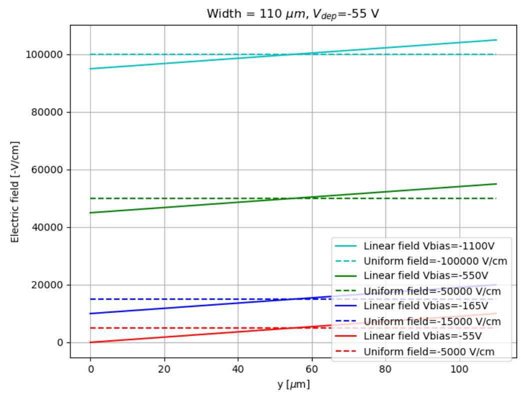
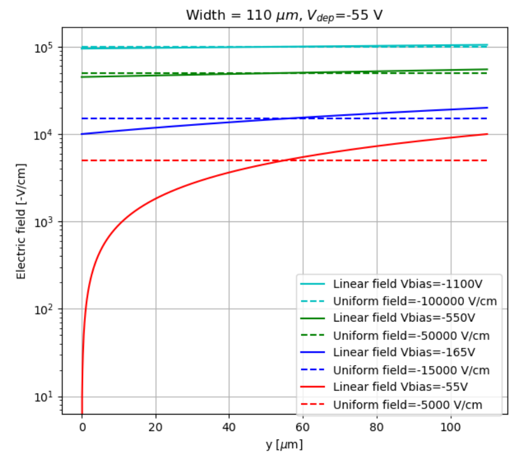
1 Timing studies of silicon detectors

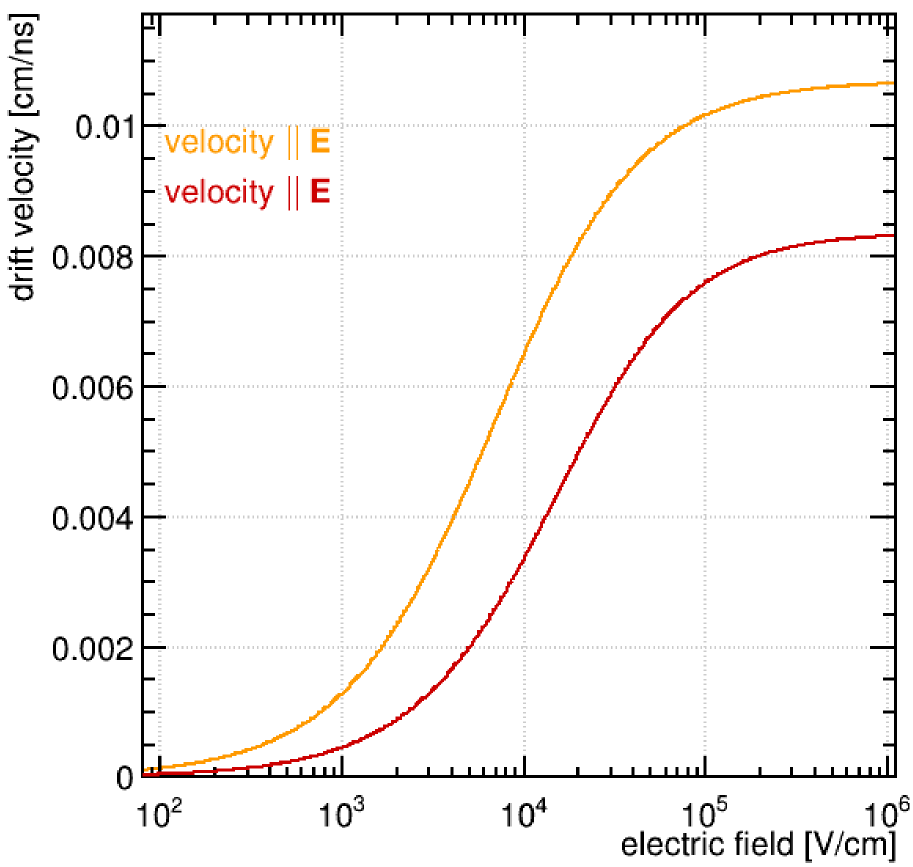
This document presents data from garfield++ simulations to study timing properties of silicon detectorsHere are data from one electron hole pair What can be seen in this document is that document presents data from garfield++ simulations to study timing properties of silicon detectors

2 Fields used



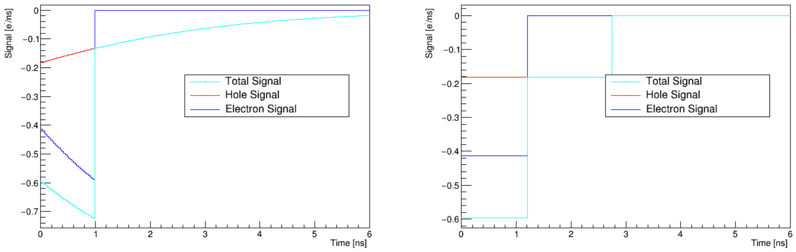


3 Drift velocity



4 Pulses (linear uniform)

4.1 Voltage 55, one pair in gap/2, (linear uniform)



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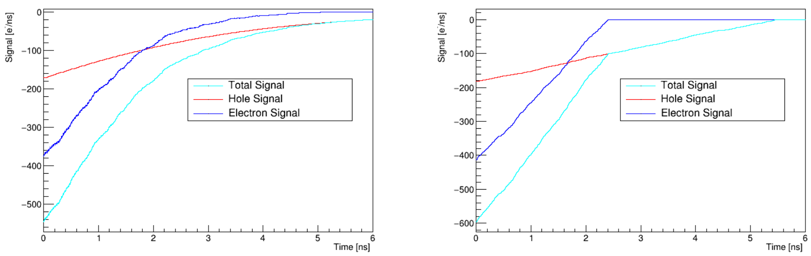
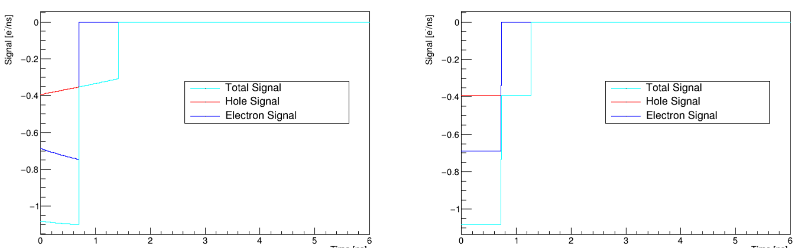
4.2 Many electron hole pairs along track (linear uniform)

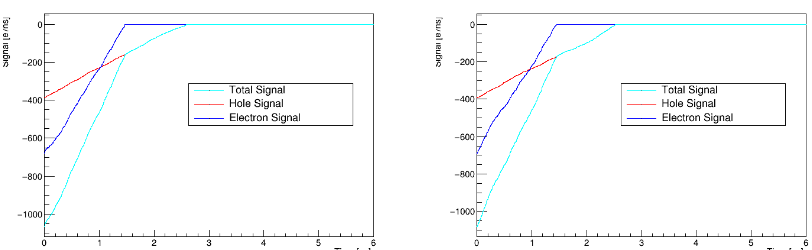


4.3 Voltage 165, one pair in gap/2, (linear uniform)

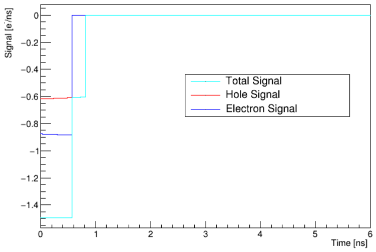


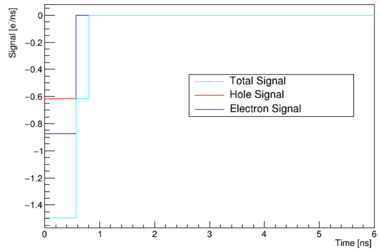
c

4.4 Many electron hole pairs along track (linear uniform)



4.5 Voltage 550, one pair in gap/2, (linear uniform)





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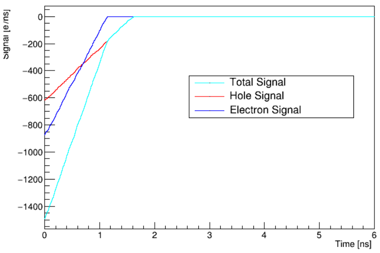
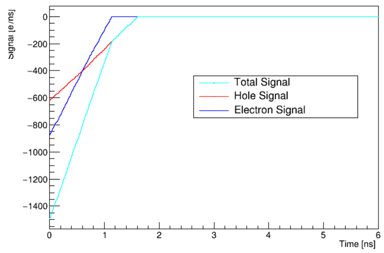
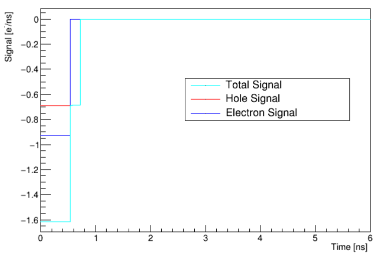
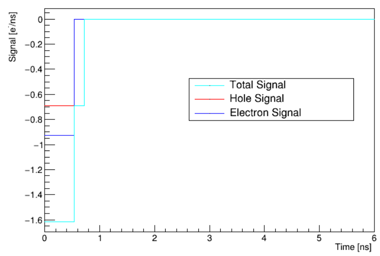
4.6 Many electron hole pairs along track (linear uniform)





4.7 Voltage 1100, one pair in gap/2, (linear uniform)





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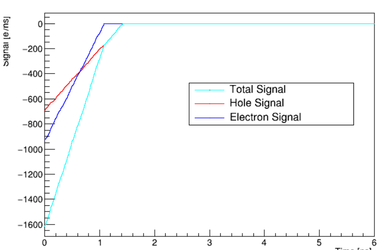
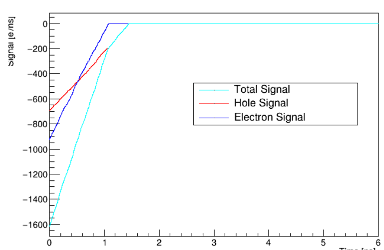
4.8 Many electron hole pairs along track (linear uniform)

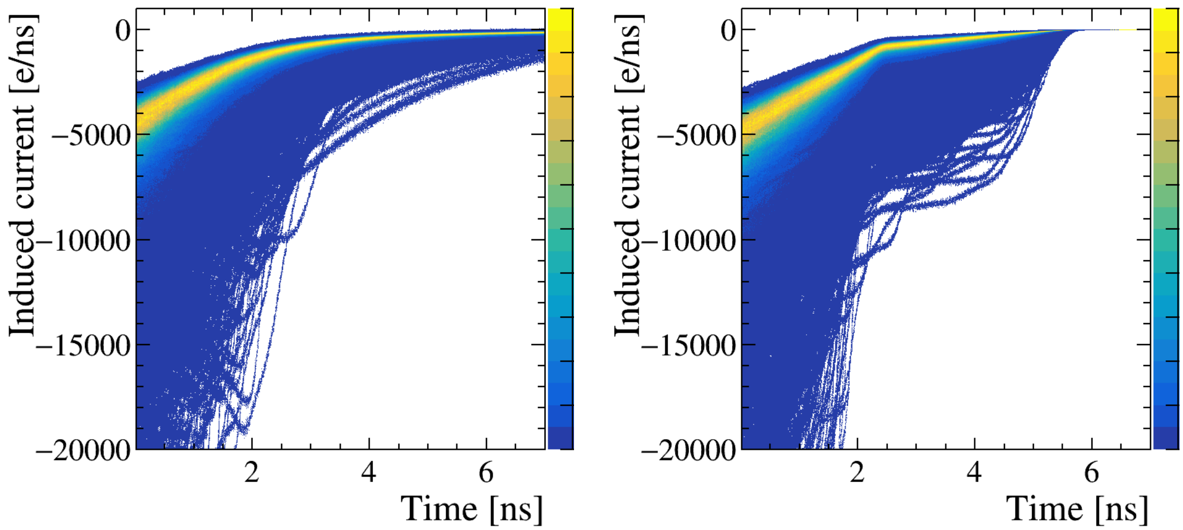




Thepulses from the linear field approaches the uniform field pulses. from 550V they share roughly the same characteristics

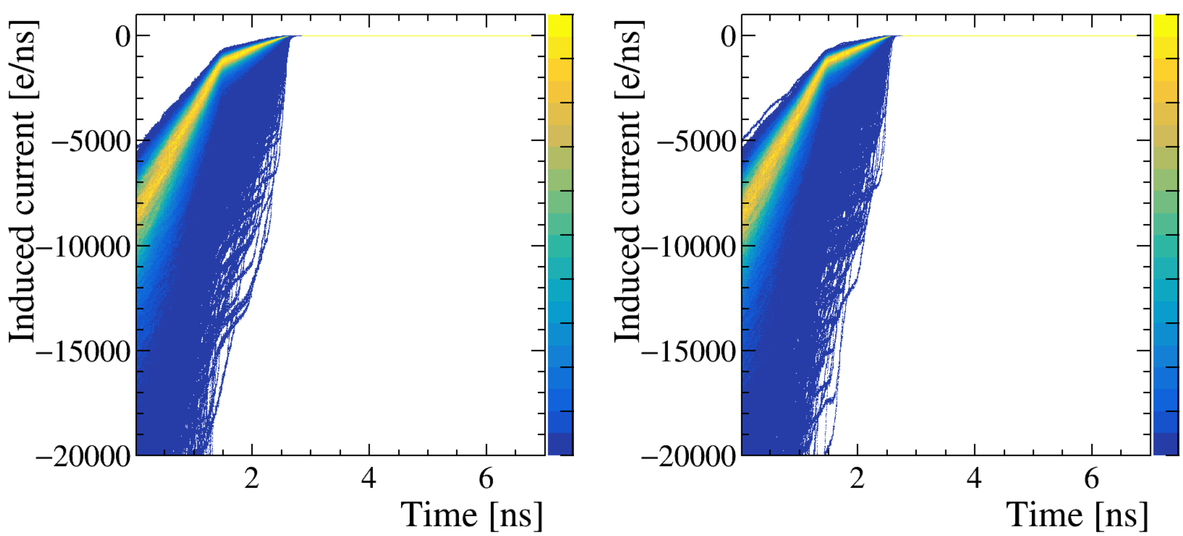
5 Raw pulses of thicknesses 110um, (linear uniform)

5.1 Raw pulses, voltage 55

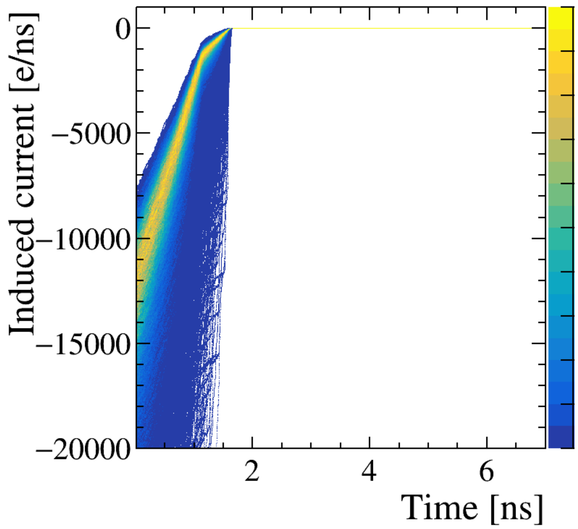


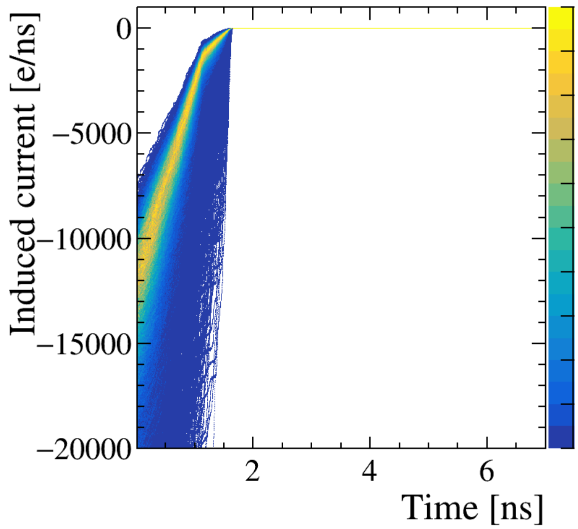
The linear uses long time because the hole speed is so small in the end... it is blurry because of a lot of diffusion

5.2 Raw pulses, voltage 165

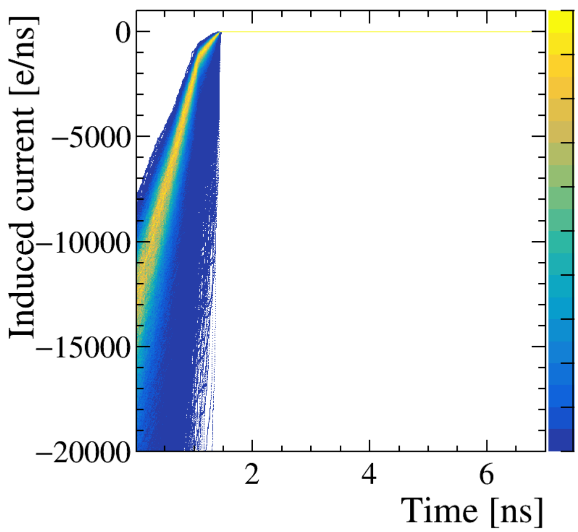


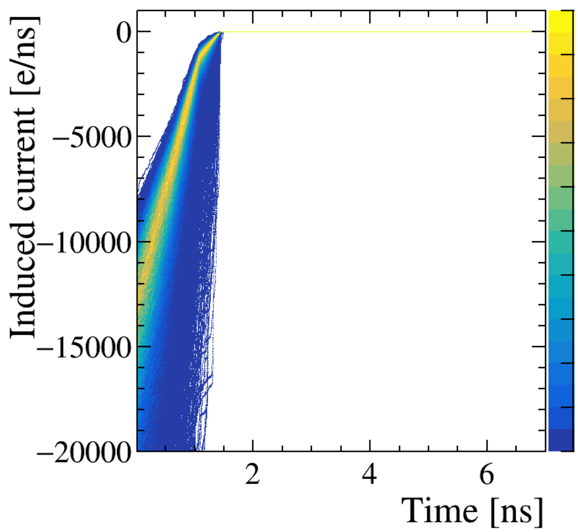
5.3 Raw pulses, voltage 550





5.4 Raw pulses, voltage 1100

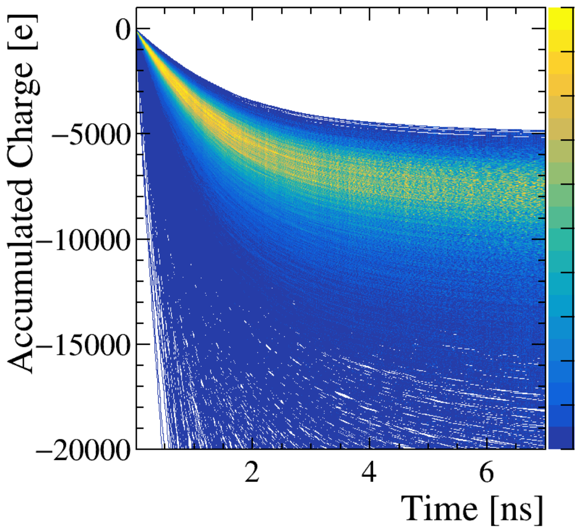


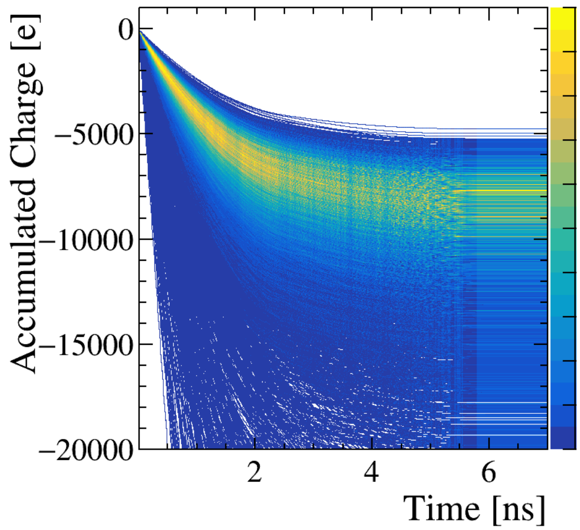


In this section one can observe how the raw pulses changes with linear vs uniform field for different voltages. One expects that when the voltage is at bias voltage that the difference is the biggest. The more applied voltage, the more is an uniform approximation valid. With increased voltage the larger the signal magnitude due to a larger drift velocity...It is roughly the same for the low voltage regime too.

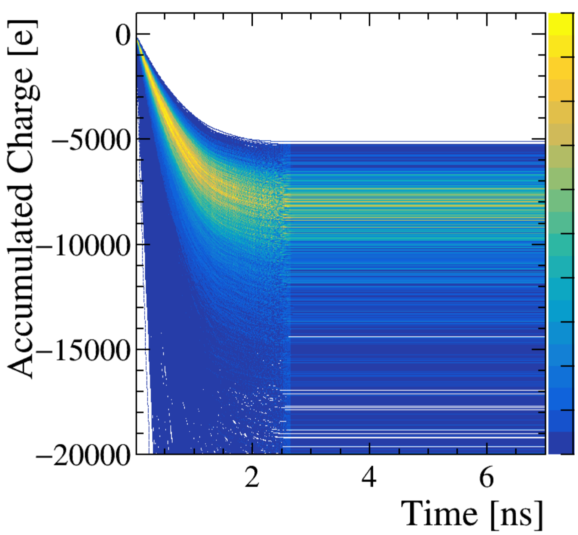
6 Accumulated charge 110um (linear uniform)

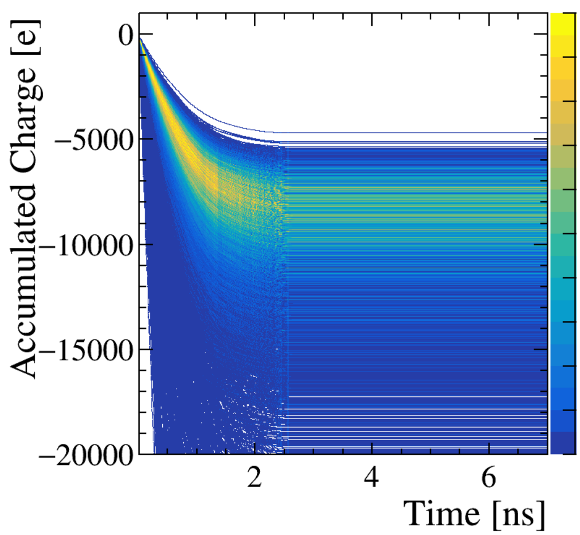
6.1 Accumulated charge biasvoltage 55(linear uniform)



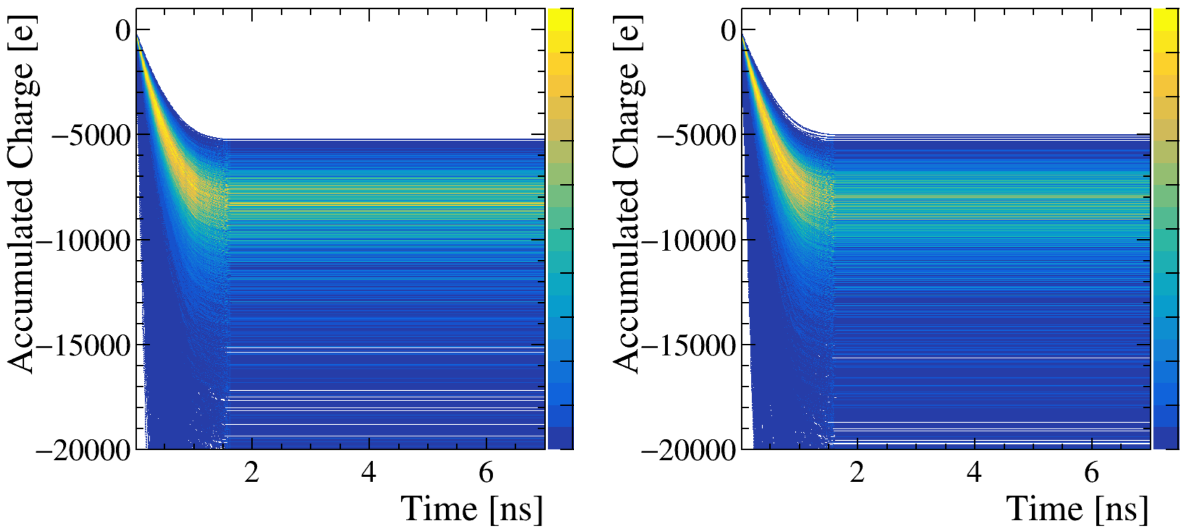


6.2 Accumulated charge biasvoltage 165(linear uniform)

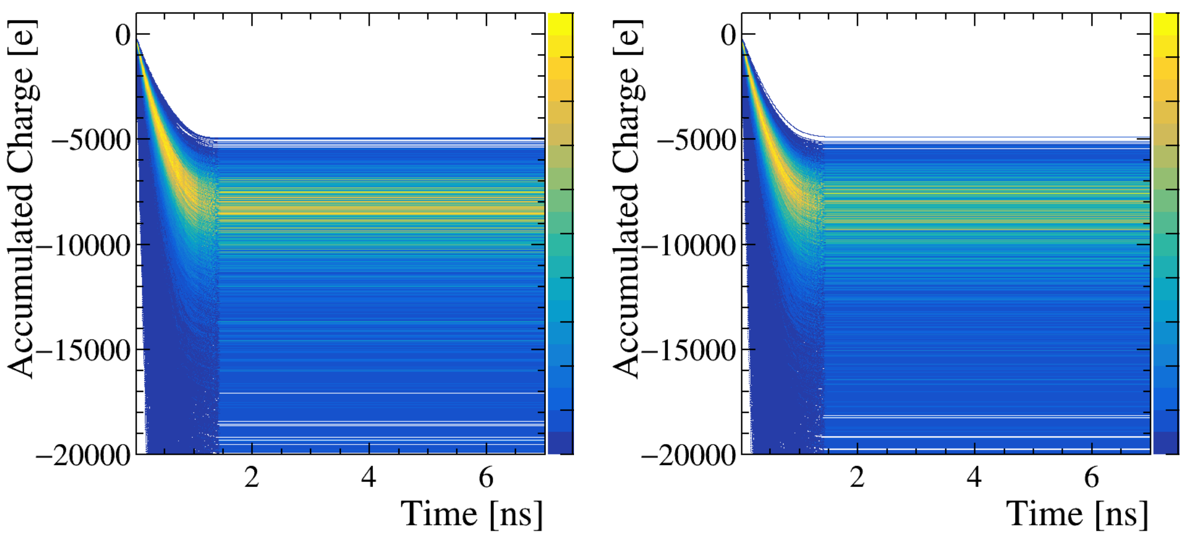




6.3 Accumulated charge biasvoltage 550(linear uniform)



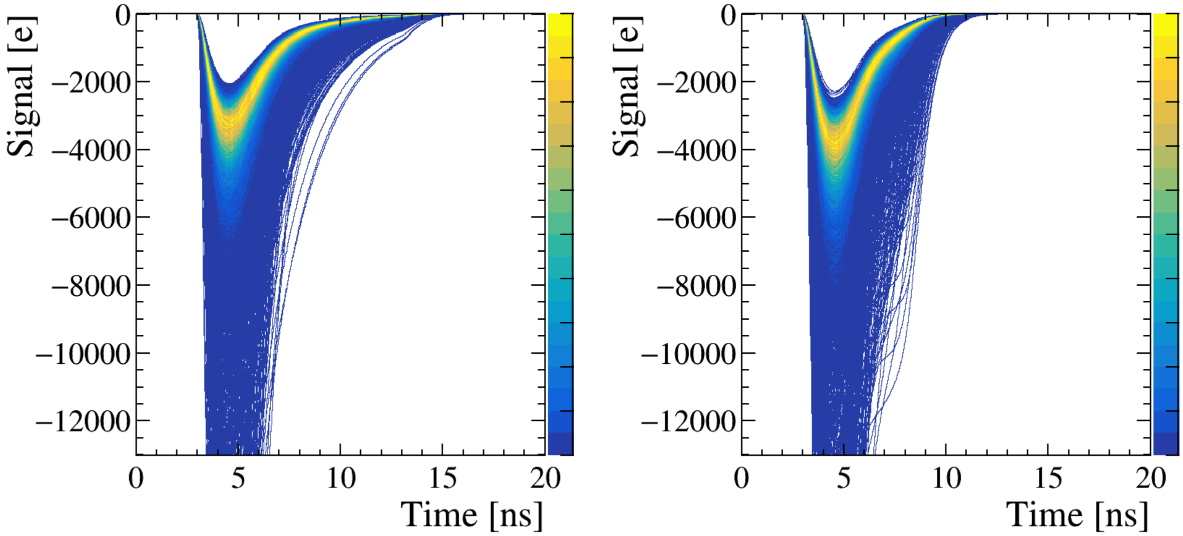
6.4 Accumulated charge biasvoltage 1100(linear uniform)



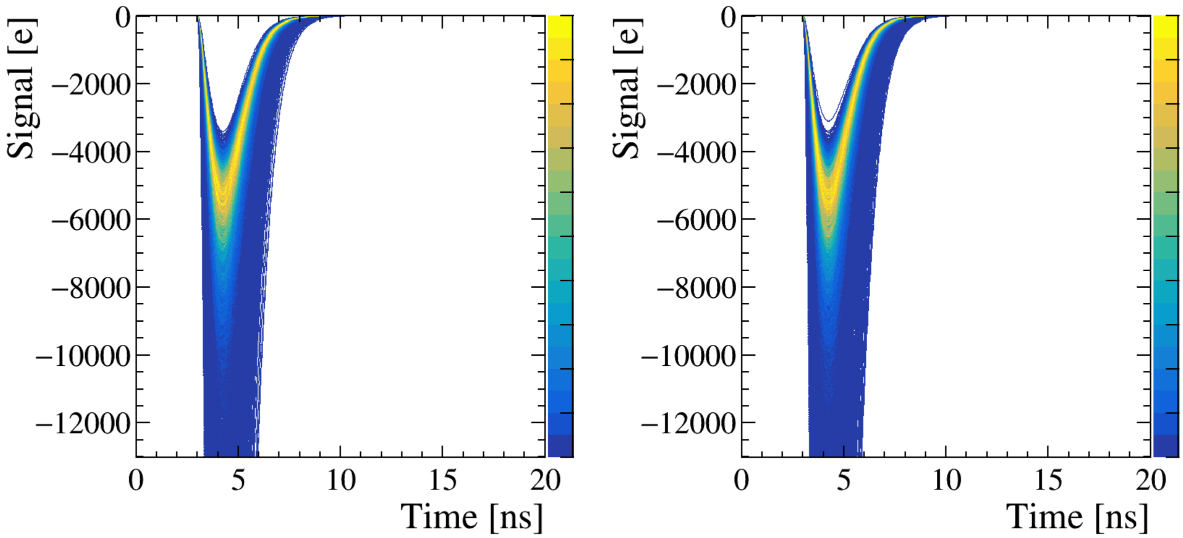
The accumulated charge should in any case be the same. as the same amount of charge that drifts to the electrodes are the same

7 Shaped signal (linear uniform)

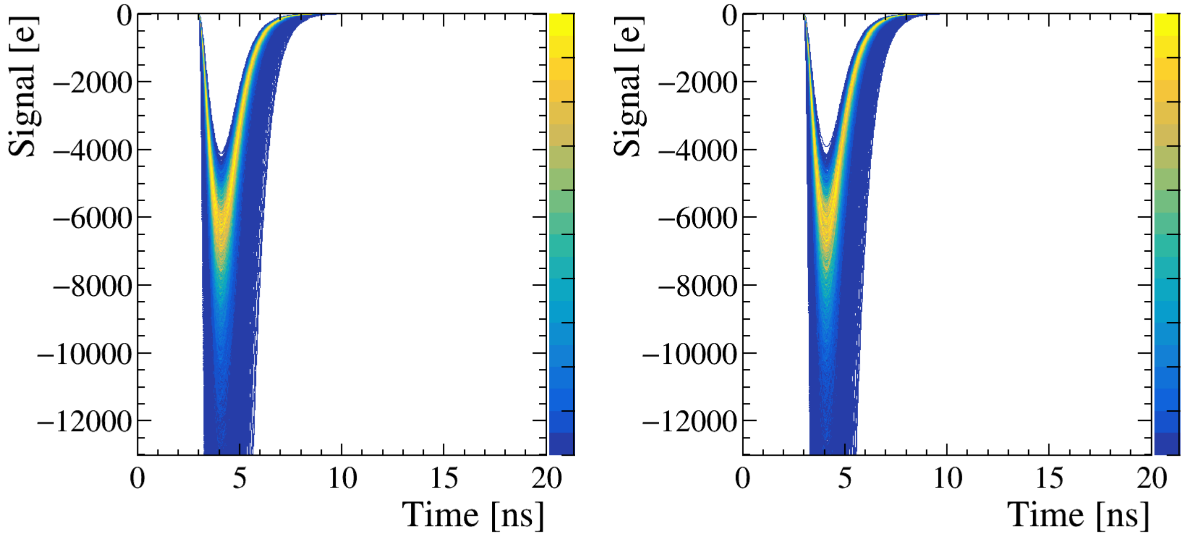
7.1 Shaper *no noise* peak time 500ps vbias55(linear - uniform)



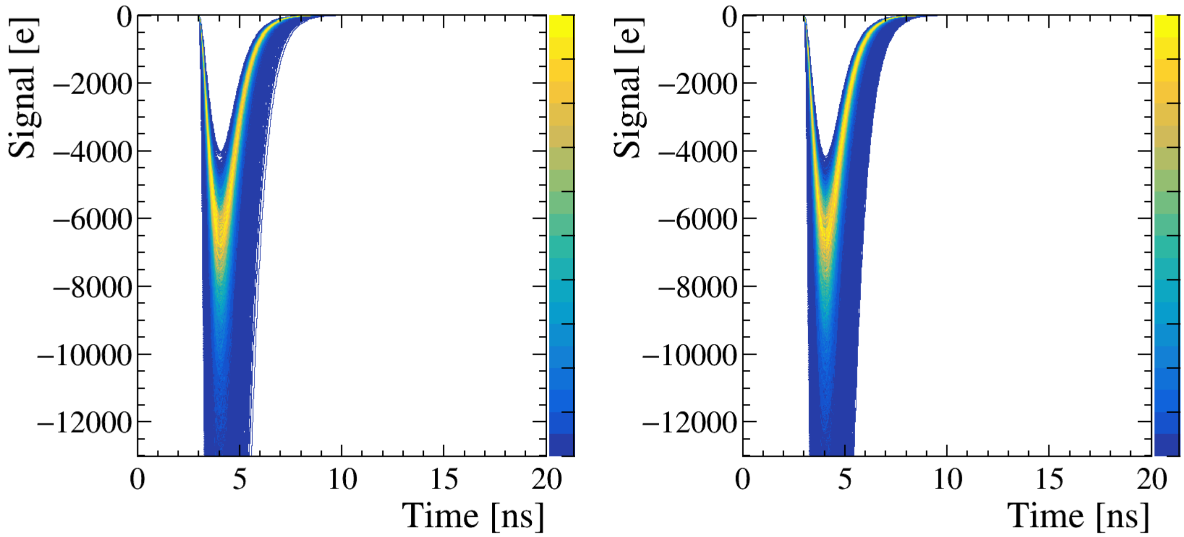
7.2 Shaper *no noise* peak time 500ps vbias165(linear - uniform)



7.3 Shaper *no noise* peak time 500ps vbias550(linear - uniform)

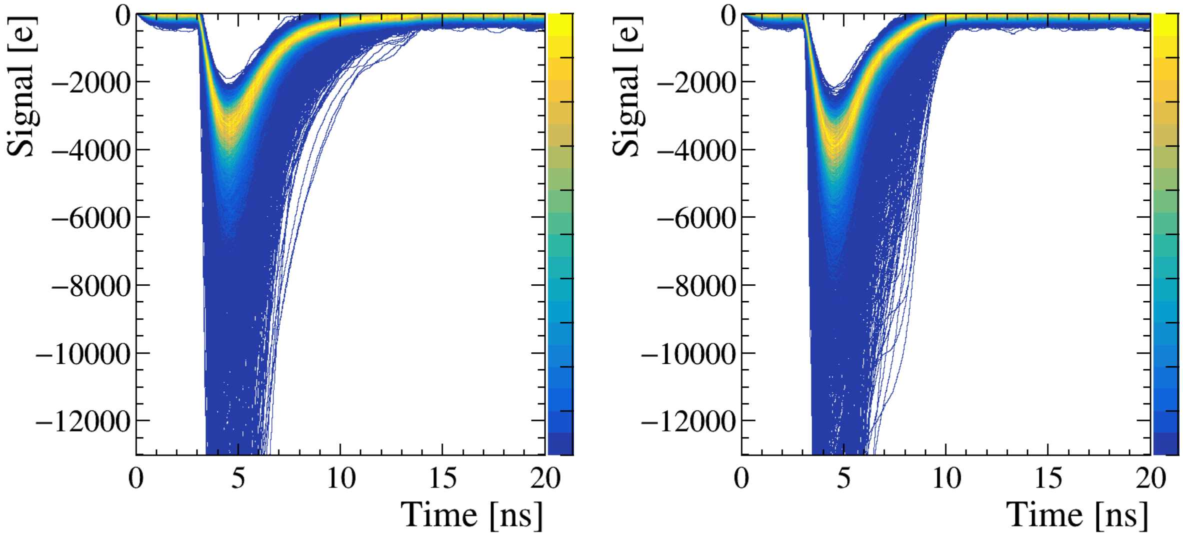


7.4 Shaper *no noise* peak time 500ps vbias1100(linear - uniform)

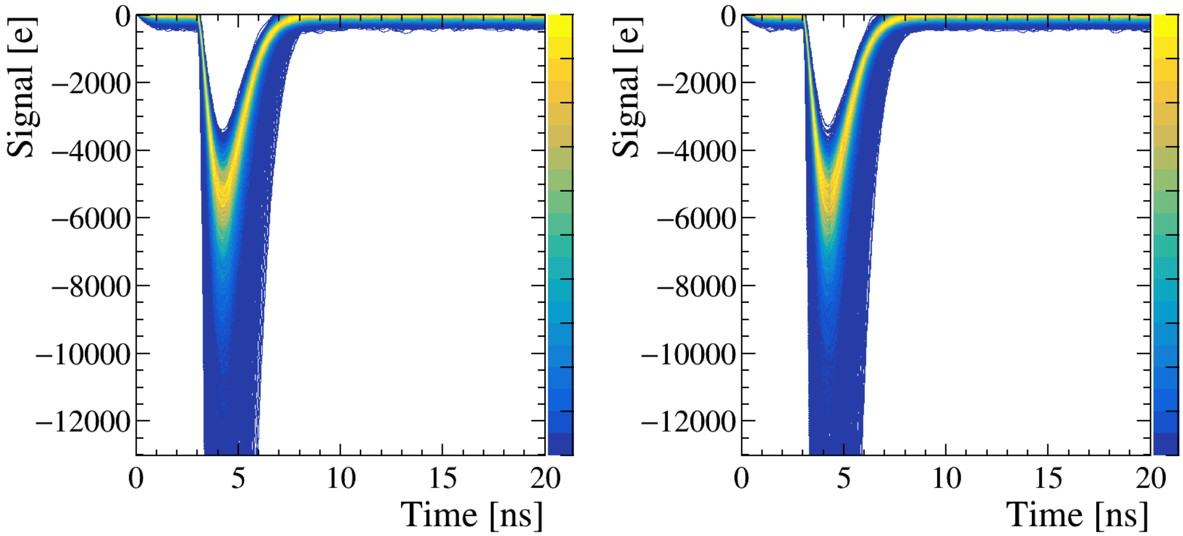


8 Shaped signal (linear uniform)

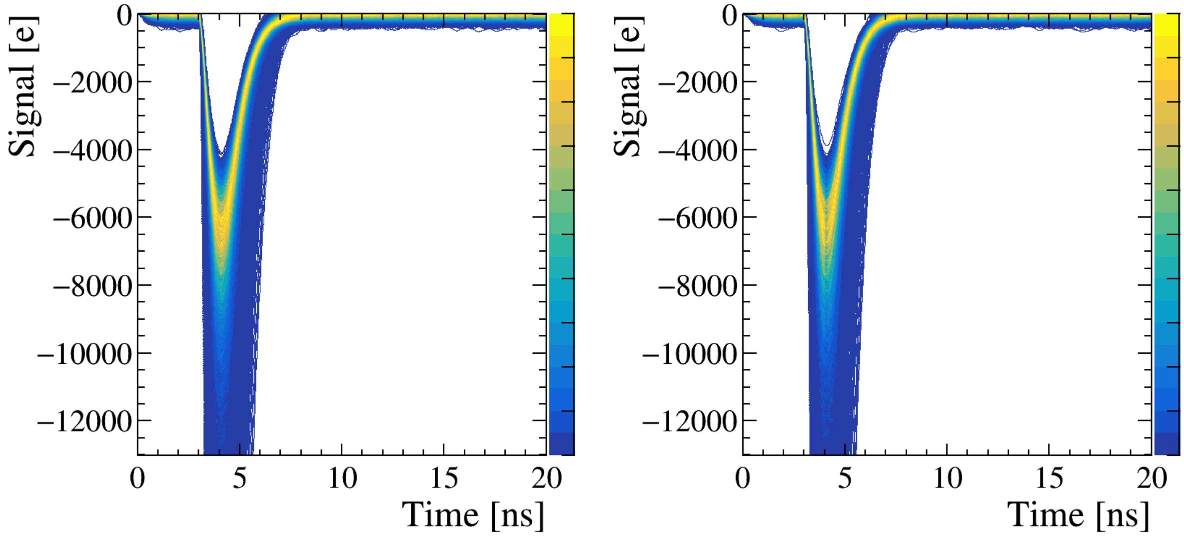
8.1 Shaper *with noise* peak time 500ps vbias55(linear - uniform)



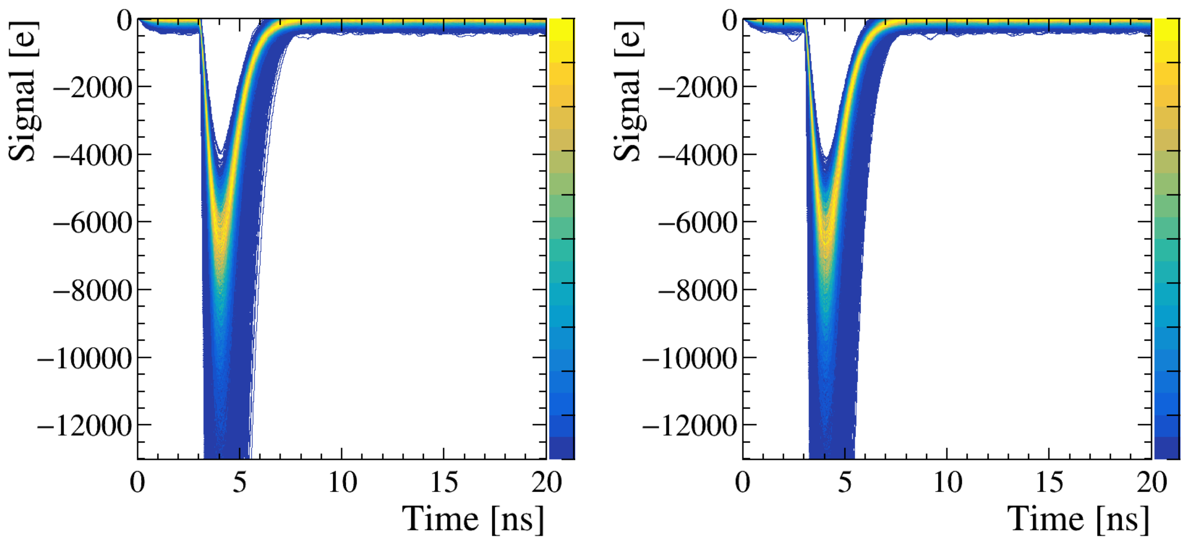
8.2 Shaper *with noise* peak time 500ps vbias165(linear - uniform)



8.3 Shaper *with noise* peak time 500ps vbias550(linear - uniform)

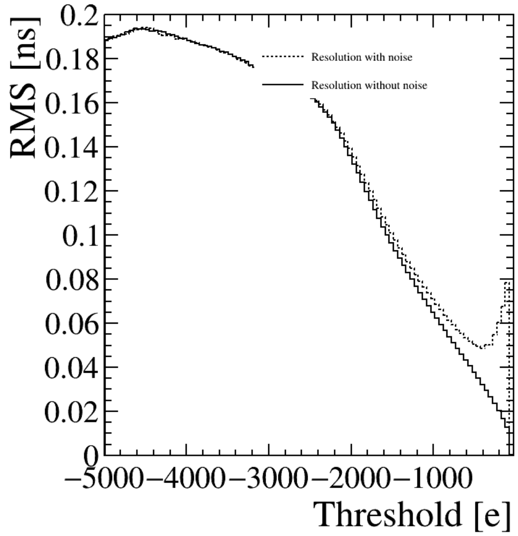


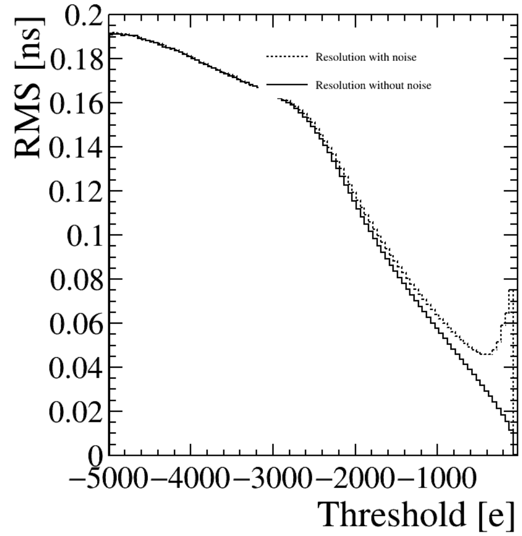
8.4 Shaper *with noise* peak time 500ps vbias1100(linear - uniform)



9 Threshold scan 500ps ((linear uniform)

9.1 Threshold scan 55V (linear - uniform)





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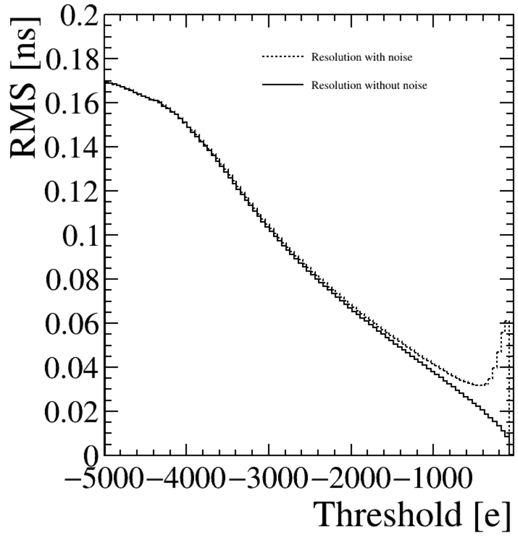
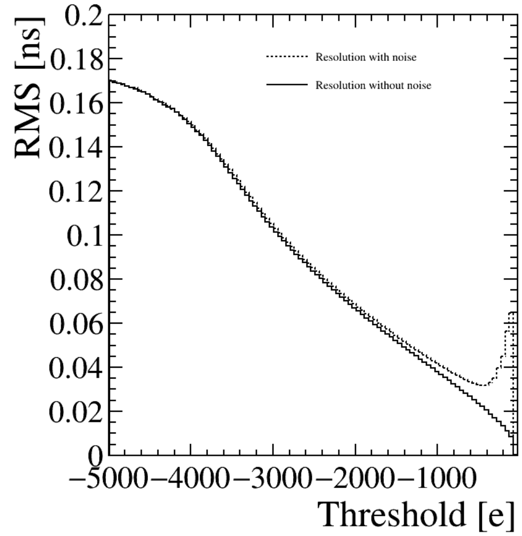
9.2 Threshold scan 165V (linear - uniform)





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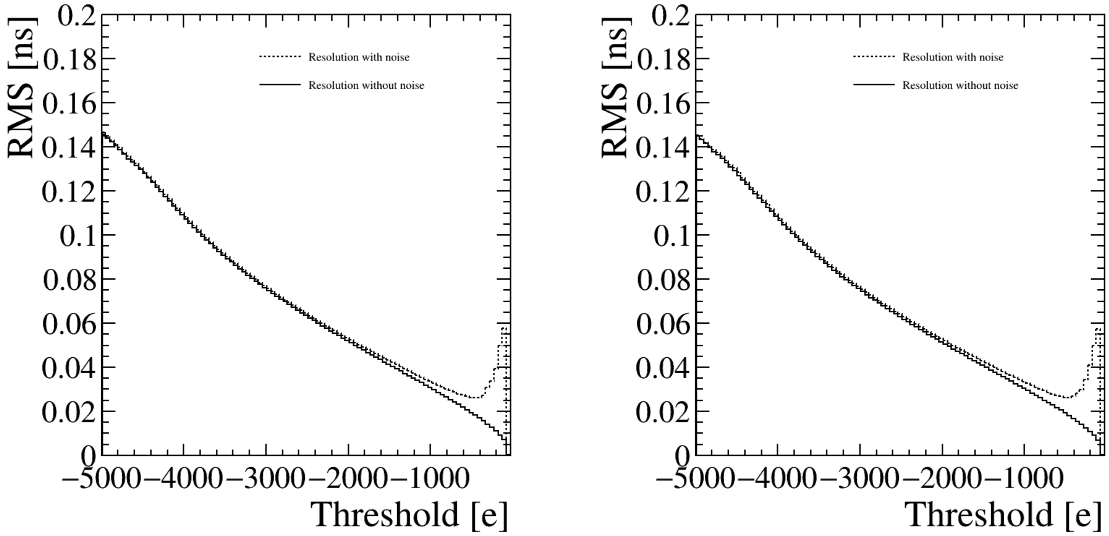
9.3 Threshold scan 550V (linear - uniform)



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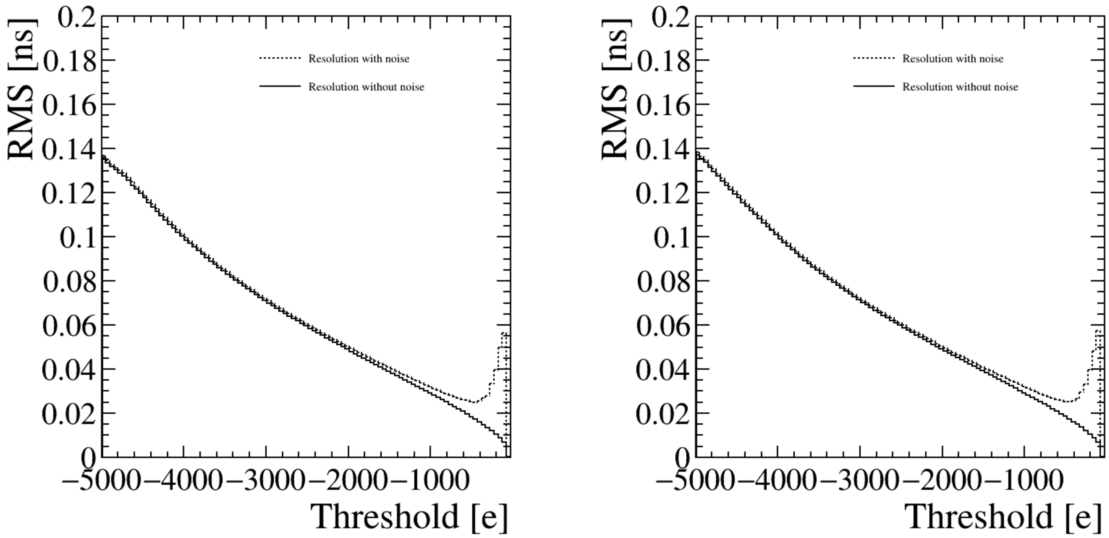
9.4 Threshold scan 1100V (linear - uniform)



c