



ROYAL  
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# Gain Measurements

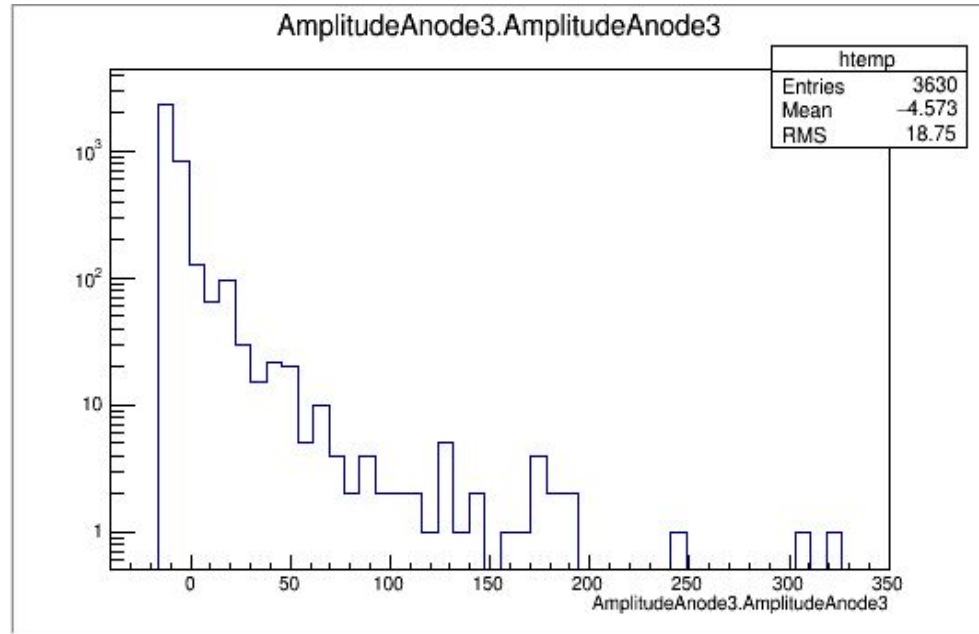
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Harrison Ritchie-Yates  
March 2019

# RAPtorr Analysis



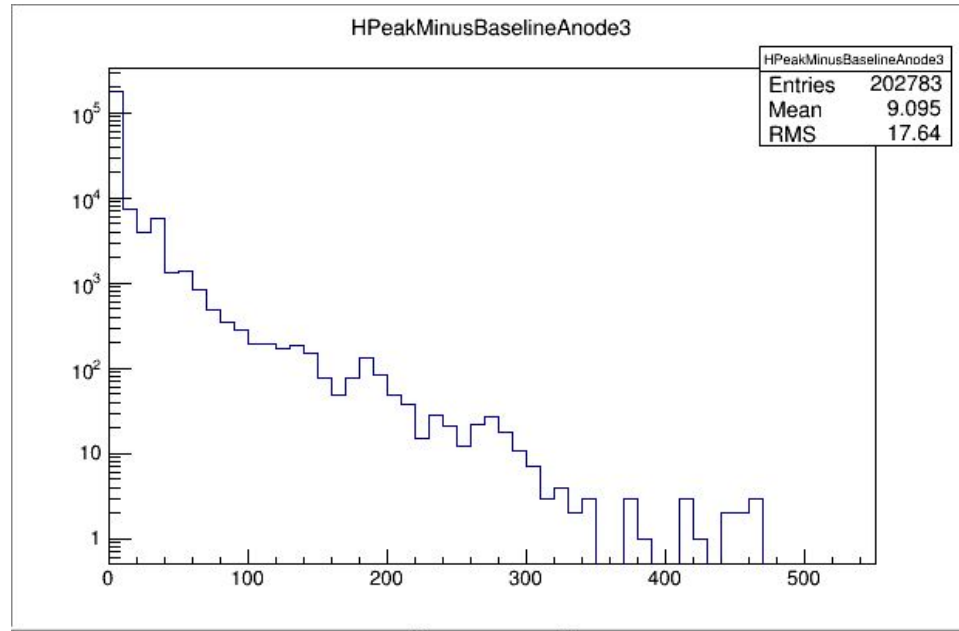
RAPtorr waveform analysis takes charge readout data and creates histograms.



# RAPtorr Analysis



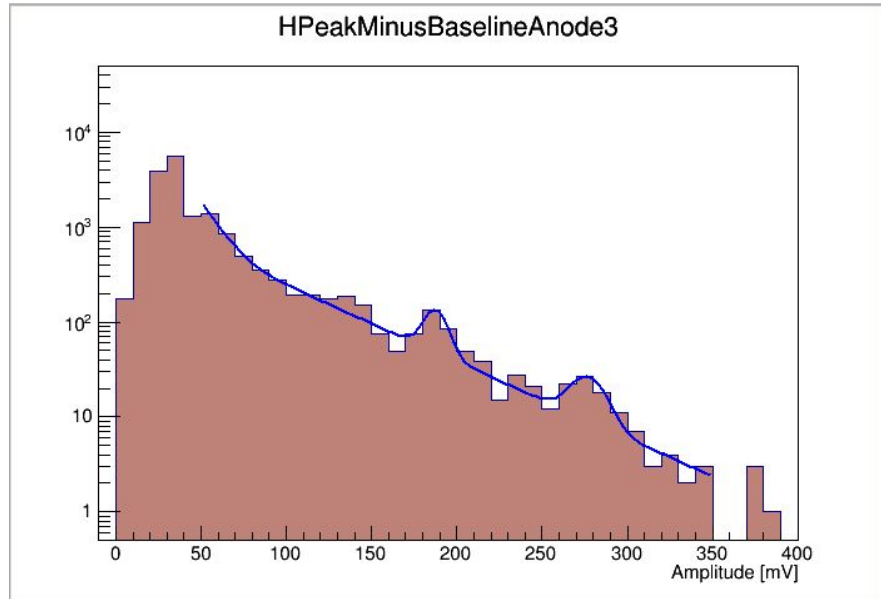
Histograms of amplitude spectra for many runs are added together.



# Fitting



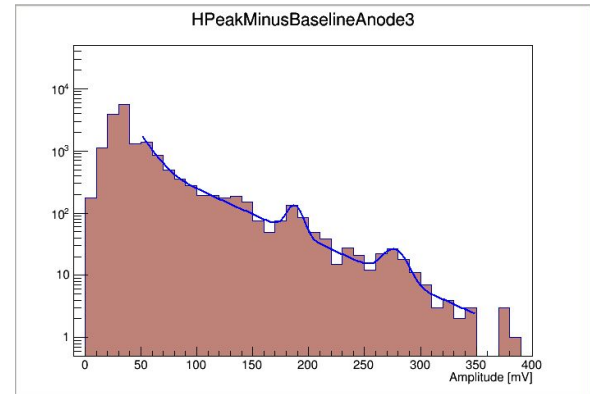
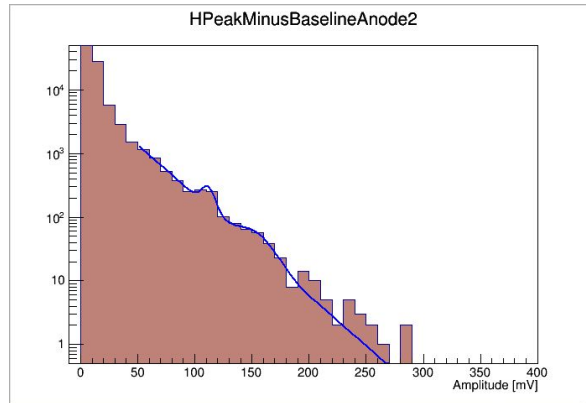
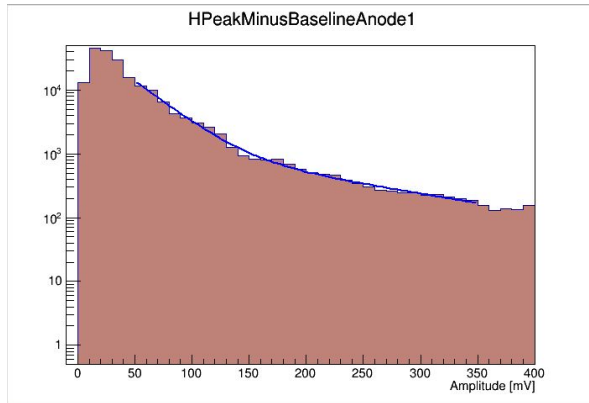
A function is fitted to the waveforms to find the position of the peaks.



# Data Cleaning



Cuts are made to clean the data.  
Before cleaning.

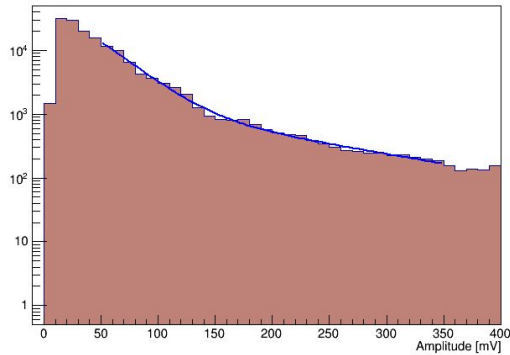


# Data Cleaning

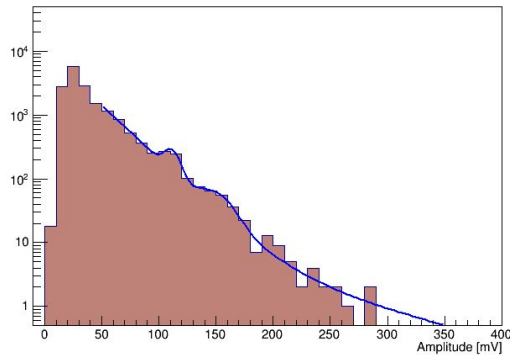


Cuts are made to clean the data.  
After cleaning.

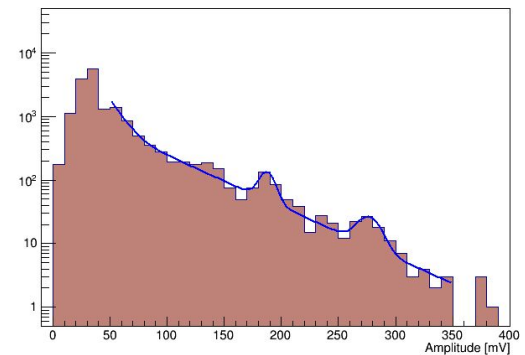
HPeakMinusBaselineAnode1



HPeakMinusBaselineAnode2



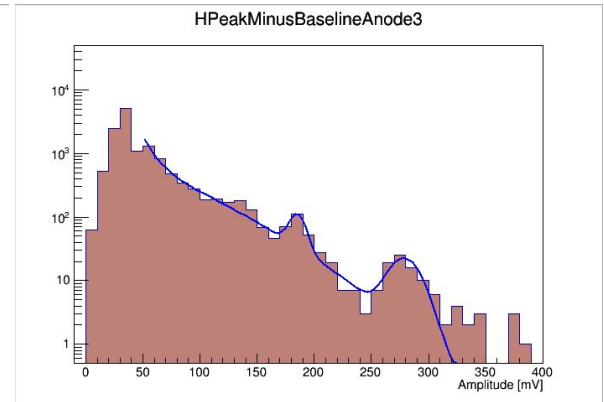
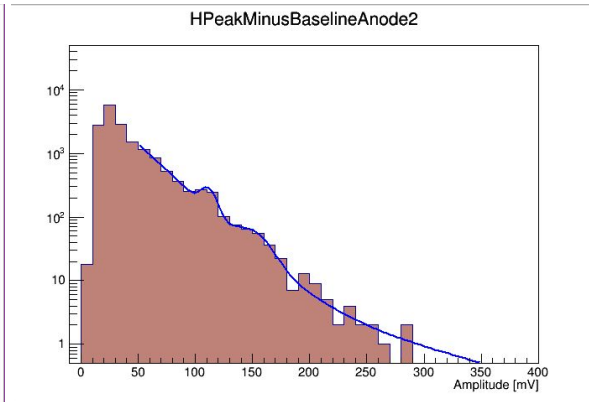
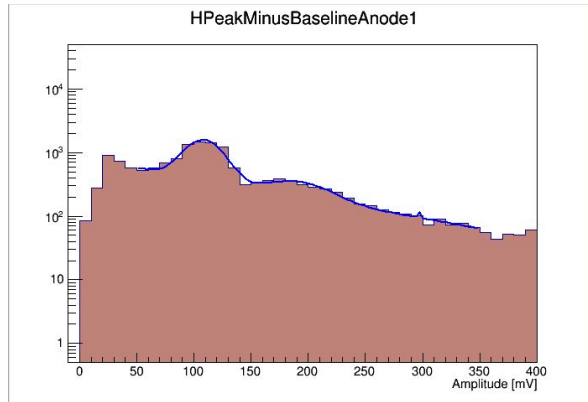
HPeakMinusBaselineAnode3



# Data Cleaning



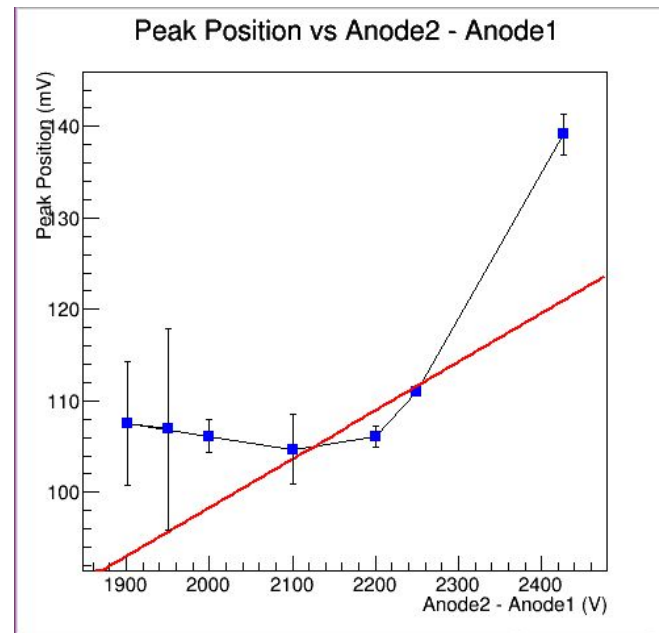
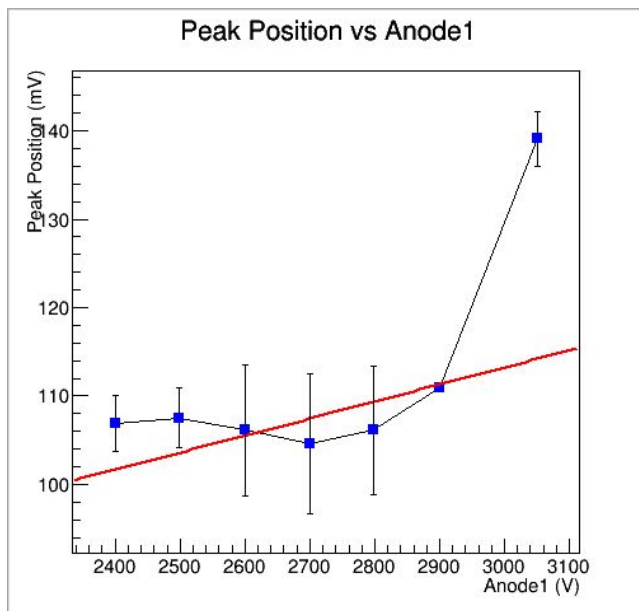
Cuts are made to clean the data.  
After cleaning and cross-talk cuts.



# Plotting



Peak positions are plotted against anode and cathode voltages.

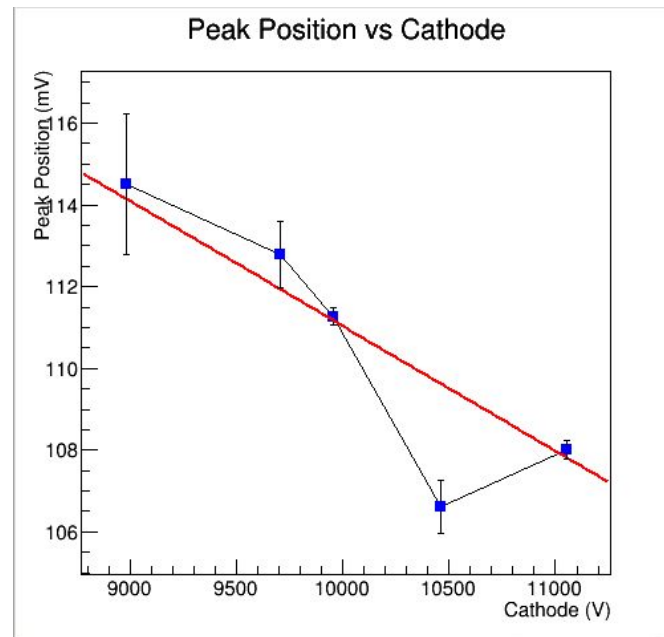
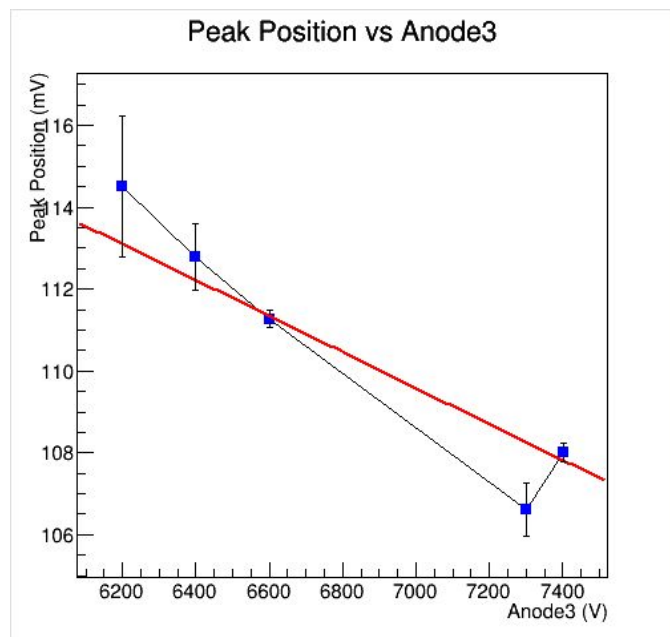




# Plotting



Peak positions are plotted against anode and cathode voltages.

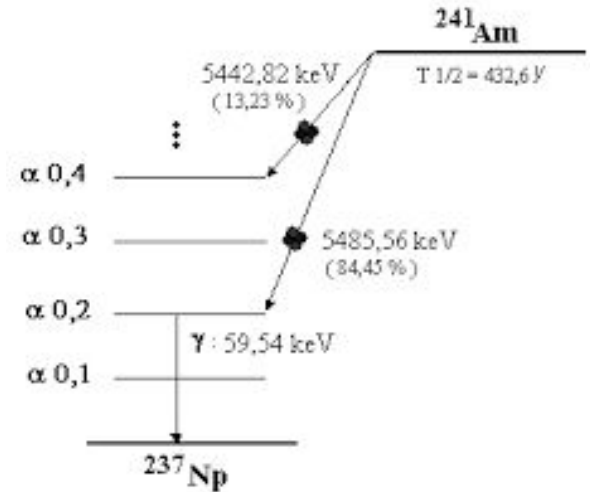
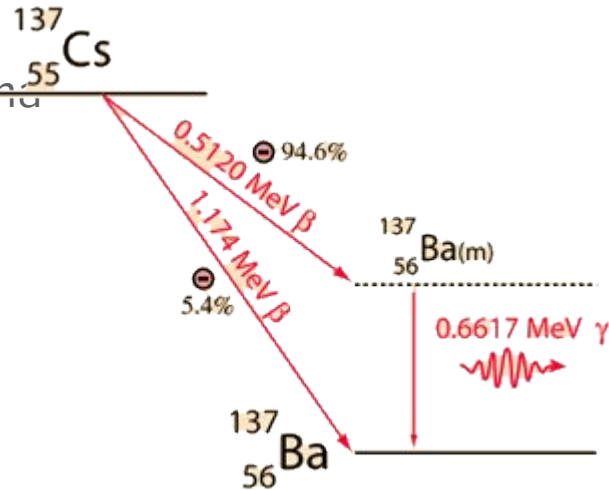


# Gain Calculation



Cs-137 - 512KeV Beta  
-661 KeV Gamma  
-1174KeV Beta

Am-241 - 60KeV Gamma  
~ 5.5MeV Alpha



# Gain Calculation



Gas gain is calculated from the peak position.

$$N_e = \frac{E_{dep}}{W}$$

$$N_e = \frac{512 * 10^3 eV}{25 eV} = 2 * 10^4$$

$$Q_{meas} = \frac{V_{meas}}{G_{preamp}}$$

$$Q_{meas} = \frac{100 mV}{1.3 mV / pC} = 77 pC$$

$$G = \frac{Q_{meas}}{N_p * e}$$

$$G = \frac{Q_{meas}}{N_p * e} = \frac{7.7 * 10^{-12} C}{2 * 10^4 * 1.6 * 10^{-19} C}$$

$$= \sim 2 * 10^3$$

