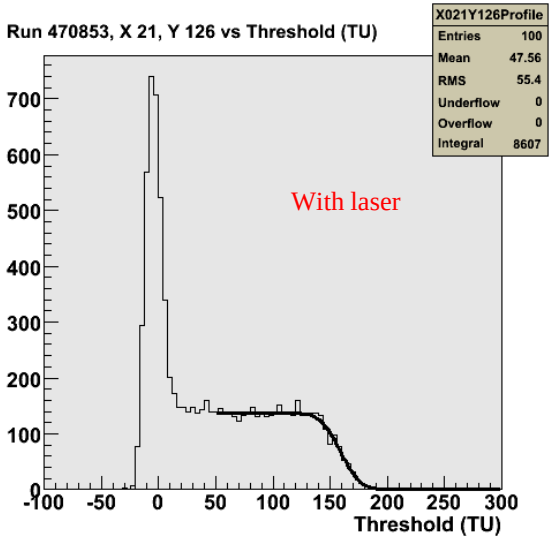
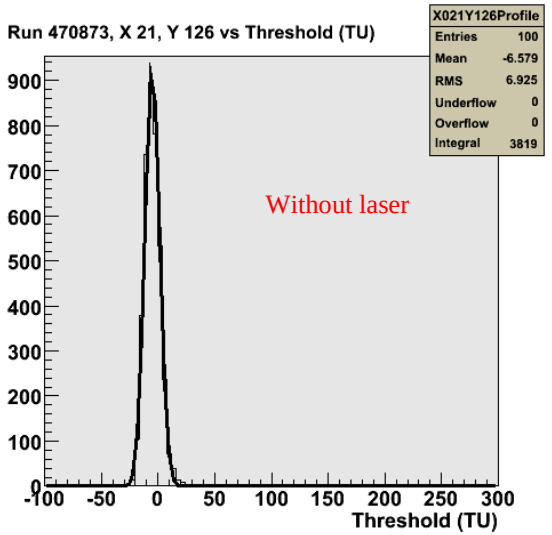
Various sensor test results

Paul Dauncey

Working point

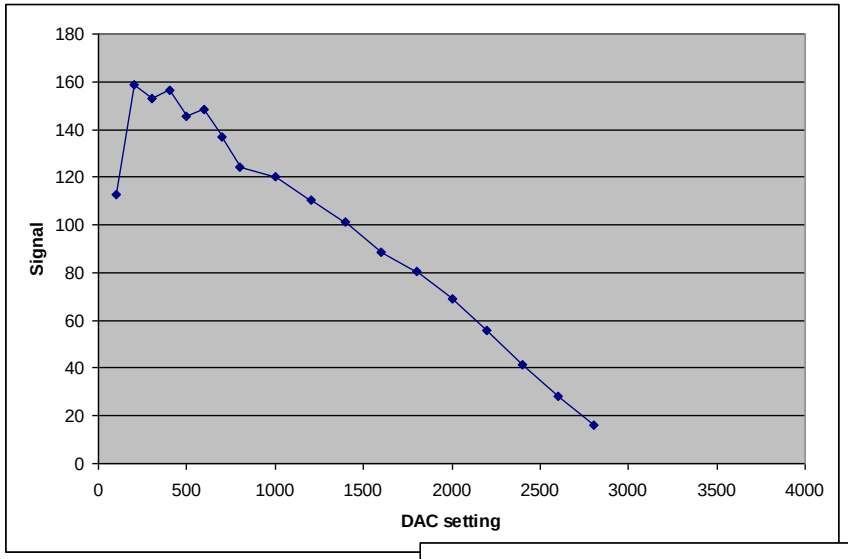
- Jamie determined working point of the bias DACs from simulation
- Should check these explicitly
  - Use laser to measure signal from threshold scan
  - Use threshold scan without laser to determine noise
  - Take ratio as figure of merit
  - Can only do one pixel at a time as uses laser

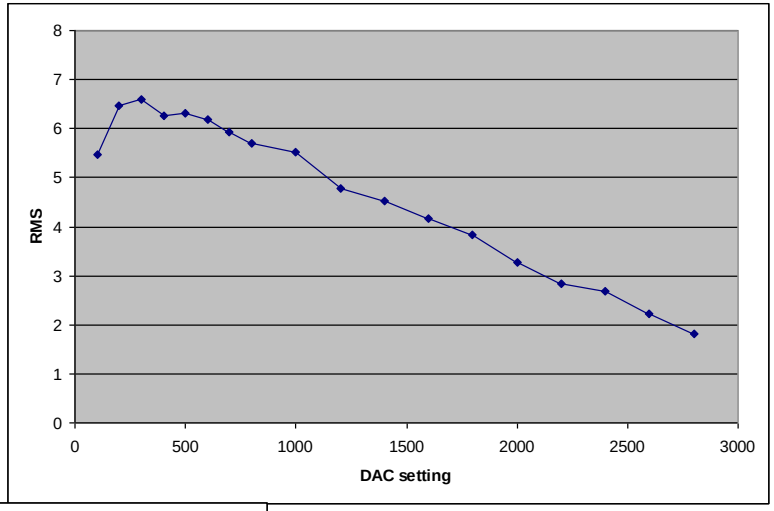


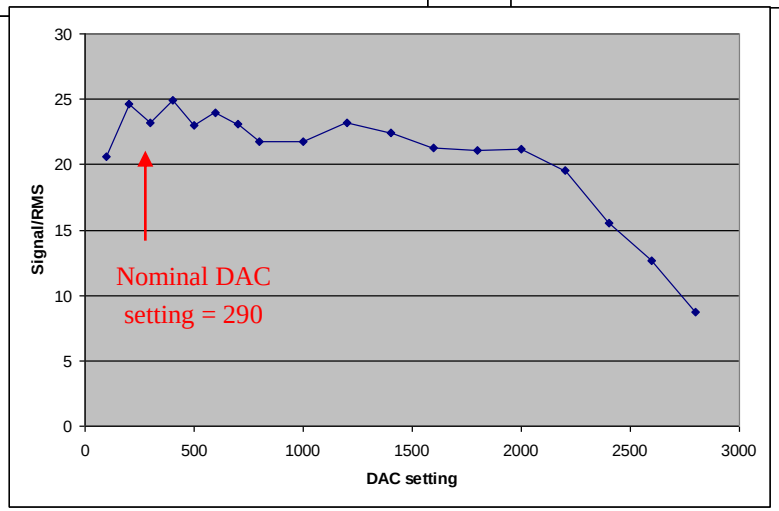


i12PreAmpBias

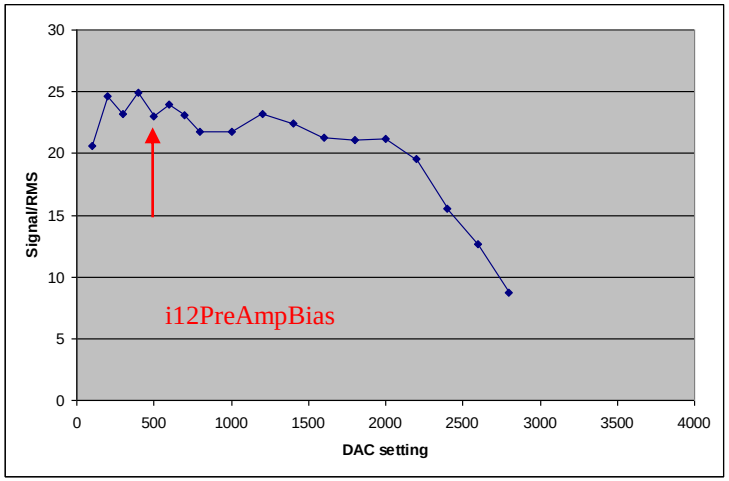
- Example of one of the DAC biases

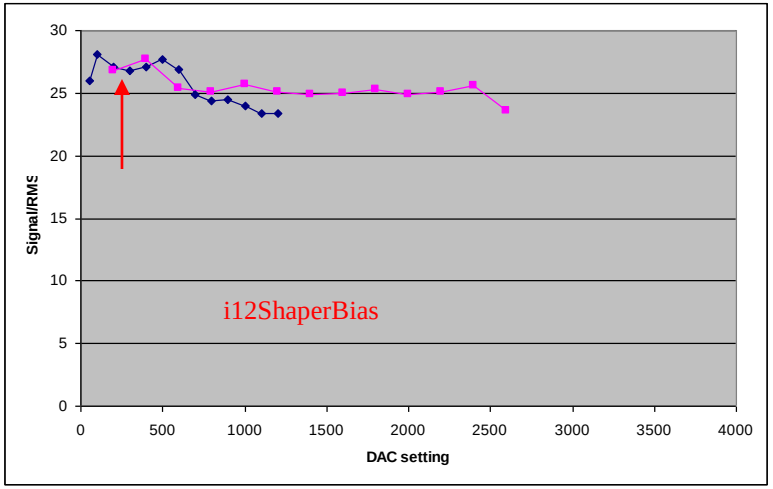


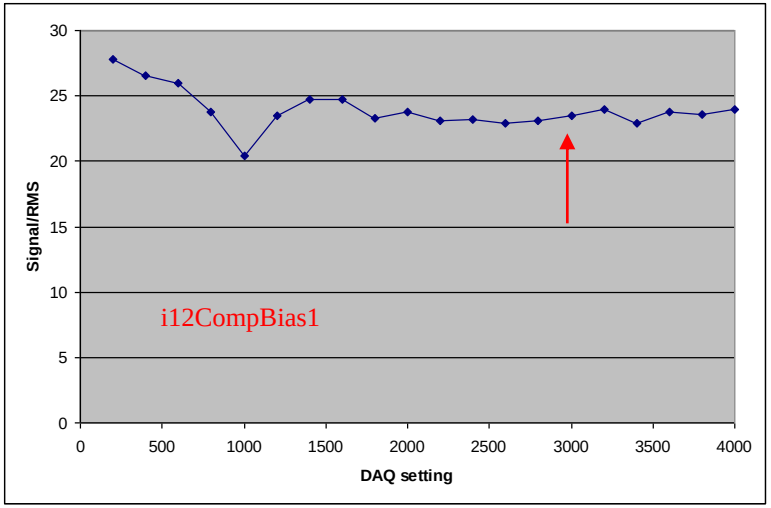


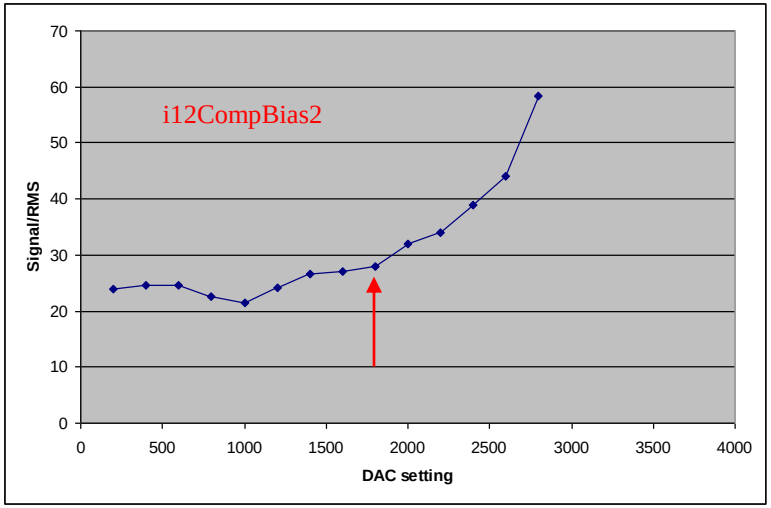


Full set of biases; part I

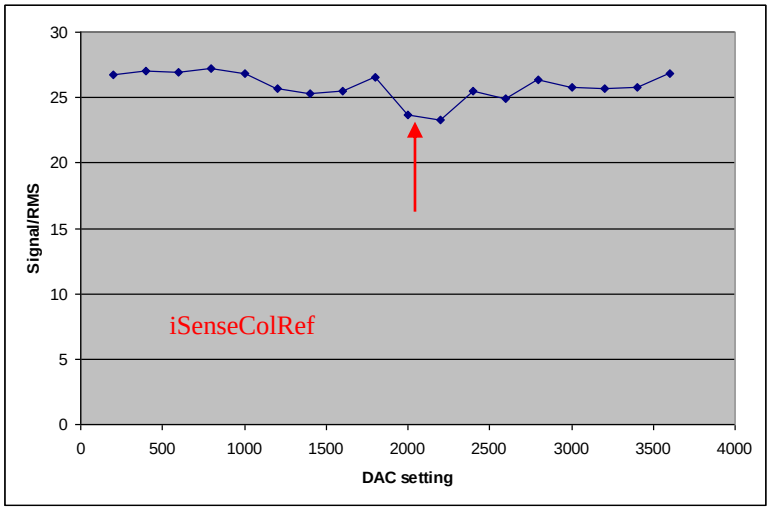


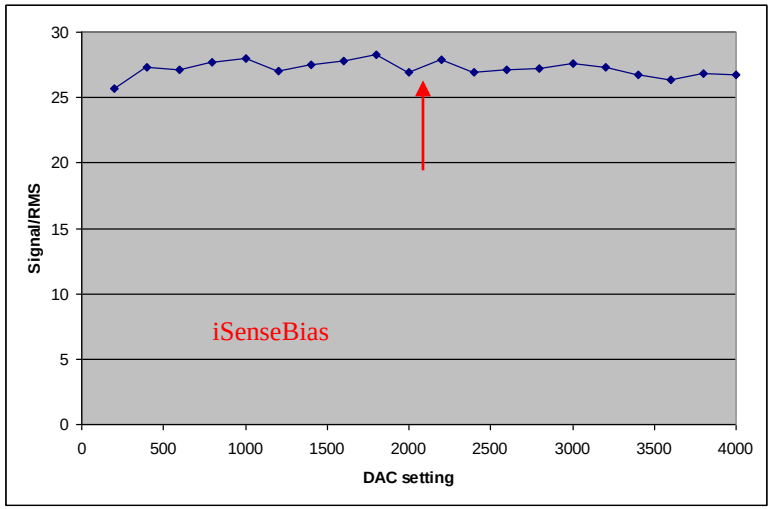


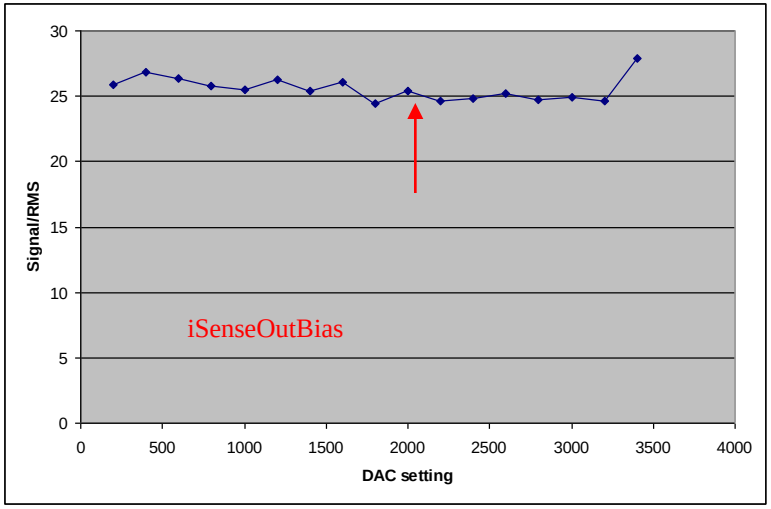


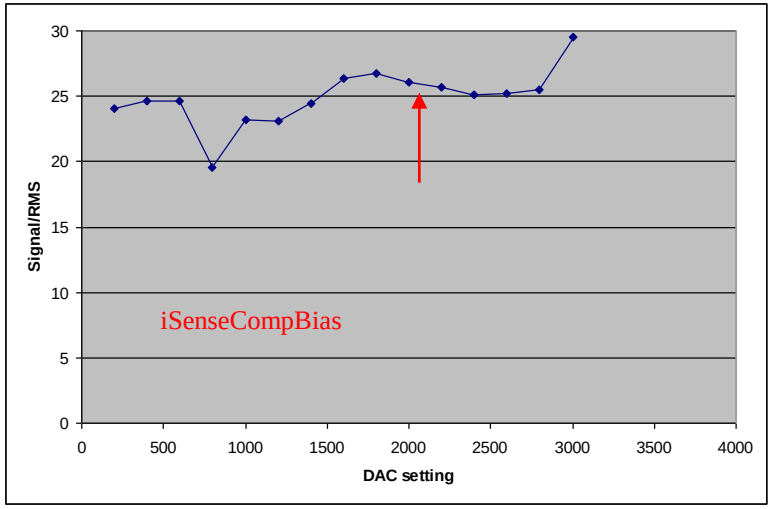


Part II

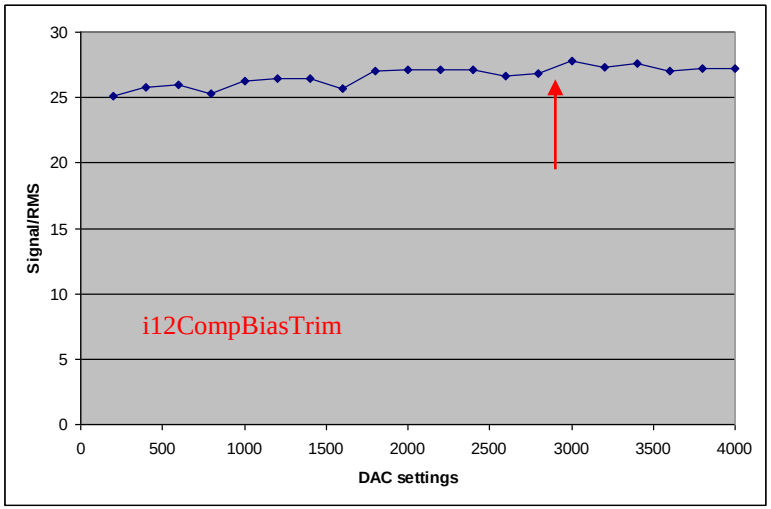

Signal/RMS
DAC setting
iSenseColRef

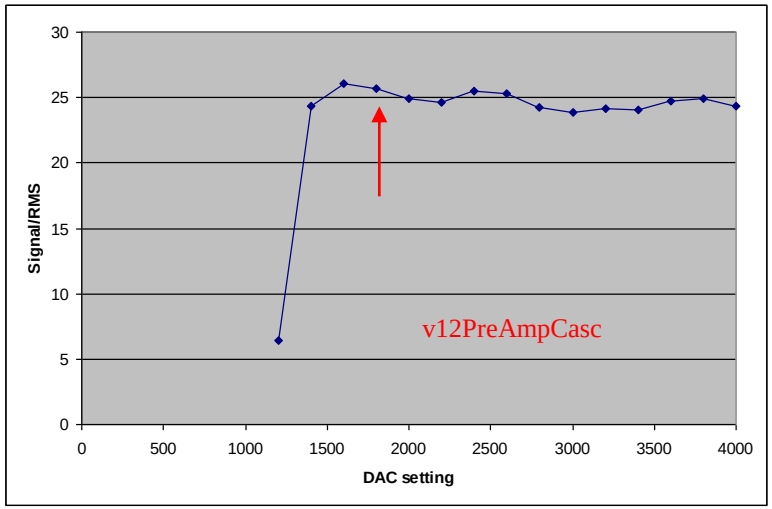

Signal/RMS
DAC setting
iSenseBias

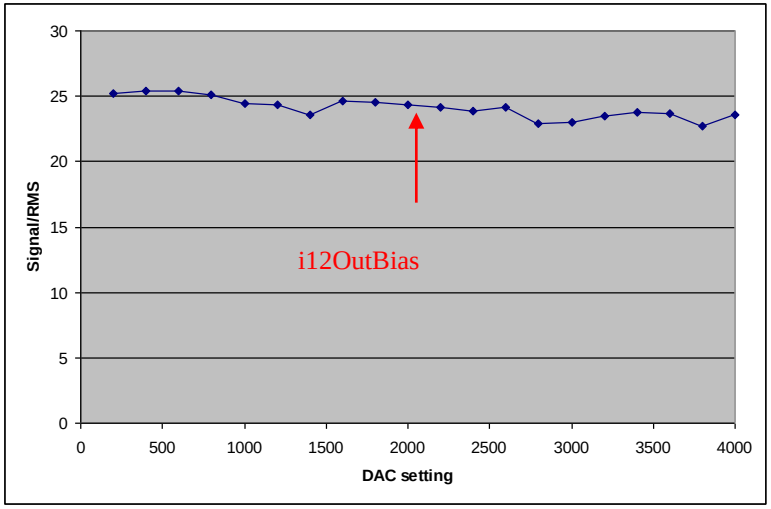

Signal/RMS
DAC setting
iSenseOutBias

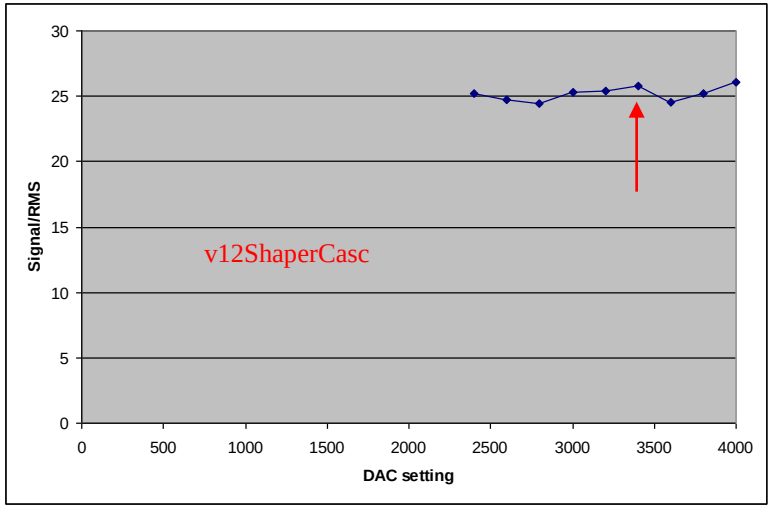

Signal/RMS
DAC setting
iSenseCompBias

Part III


Signal/RMS
DAC settings
i12CompBiasTrim

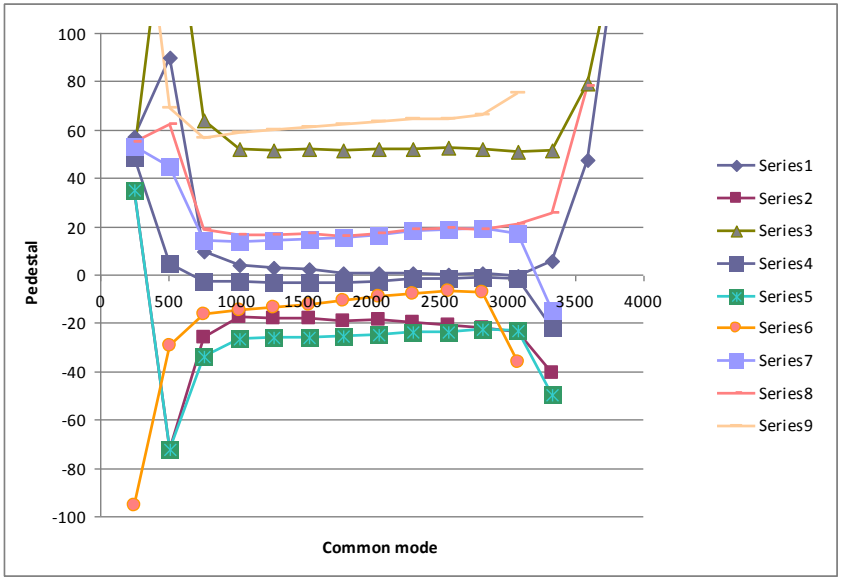

Signal/RMS
DAC setting
v12PreAmpCasc

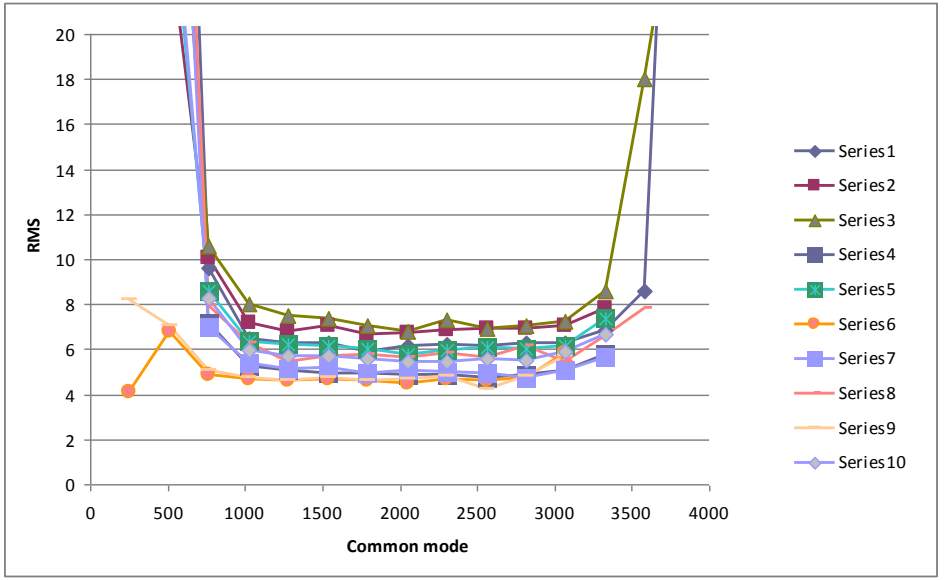

Signal/RMS
DAC setting
i12OutBias


Signal/RMS
DAC setting
v12ShaperCasc

Threshold common mode

- Dependence of pedestal and noise on common mode setting
  - Checked for ten different pixels

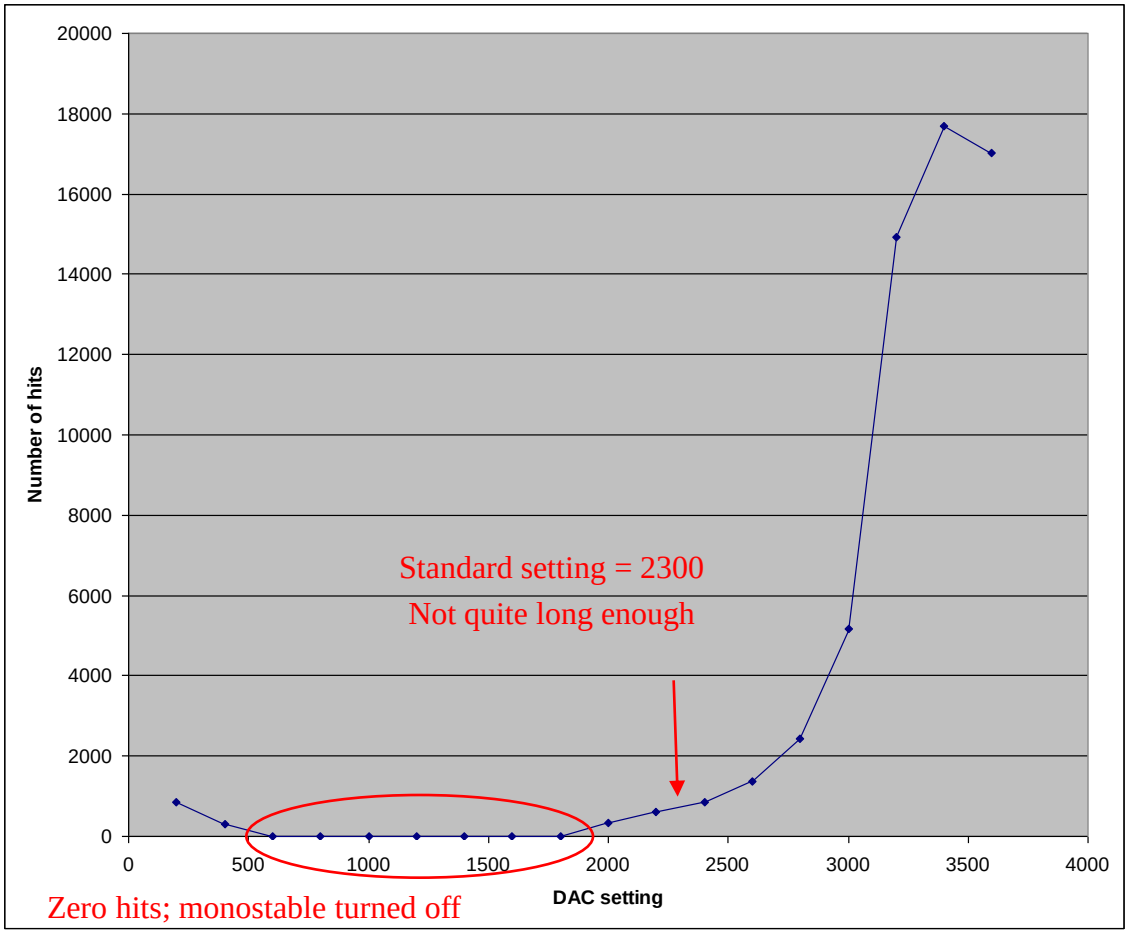




- Wide sweet-spot in the middle; should stay in this region

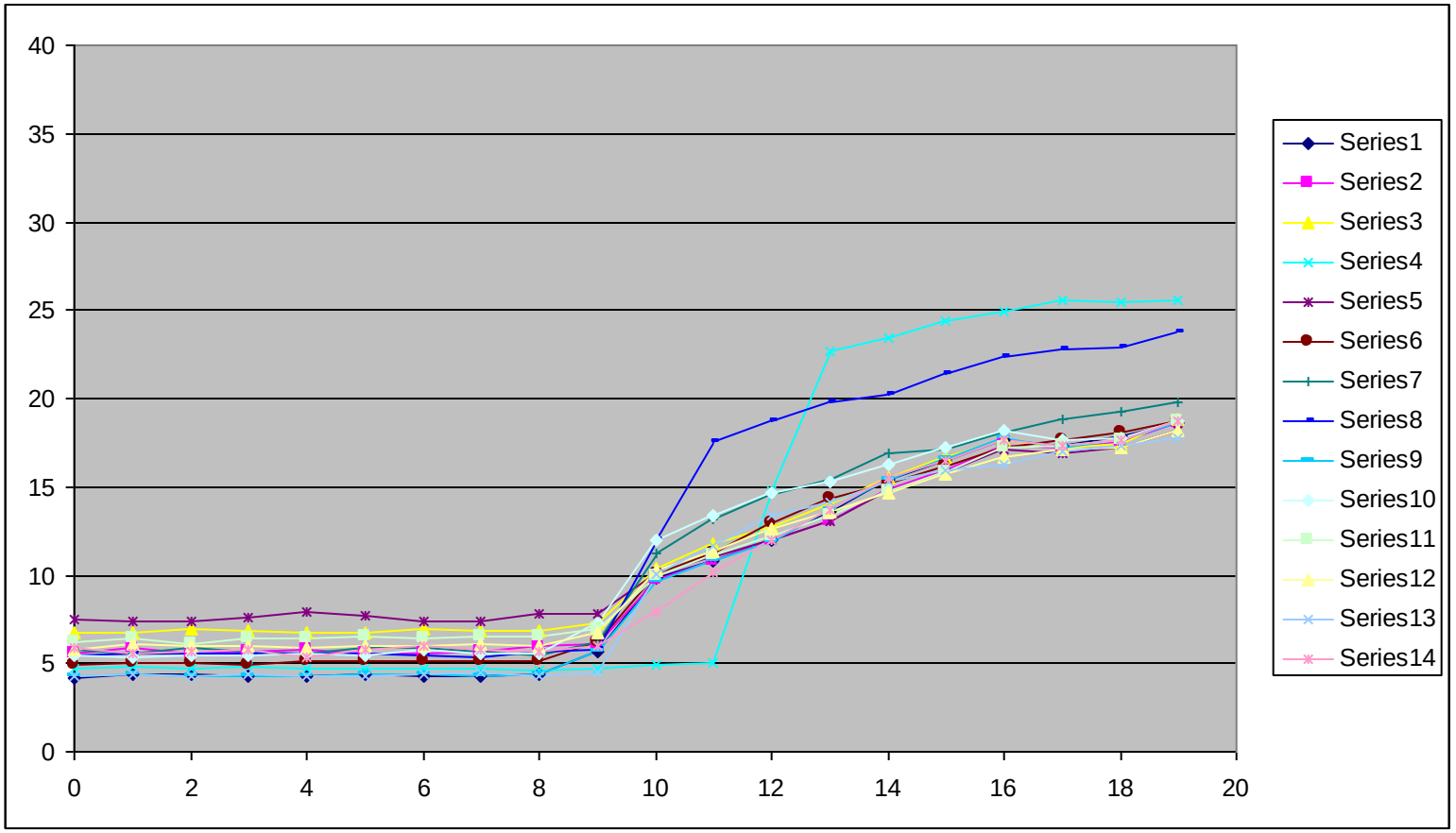
Monostables

- Dependence of number of hits on monostable length
  - 1000 bunch trains so average must be > 1000 for full efficiency



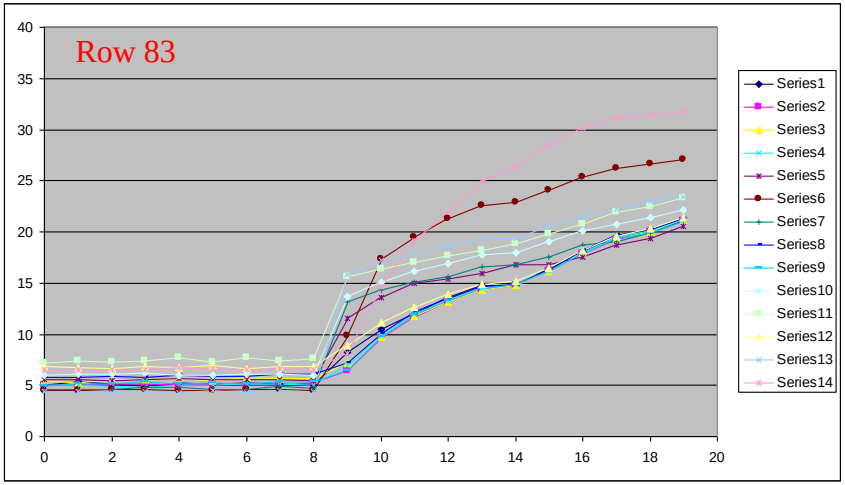
Crosstalk

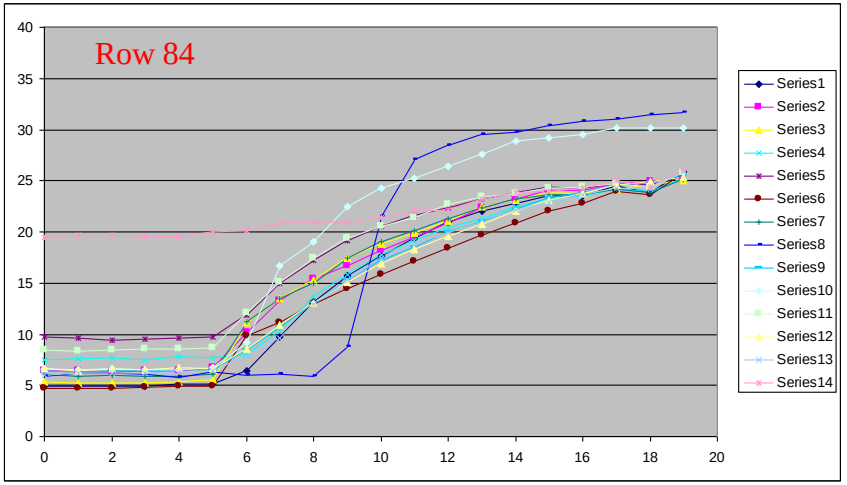
- Crosstalk depends on number of unmasked pixels
  - Reported by Jamie at FDR

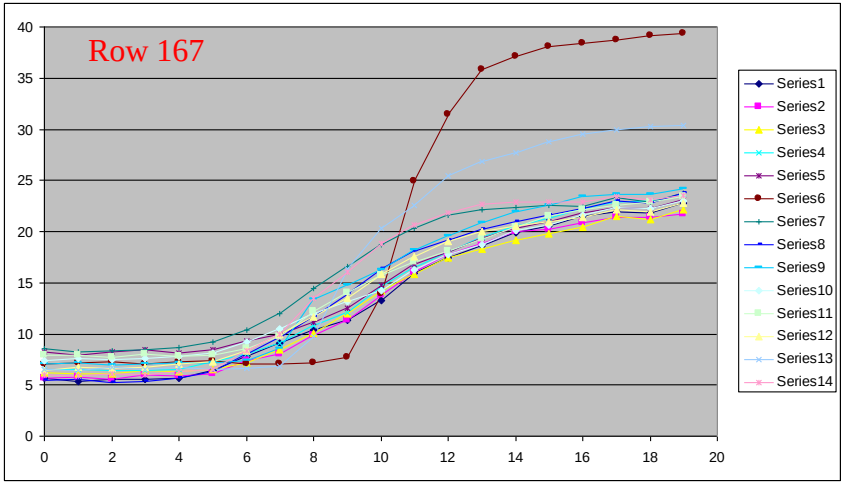


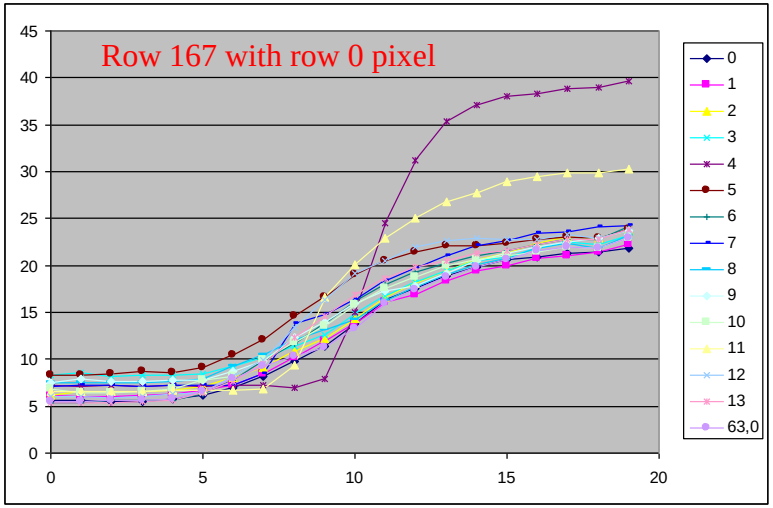
Number of extra region 1 rows (= 42 pixels) enabled beyond region 1, row 0

Independent of location or proximity





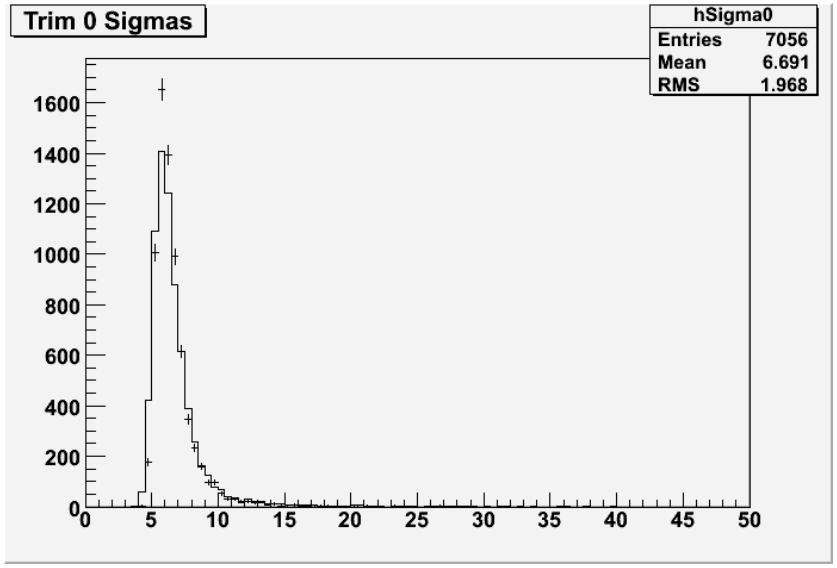


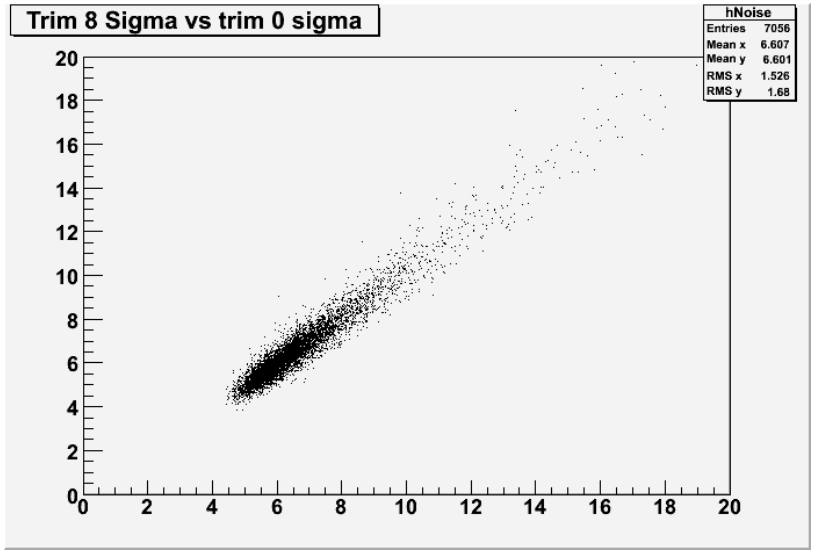


Source setup

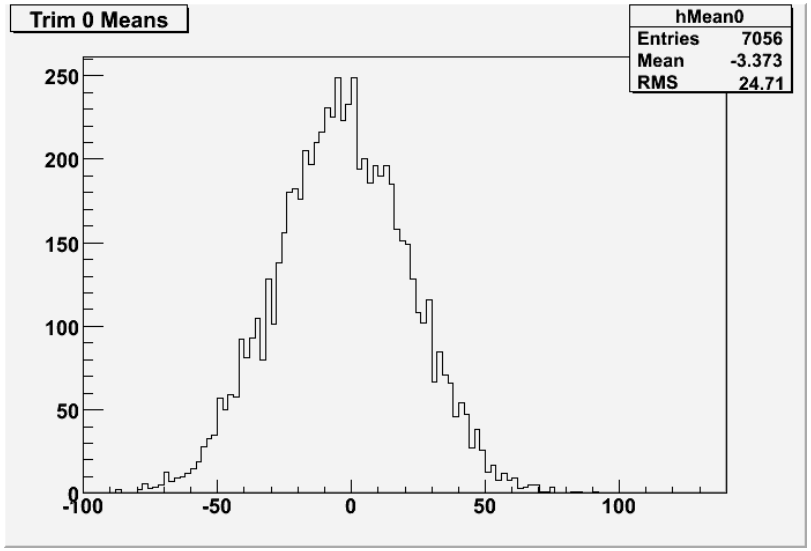
- Setting up second teststand at Imperial
  - Source tests in parallel with laser
- Need to trim sensor before running with source
  - Want to get lowest threshold without too much noise
- Threshold scan whole sensor in groups of 4 42 groups
  - One per region; below level of crosstalk
- Repeat with various trims

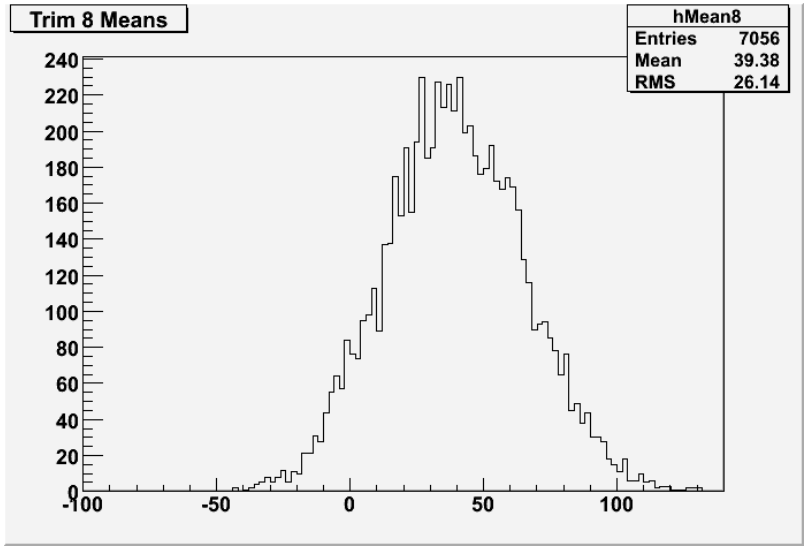
Sensor #10



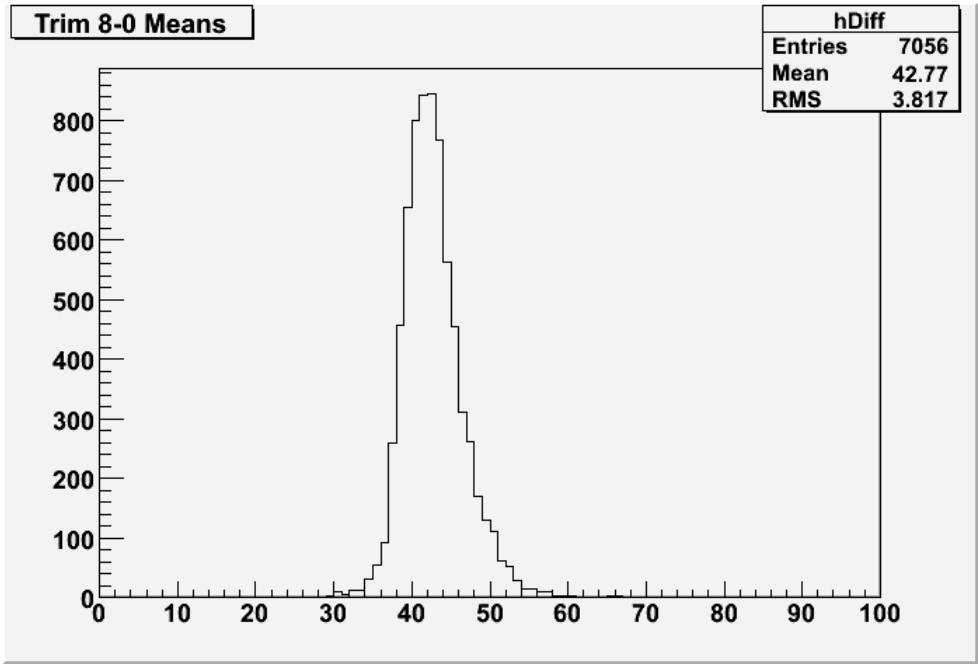


Trim range





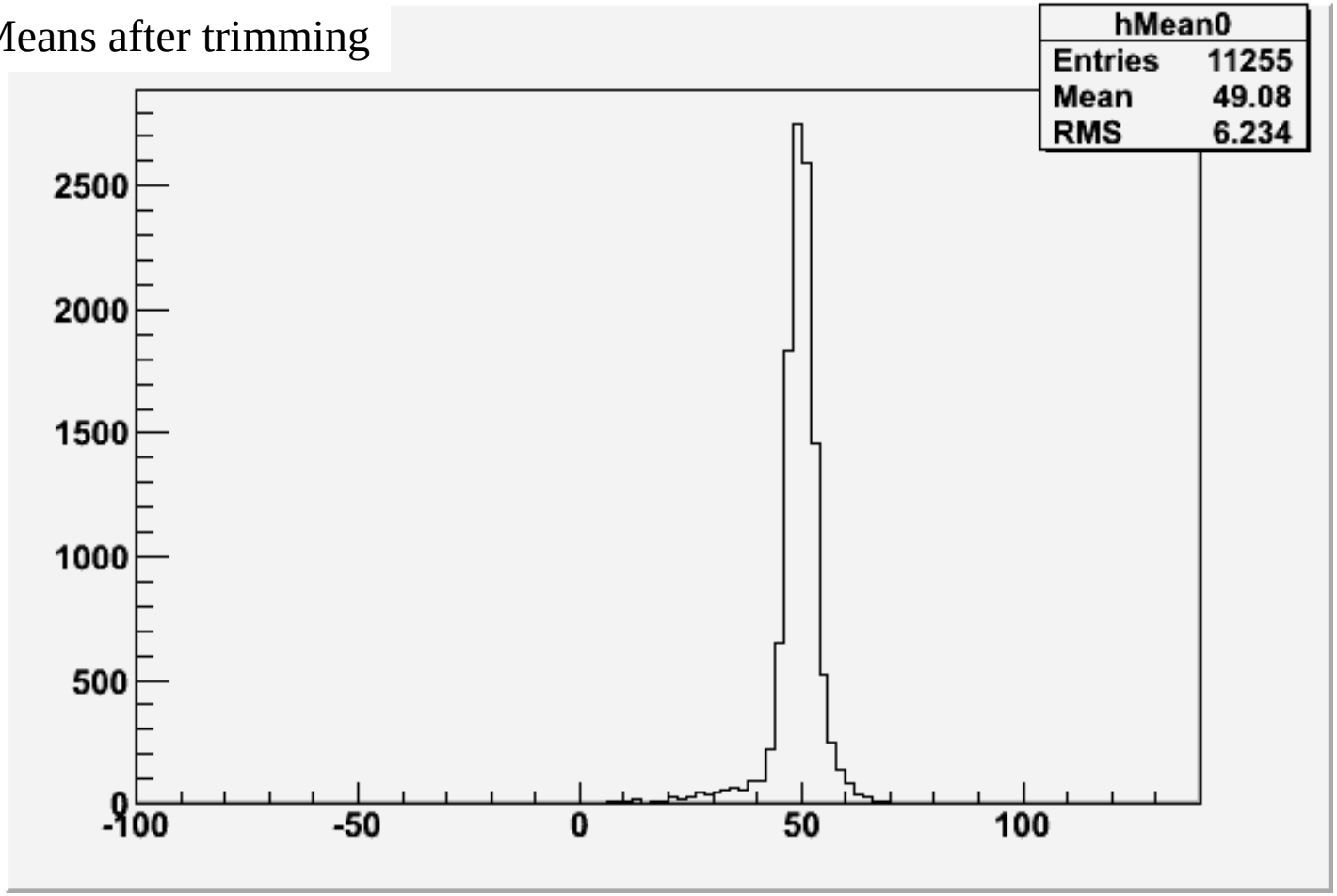
- Trim 0 to trim 8 shifts by ~40 TU
  - Full range ~80TU
  - But spread is more like ~100 TU
  - Needed to compromise on tails



Trim range

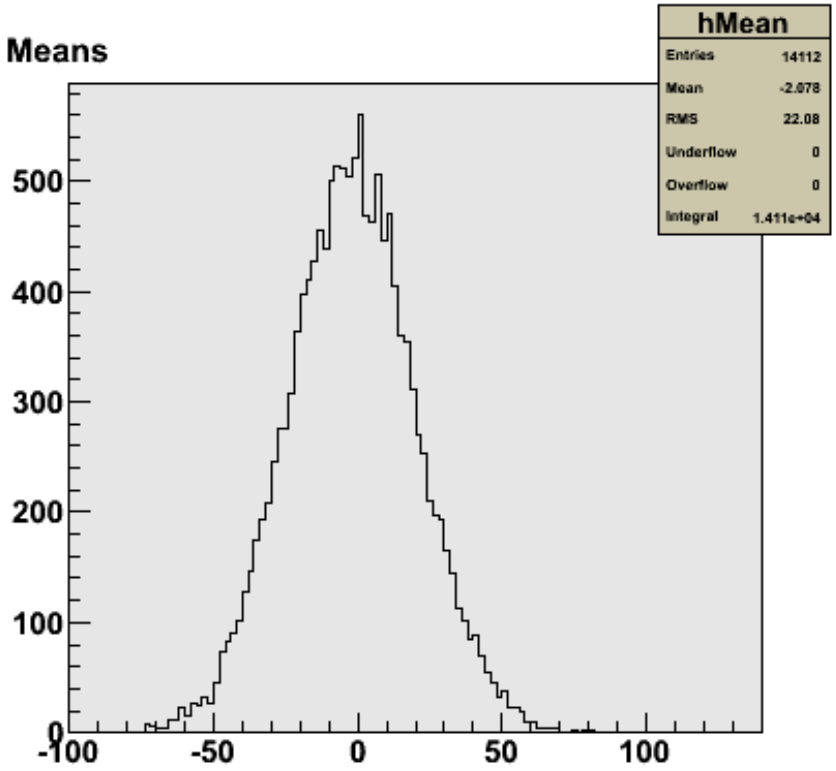
- Final distribution of shaper pedestals
- Be useful to compare with method with Owen's

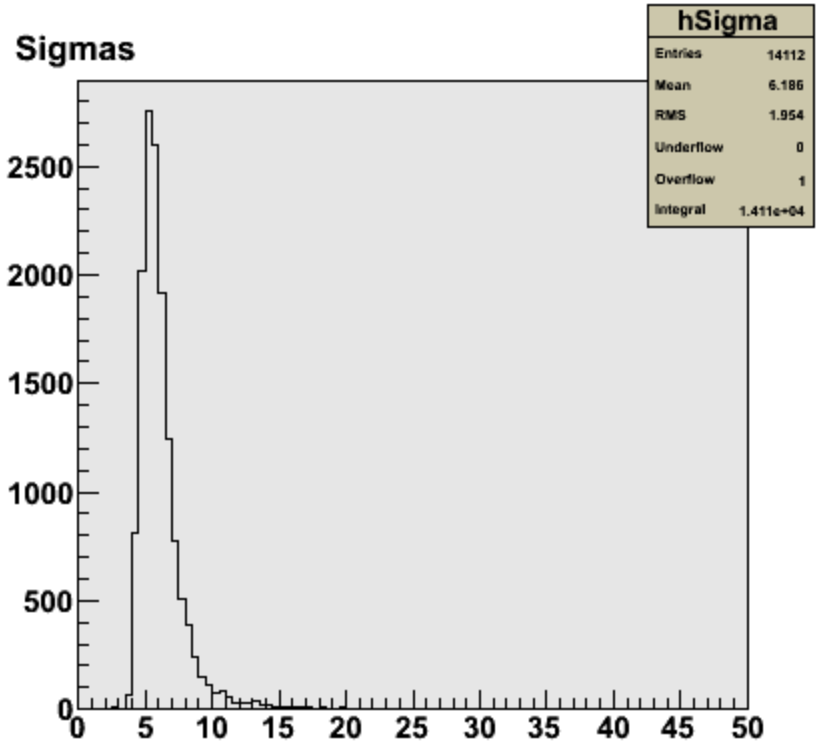
Means after trimming



Beam test revisited

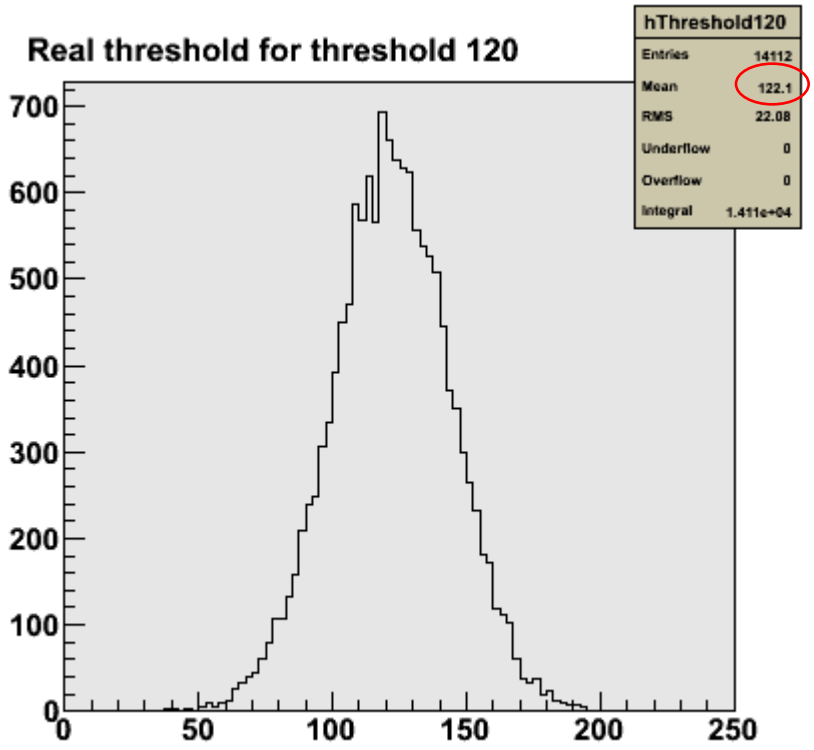
- Use same technique to measure pedestals of sensor #7
  - One of the four used in the beam test stack
  - "Borrowed" Birmingham system before cosmics started
  - Did not adjust trims; beam data were all at trim=0

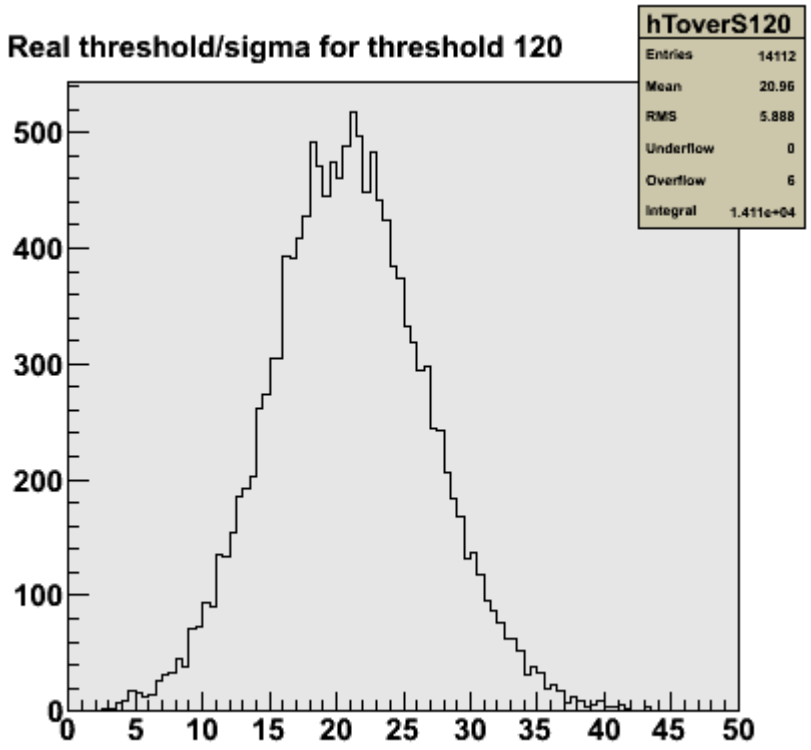




Beam test real threshold

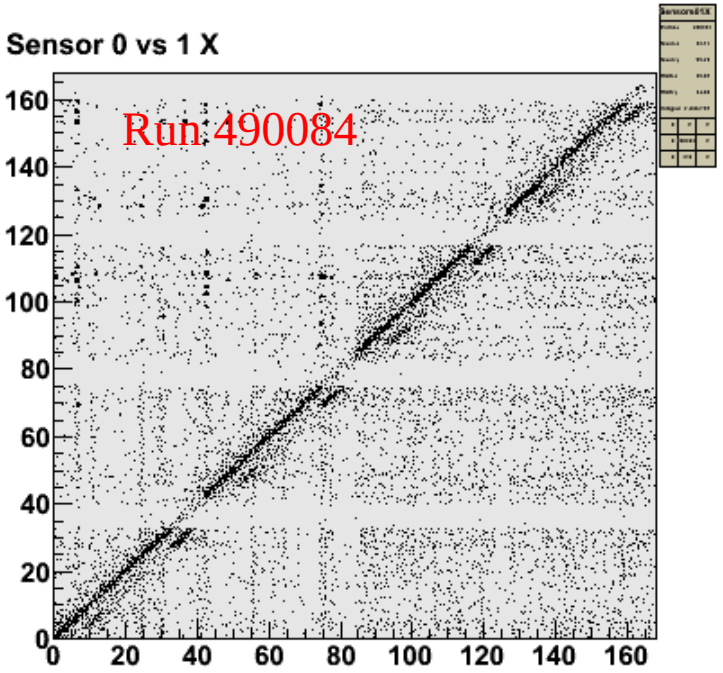
- Subtracting pedestal from general threshold gives “real” threshold setting per pixel
  - Assumes sensor #7 is unchanged since Dec

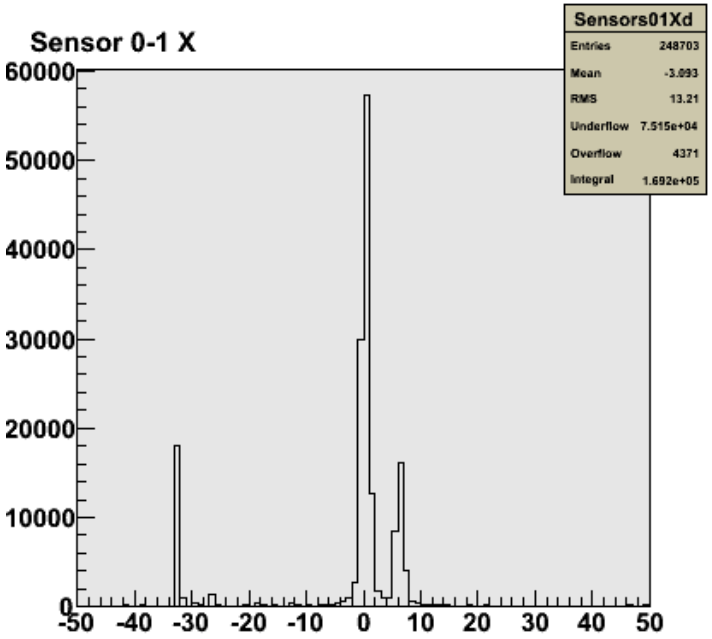




Identifying real hits from tracks

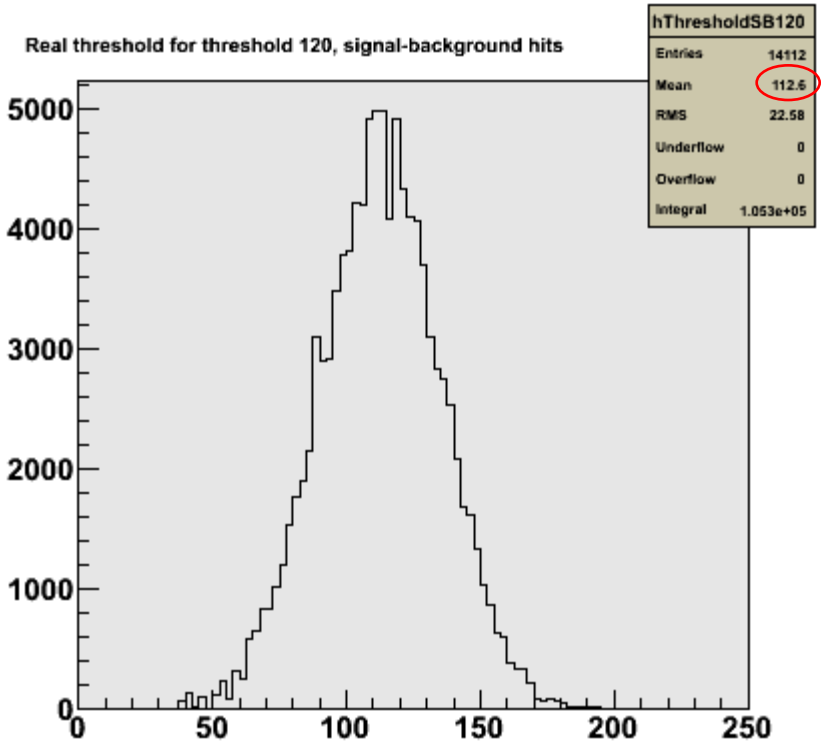
- Use simple x/y correlations, not full track reconstruction
  - Minimal alignment added for convenience
- Any hit matched in x 2, y 2 and t 0 to another layer is counted as real
  - Noise hits counted by matching in x, y and t−10

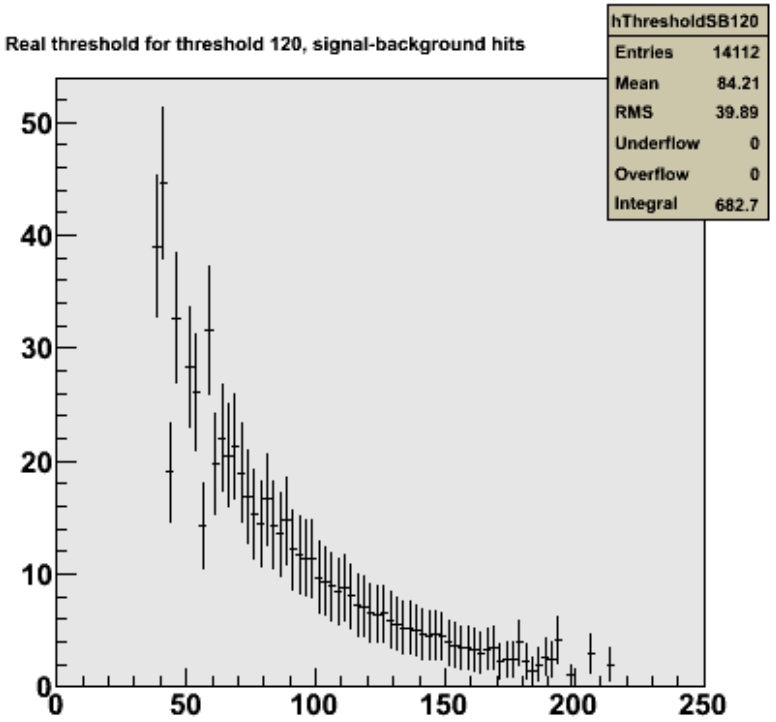




Real threshold of track hits

- Plot number of hits per pixel vs real threshold
- Dividing by original distribution gives relative efficiency
  - Assuming no correlation between real threshold and position, as shown by Owen

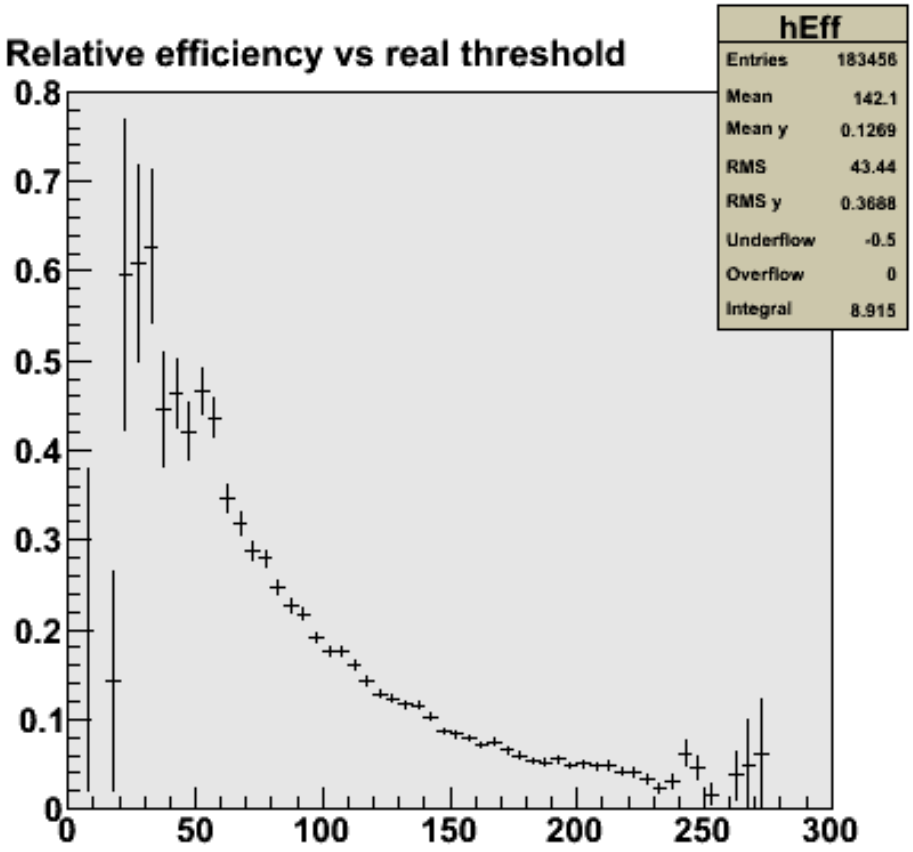




Using threshold scan

- Use other threshold values to extend range
  - Different amount of data; divide threshold of 120 by factor 41 to get correct normalisation

- Take weighted average per real threshold
- Only gives relative efficiency; absolute normalisation would need quite a bit more work...



Conclusions

- Working point is pretty optimal
  - Although should consider what to do with i12CompBias2
- Threshold common mode at 3072 is on the edge
  - Better to use the original 2048
- Monostable output is a bit short
  - Increase to 2600 for this channel studied
- Crosstalk kicks in with ~200-300 pixels enabled
  - Enabling less at a time allows whole sensor to be measured
- Relative efficiency from beam test looks measurable
  - Worth putting in more effort on this
  - Other sensors could be measured also