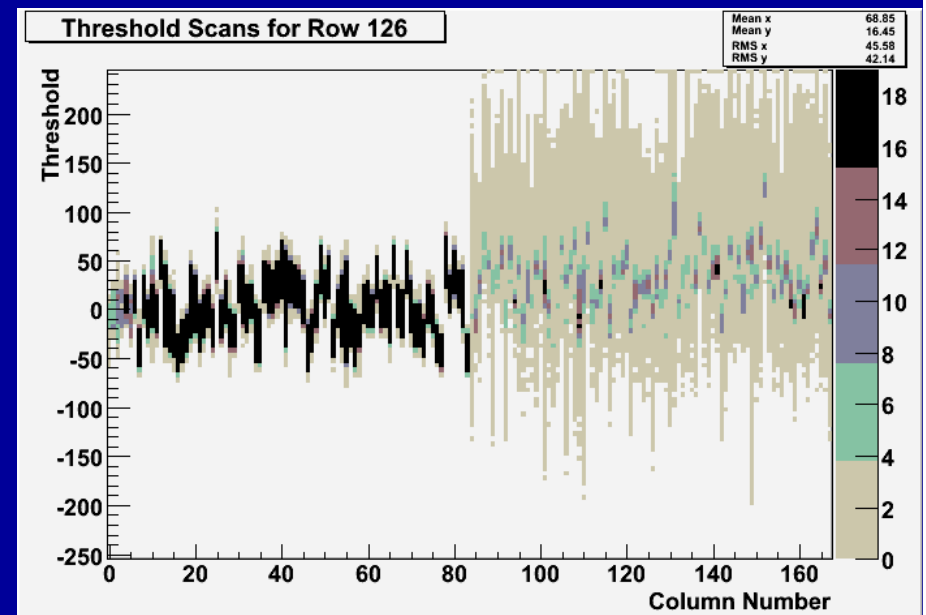
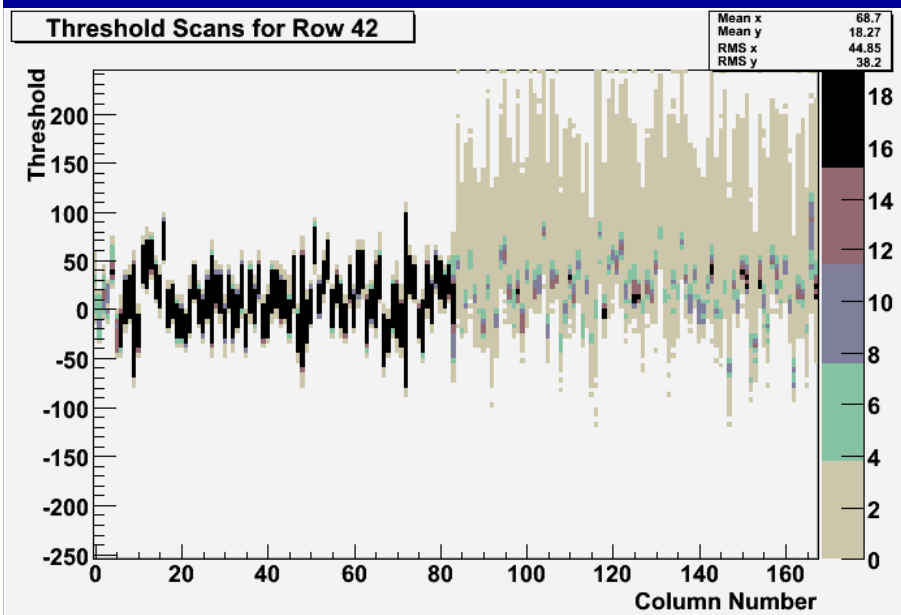
# Some Samples of individual Pixels:



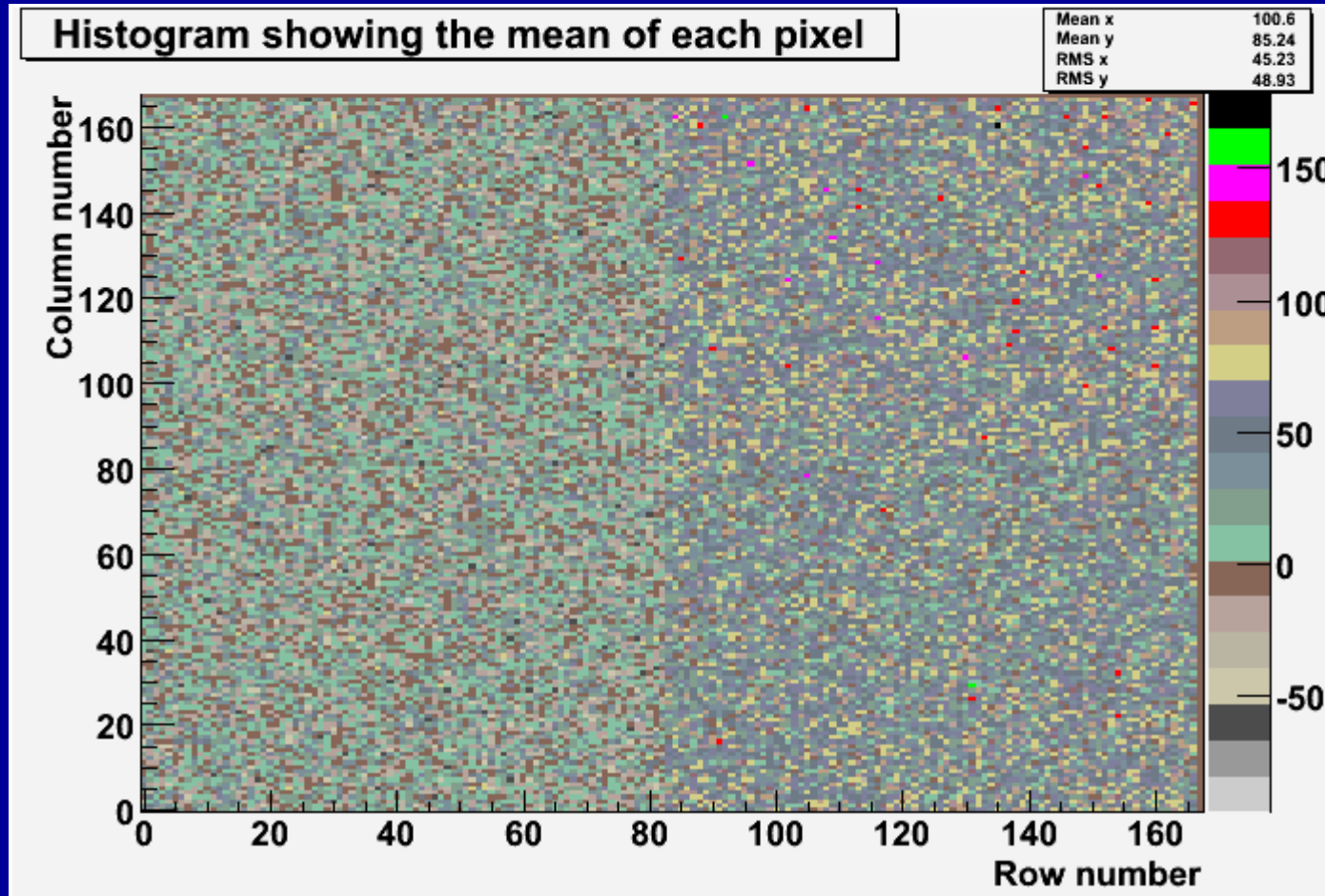
# Individual Pixel Behaviour by Column



# Individual Pixel Behaviour by Row

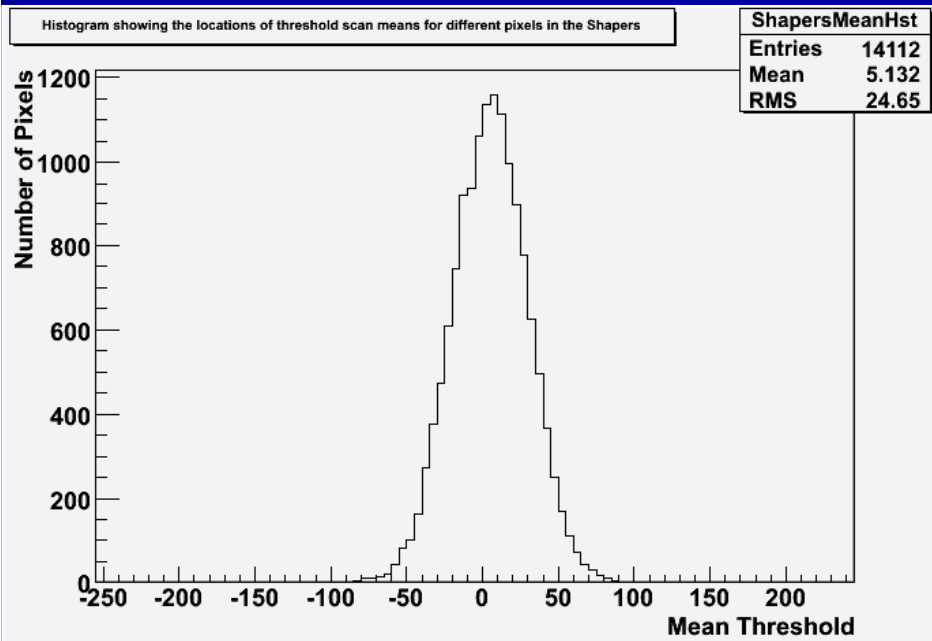


# Mean thresholds Across the Whole Sensor

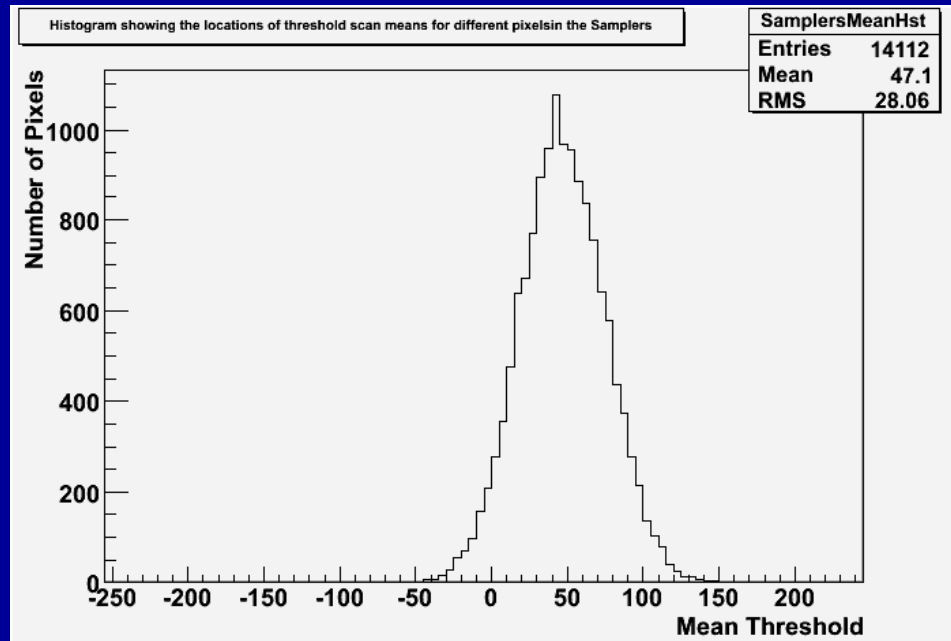


# Variation Between shapers and samplers

Shapers

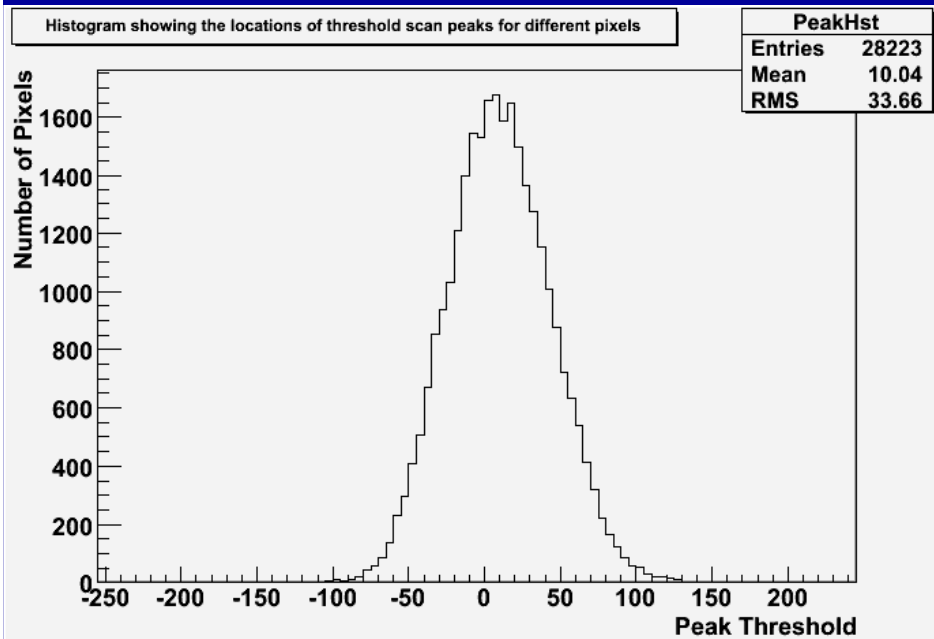


Samplers

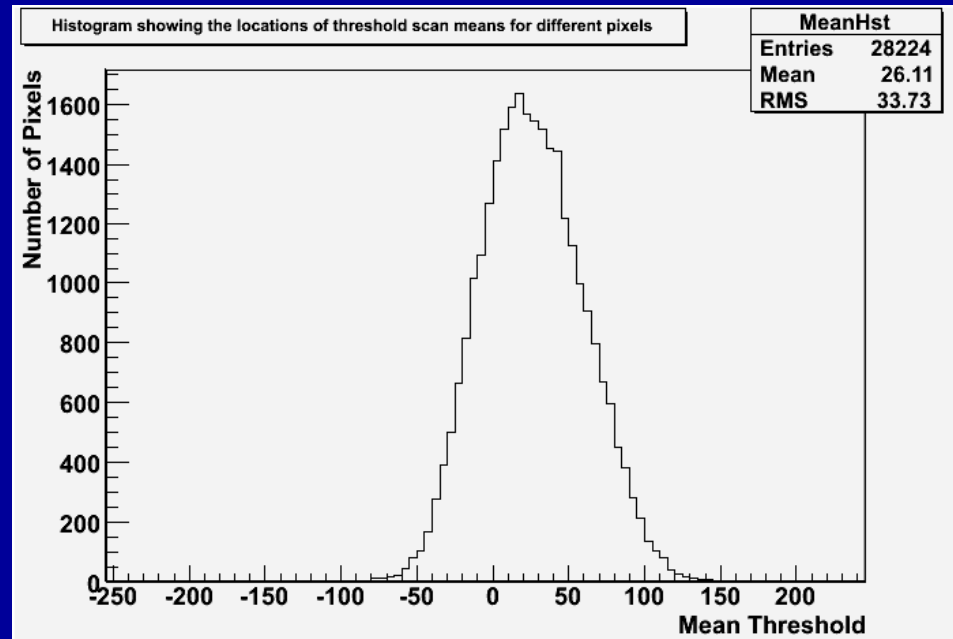


# Overall variation in behaviour

## Peak Thresholds



## Mean Thresholds



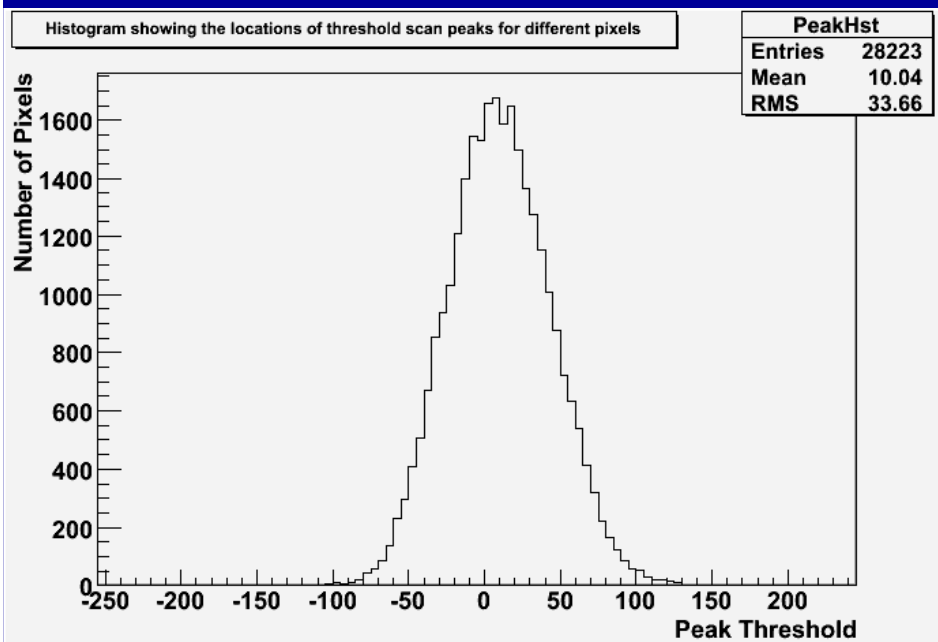


## 2. Pixel Trimming

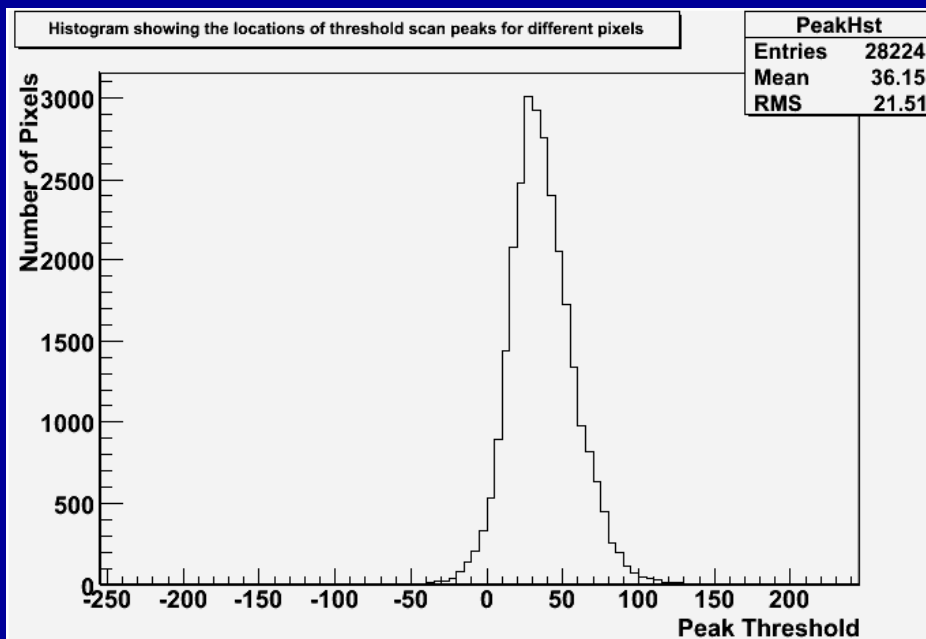
- Pixel non-uniformity can (in theory) be dealt with by assigning separate trim values to individual pixels.
- A preliminary trim file was made based on the average threshold of the individual pixel threshold scan histograms, here's how it works:
  - Pick a target value for the mean.
  - For each pixel calculate the trim value which should result in that pixel having the target mean.
- Sounds simple, but the tricky part is selecting a target mean that minimises the number of pixels that would need impossible trim values ( $<0$  or  $>15$ ).

# The Impact of Pixel Trimming on Threshold Peaks

Before



After

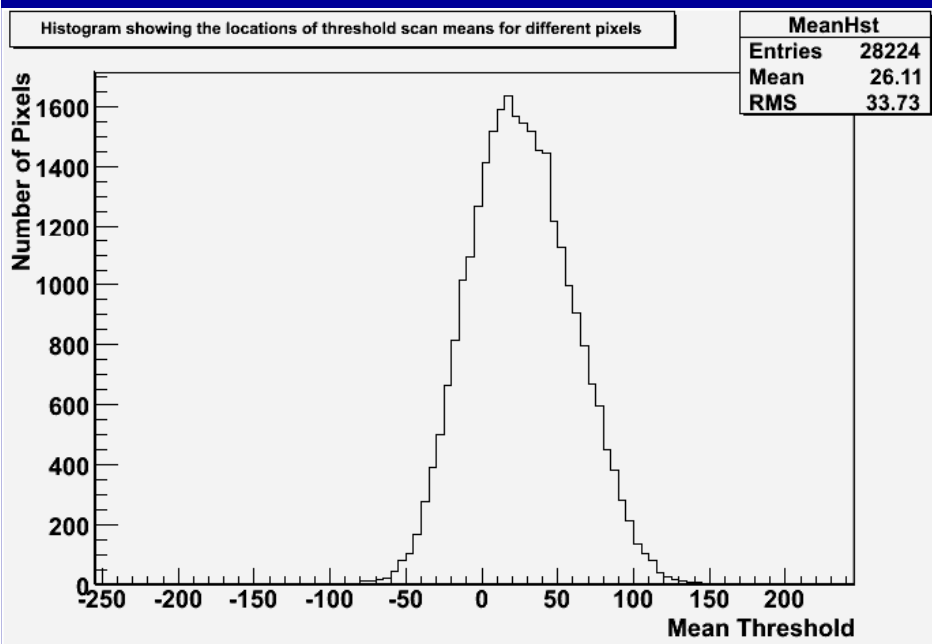


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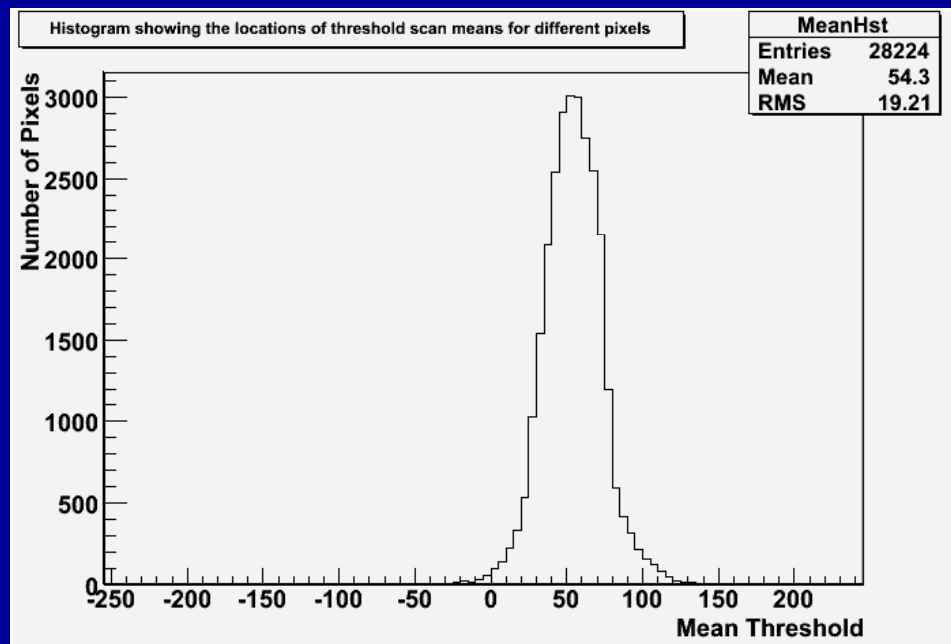
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# The Impact of Pixel Trimming on Threshold Means

Before



After



# 3. Improving the Trimming

- As you can see the pixel trimming is a long way from perfect.
- Some possibilities for improving pixel trimming are:
  - Calculate trim values separately for shapers and samplers.
  - Use different statistics in as the basis for calculating the trim values.
- Overall pixel behaviour will depend on which values are used to calculate the trim settings for individual pixels.
- So what exactly would you like to see?