

# Trimming and VthrComp Study

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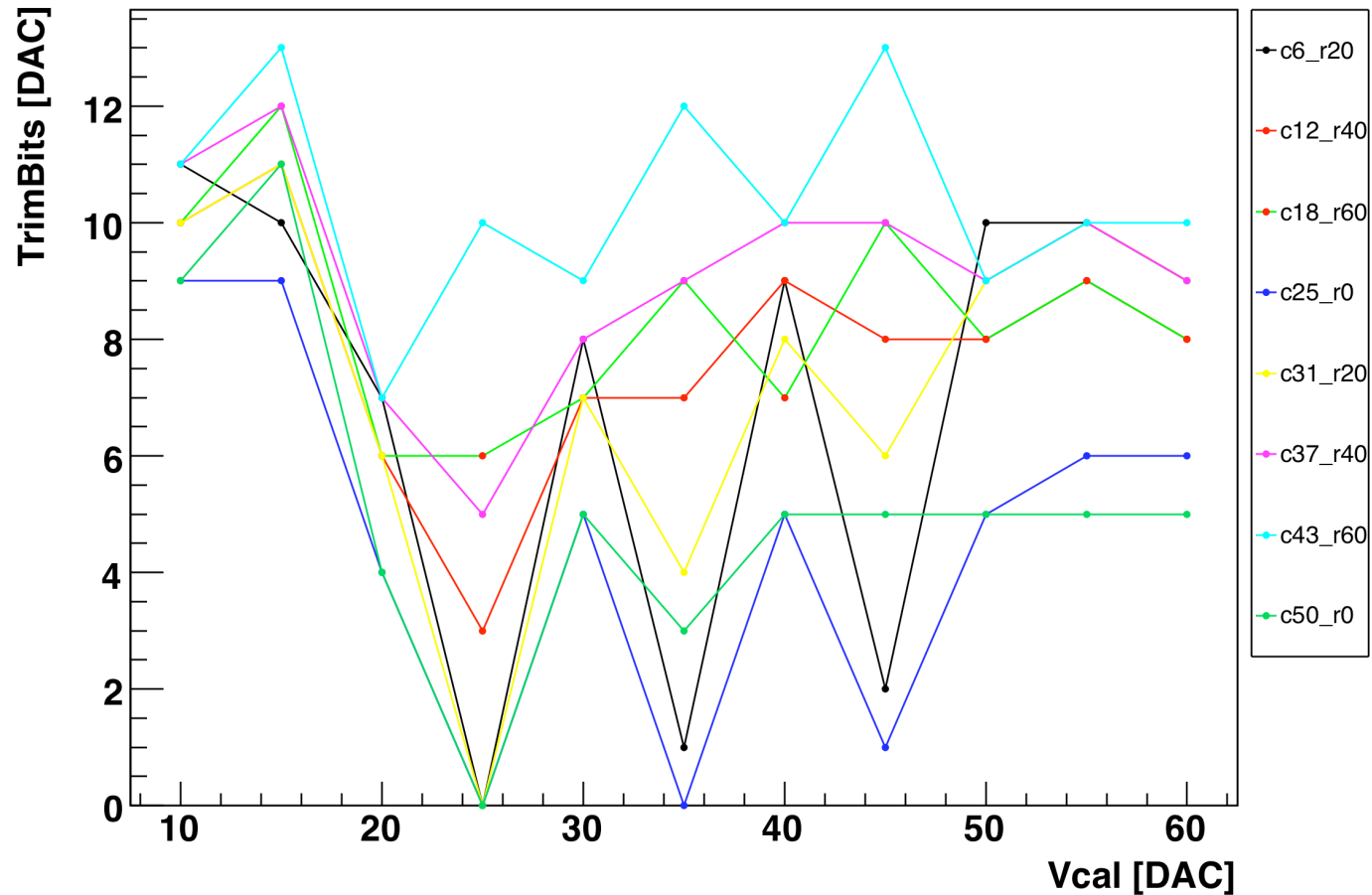


# Overview

- Trimming Exercise
  - Study possibility of trimming without Vcal inject
- Procedure
  - Lower threshold until ROCs became too noisy
  - Trim at this level using Vcal inject
  - Begin trimming exercise
- Assumptions
  - Once set, trimming bits characteristics do not change if the threshold is changed
- Assumption tests ...

# Trim Bits Characteristics Check

ROC 4 TrimBits for various pixels and different Vcals (mod\_1)

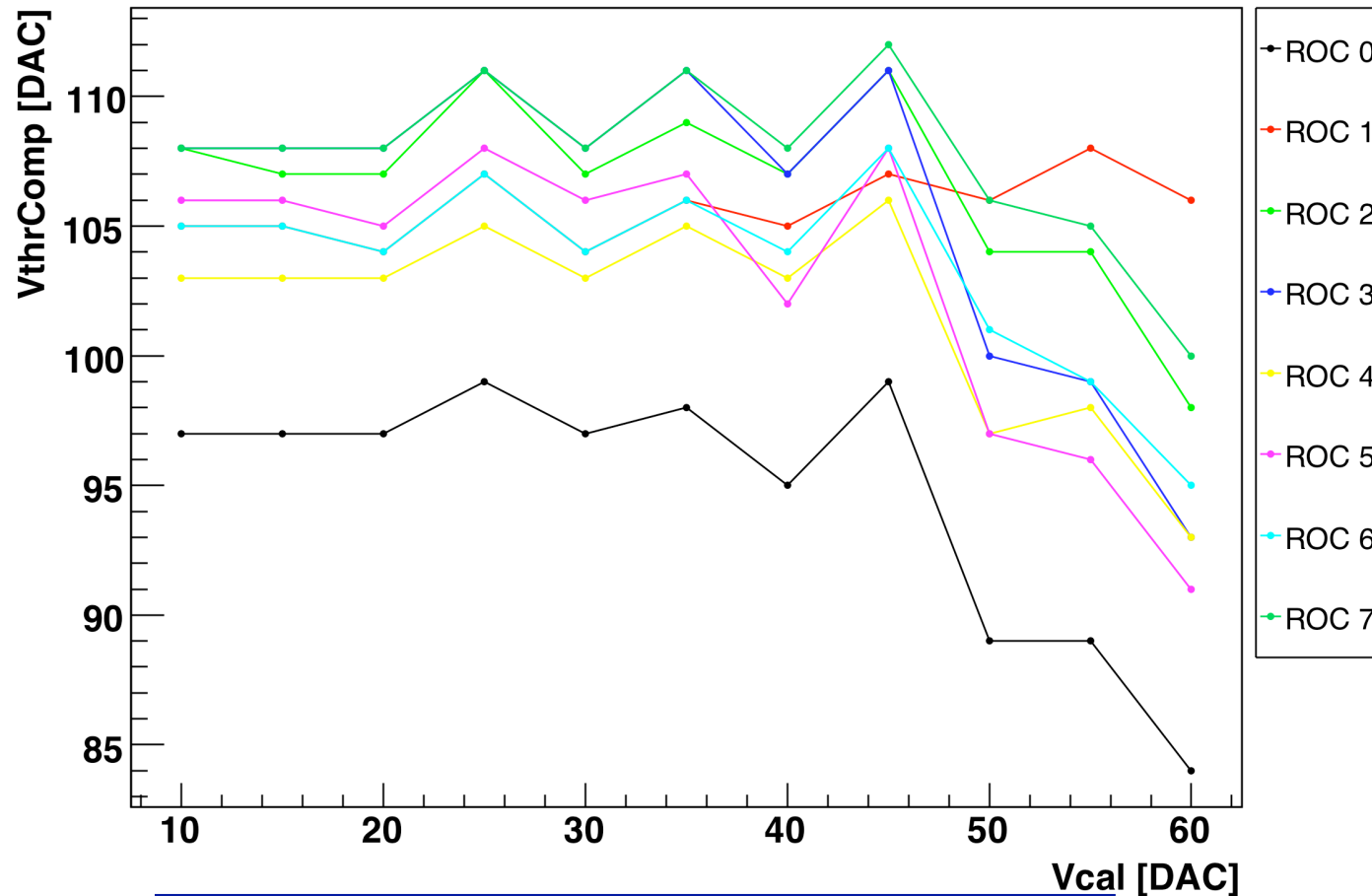


Trim bits numbers for different pixels after trimming at different Vcal values

- Showing trim bits for 8 different pixels as function of Vcal inject
  - For ROC 4 on Module 1
    - Blue cool box
- Pixels picked at random
- Same behavior observed in two different modules
- Trim bits change for different Vcals

# VthrComp Changes

Module 1: VthrComp for different Vcals

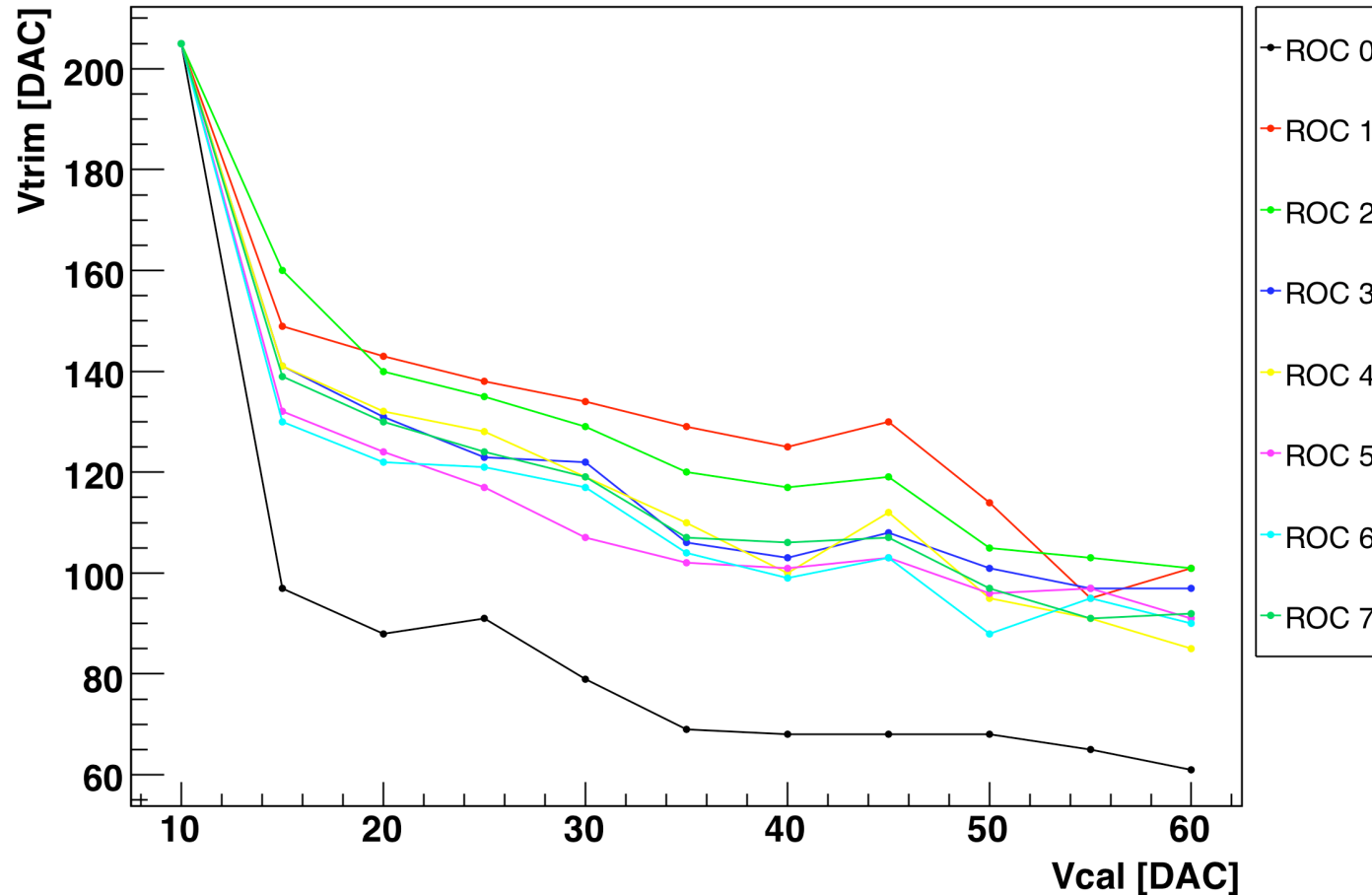


VthrComp changes after trimming at different Vcal values for 8 ROCs in module 1

- Changes expected
  - Global threshold was lowered
- ROC 1 behavior is unexpected
- ROC 0 behavior is noticeably lower relative to other ROCs

# Vtrim Changes

Module 1: Vtrim for different Vcals



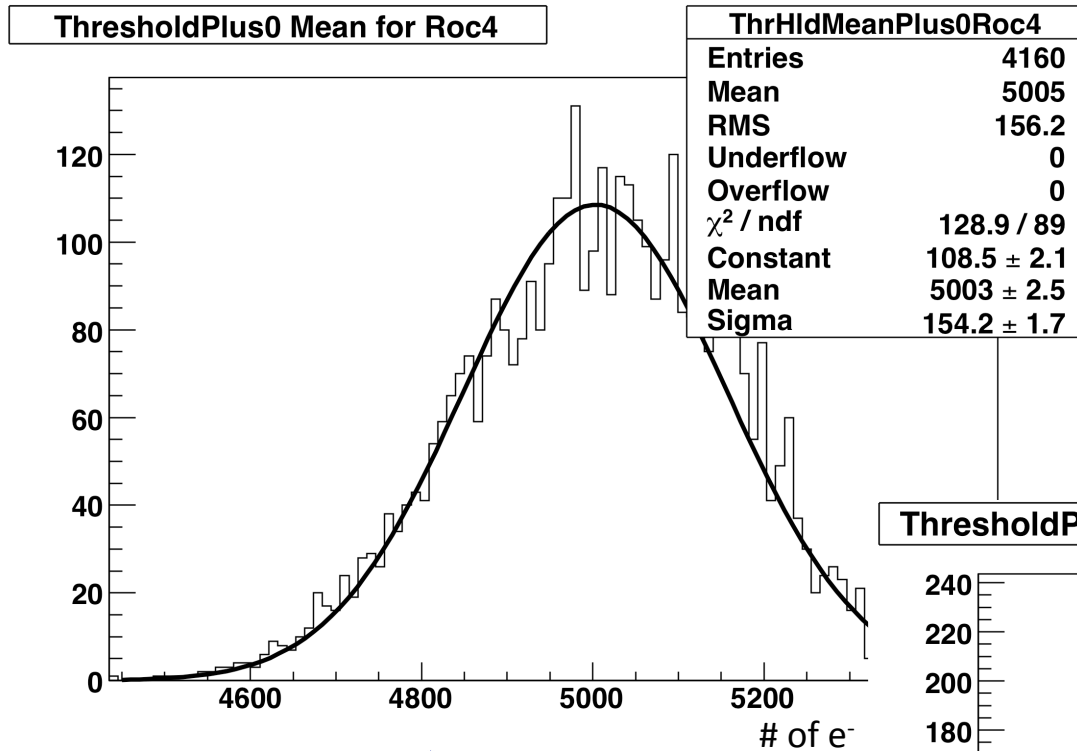
Vtrim changes after trimming at different Vcal values for 8 ROCs in module 1

- Changes expected
  - Global threshold was lowered
- ROC 0 behavior is noticeably lower relative to other ROCs

# S-Curve Exercise

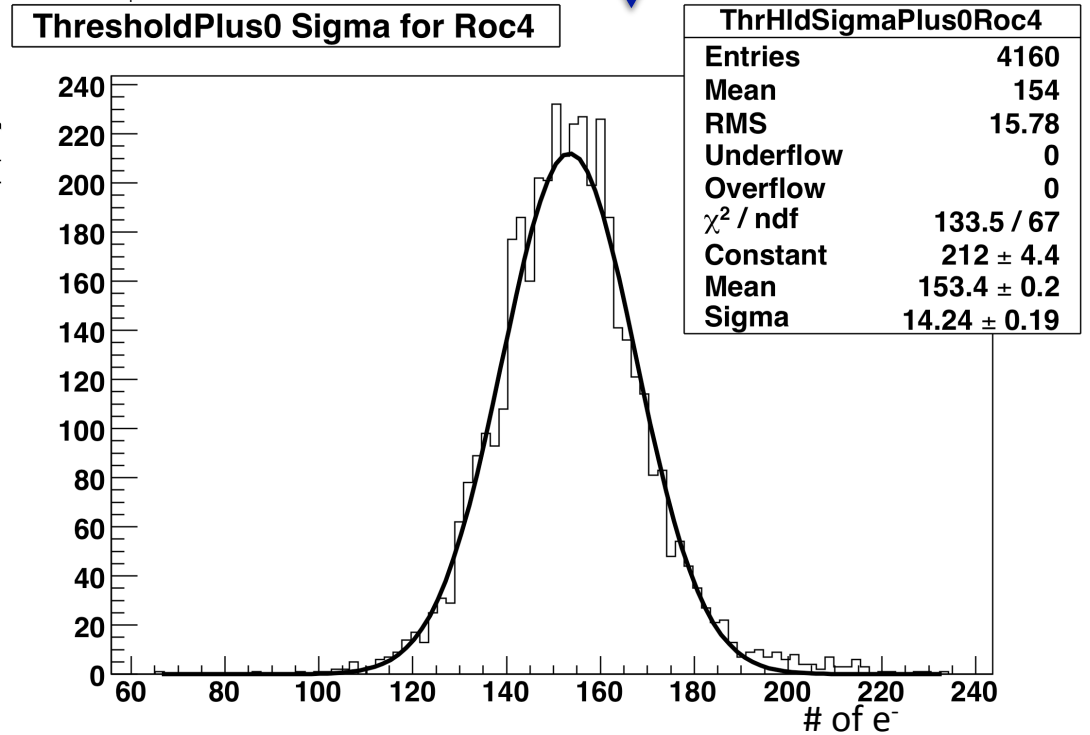
- It was suggested that the Trimming bits changes are of no consequence
- To test this assumption, it was suggested to study the S-Curve behavior at different  $V_{thrComp}$
- Procedure
  - Change the  $V_{thrComp}$  after trimming at  $V_{cal}$  60 and study the S-Curve characteristics
  - This will tell us if the trim bits changes are important

# Threshold and Noise



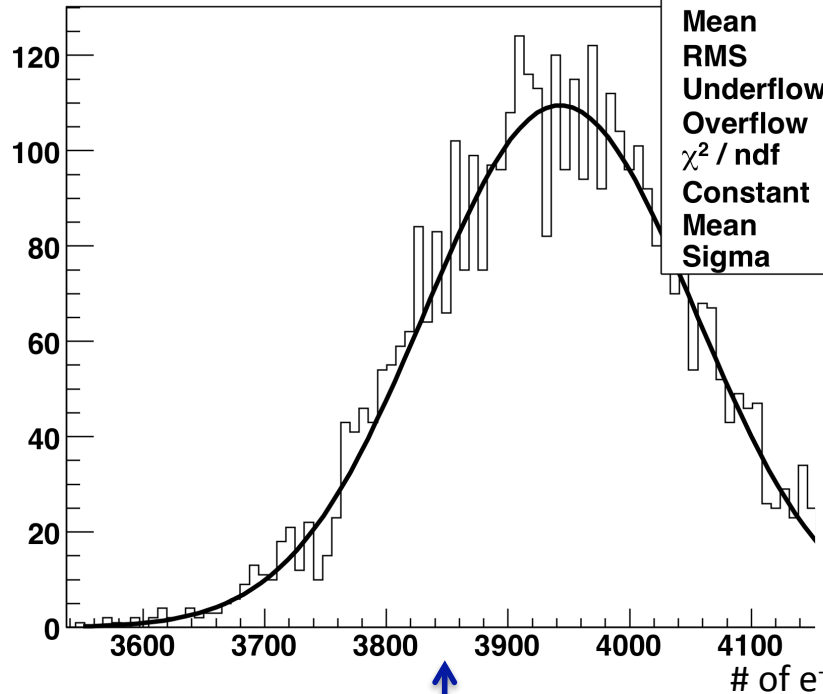
Noise distribution after trimming at Vcal 60 for ROC 4

Threshold distribution after trimming at Vcal 60 for ROC 4



# Threshold and Noise

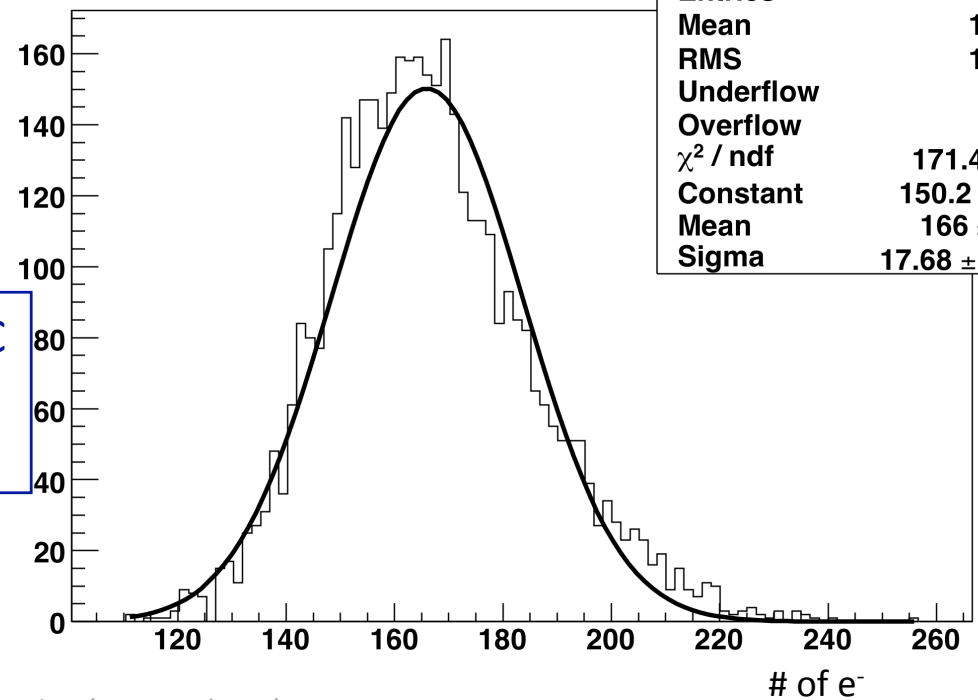
ThresholdPlus5 Mean for Roc4



ThrHldMeanPlus5Roc4	
Entries	4160
Mean	3942
RMS	112.6
Underflow	0
Overflow	0
$\chi^2 / \text{ndf}$	123.8 / 91
Constant	$109.5 \pm 2.1$
Mean	$3943 \pm 1.8$
Sigma	$110.8 \pm 1.3$

Noise distribution after adding 5 DAC units after trimming at Vcal 60 for ROC 4

ThresholdPlus5 Sigma for Roc4



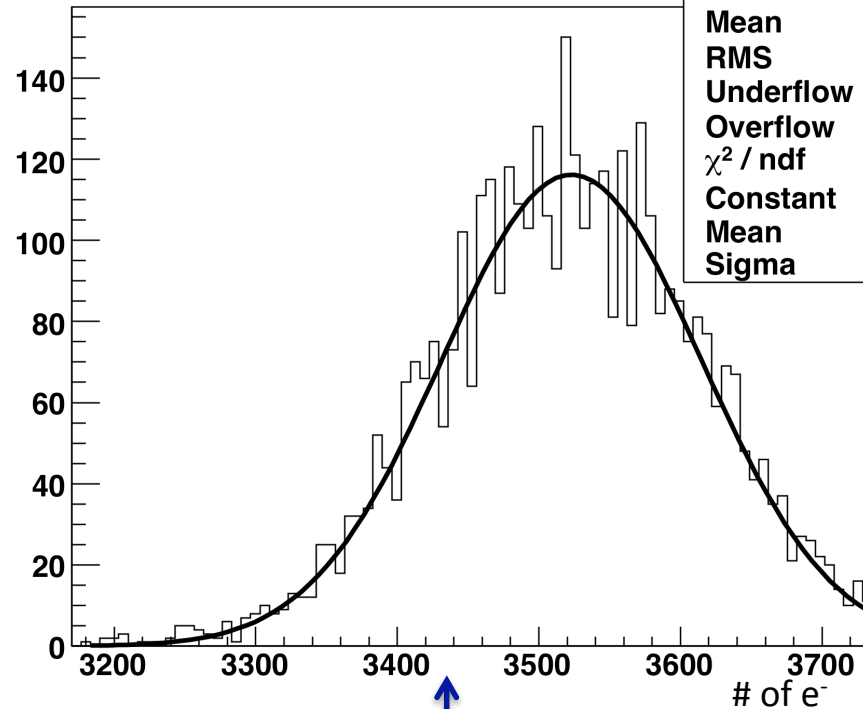
ThrHldSigmaPlus5Roc4	
Entries	4160
Mean	166.7
RMS	18.84
Underflow	0
Overflow	0
$\chi^2 / \text{ndf}$	171.4 / 73
Constant	$150.2 \pm 3.1$
Mean	$166 \pm 0.3$
Sigma	$17.68 \pm 0.24$

Threshold distribution after adding 5 DAC units from the Vcal 60 trimming value for ROC 4



# Threshold and Noise

ThresholdPlus8 Mean for Roc4

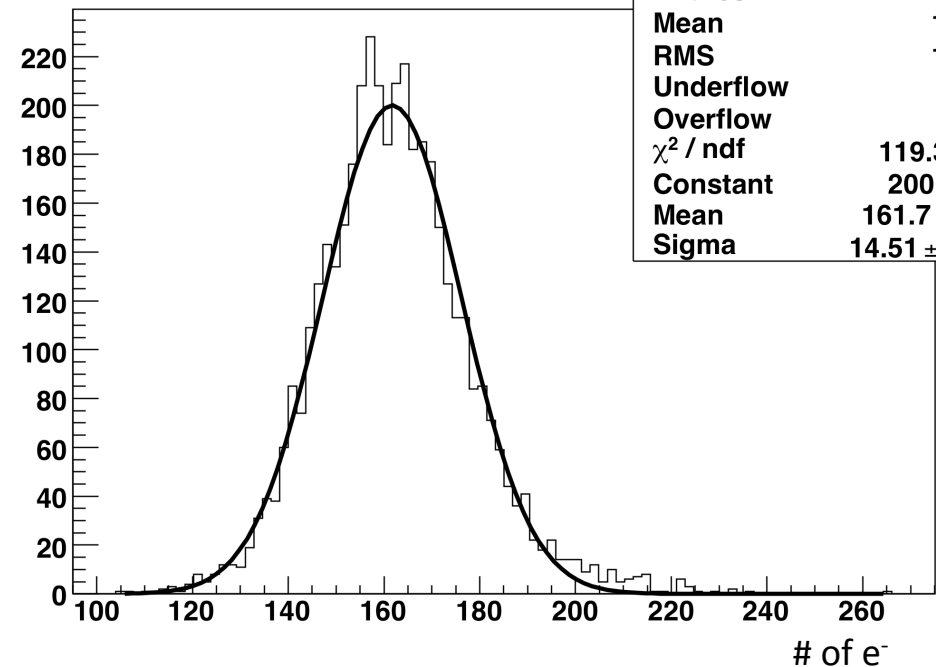


ThrHldMeanPlus8Roc4	
Entries	4160
Mean	3521
RMS	93.66
Underflow	0
Overflow	0
$\chi^2 / \text{ndf}$	149.8 / 84
Constant	$116.1 \pm 2.2$
Mean	$3523 \pm 1.5$
Sigma	$91.82 \pm 1.05$

Noise distribution after adding 8 DAC units after trimming at Vcal 60 for ROC 4



ThresholdPlus8 Sigma for Roc4

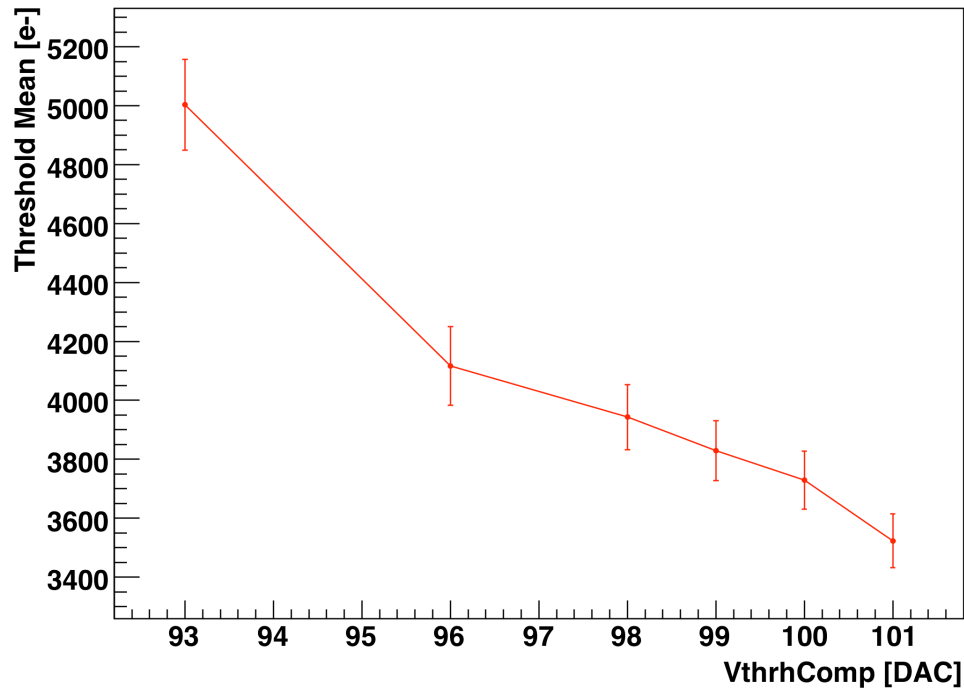


ThrHldSigmaPlus8Roc4	
Entries	4160
Mean	162.4
RMS	15.96
Underflow	0
Overflow	0
$\chi^2 / \text{ndf}$	119.3 / 65
Constant	$200 \pm 4.1$
Mean	$161.7 \pm 0.2$
Sigma	$14.51 \pm 0.19$

Threshold distribution after adding 8 DAC units from the Vcal 60 trimming value for ROC 4

# Changes in Threshold and Noise

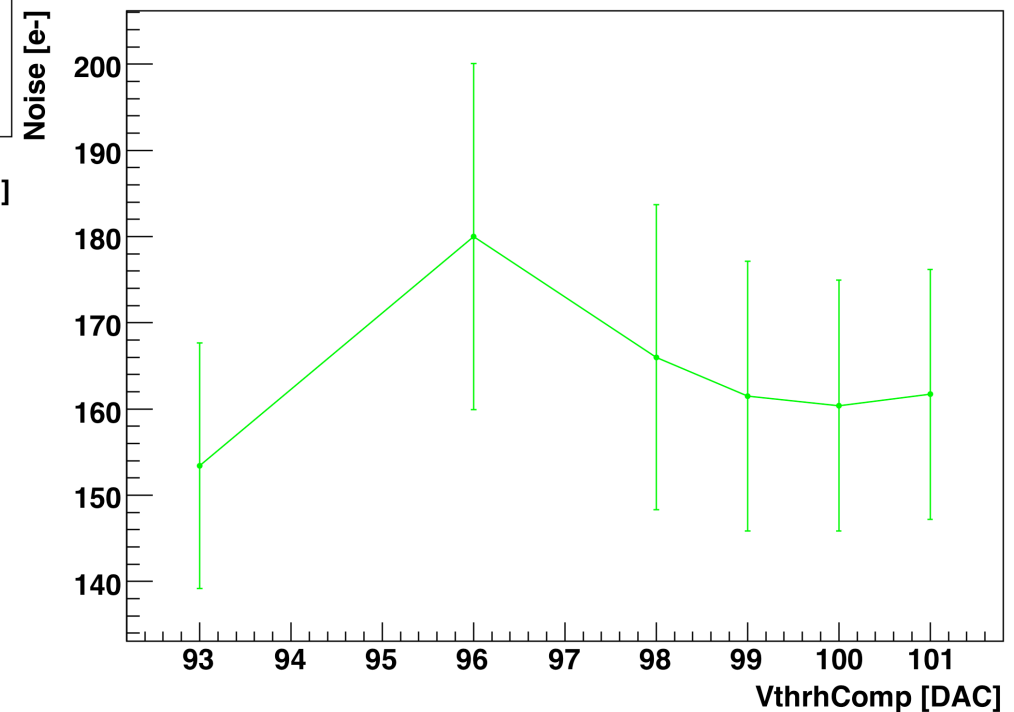
ROC 4 Threshold Mean for Different VthrComp (mod\_1)



Threshold changes for different VthrComp values

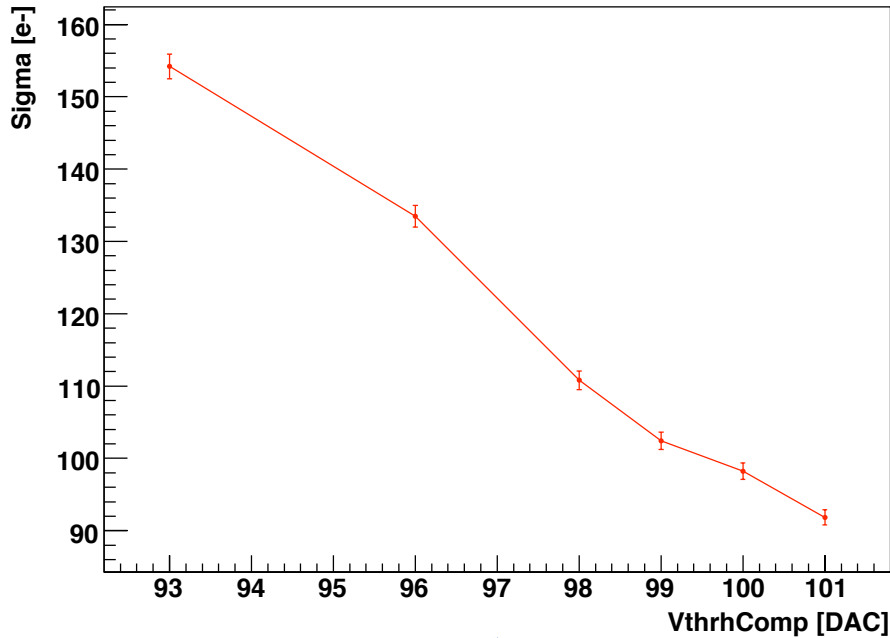
Noise changes for different VthrComp values

ROC 4 Noise for Different VthrComp (mod\_1)



# Changes in Threshold Sigma and Noise Sigma

ROC 4 Sigma Value of the Threshold (mod\_1)



Threshold sigma changes for different VthrComp values

Noise sigma changes for different VthrComp values

ROC 4 Sigma Value of the Noise (mod\_1)

