TESTING THE NEW LOW ENERGY GERMANIUM DETECTORS (LEGE)

SETTING UP/ PARAMETERS

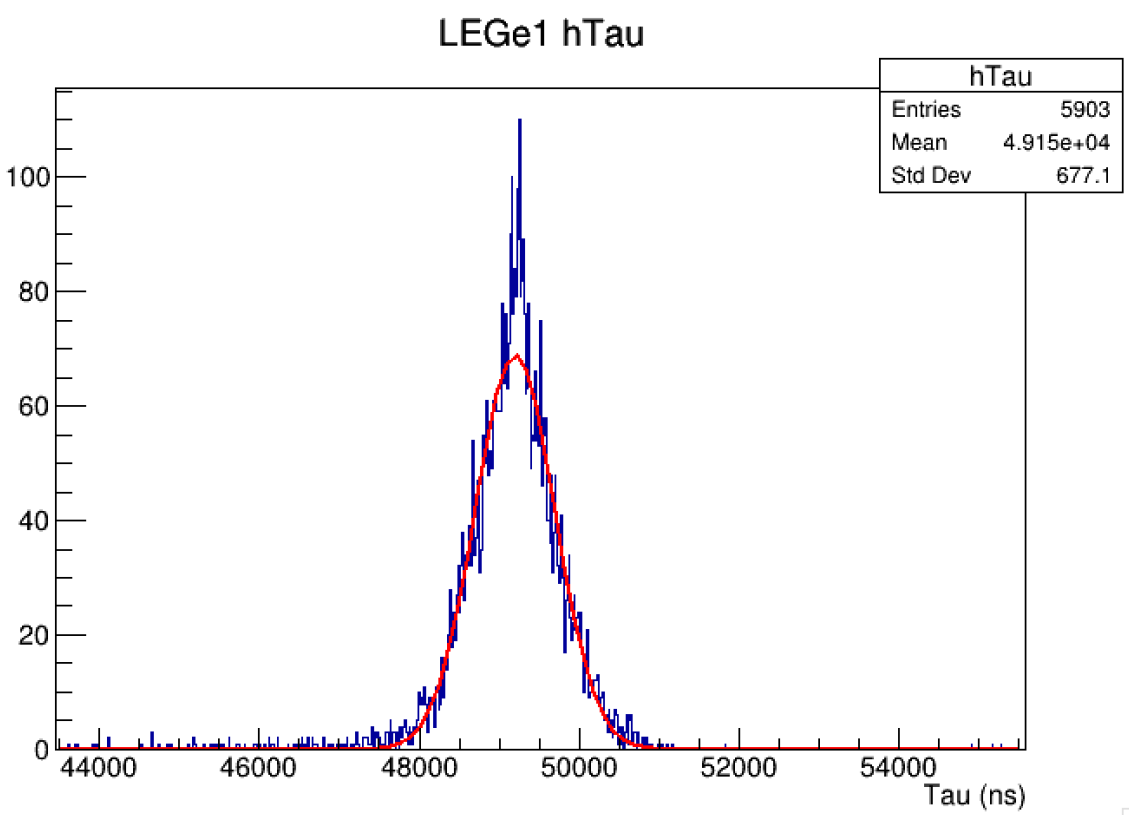
- Set the gain of the Intelligent Preamplifier at its maximum option: x10
- Trapezoid filter Parameters

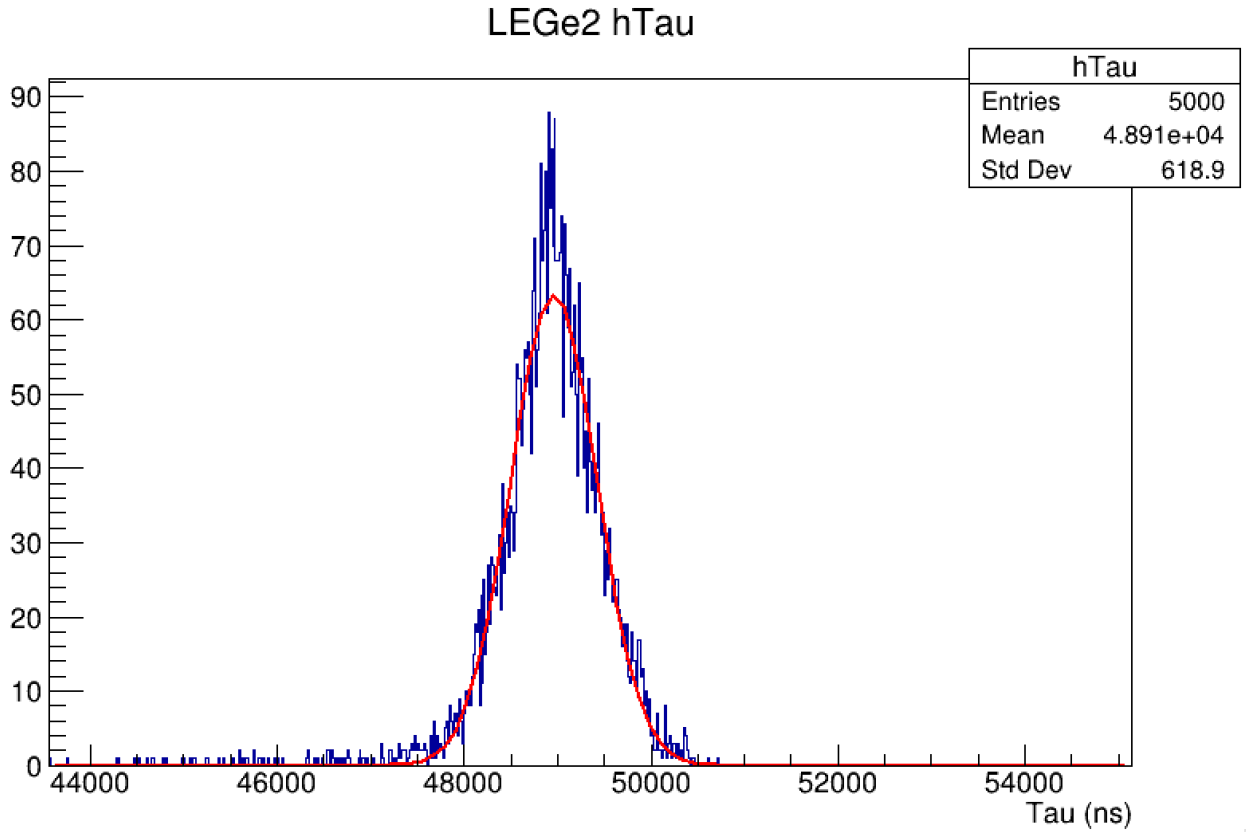
LEGe 1			
Trapezoid Parameters	Tau (ns)	Gap	Peaking
Used	49.19	300	2600
Manufacturer		200	1800

LEGe 2			
Trapezoid Parameters	Tau (ns)	Gap	Peaking
Used	48.96	250	2100
Manufacturer		200	1800

TAU PARAMETER

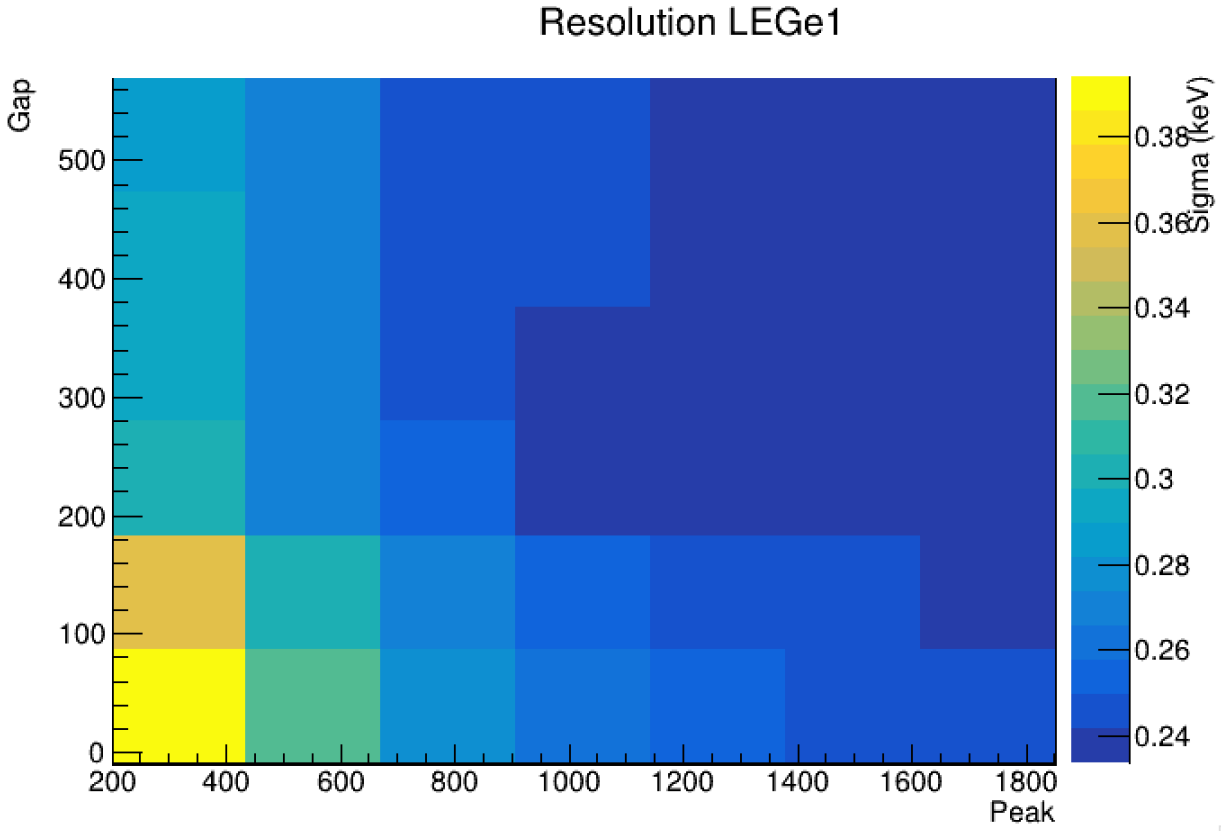
- Taking long traces with 25000 buffer length

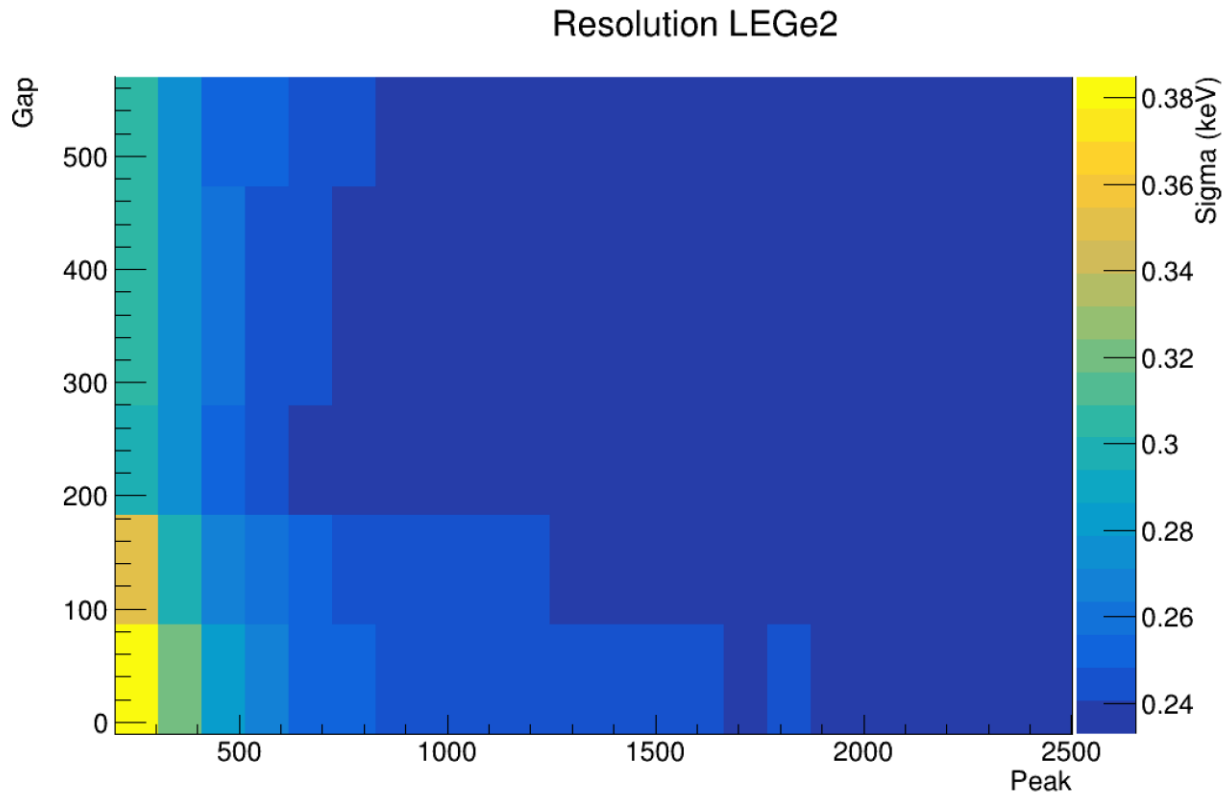




GAP AND PEAKING

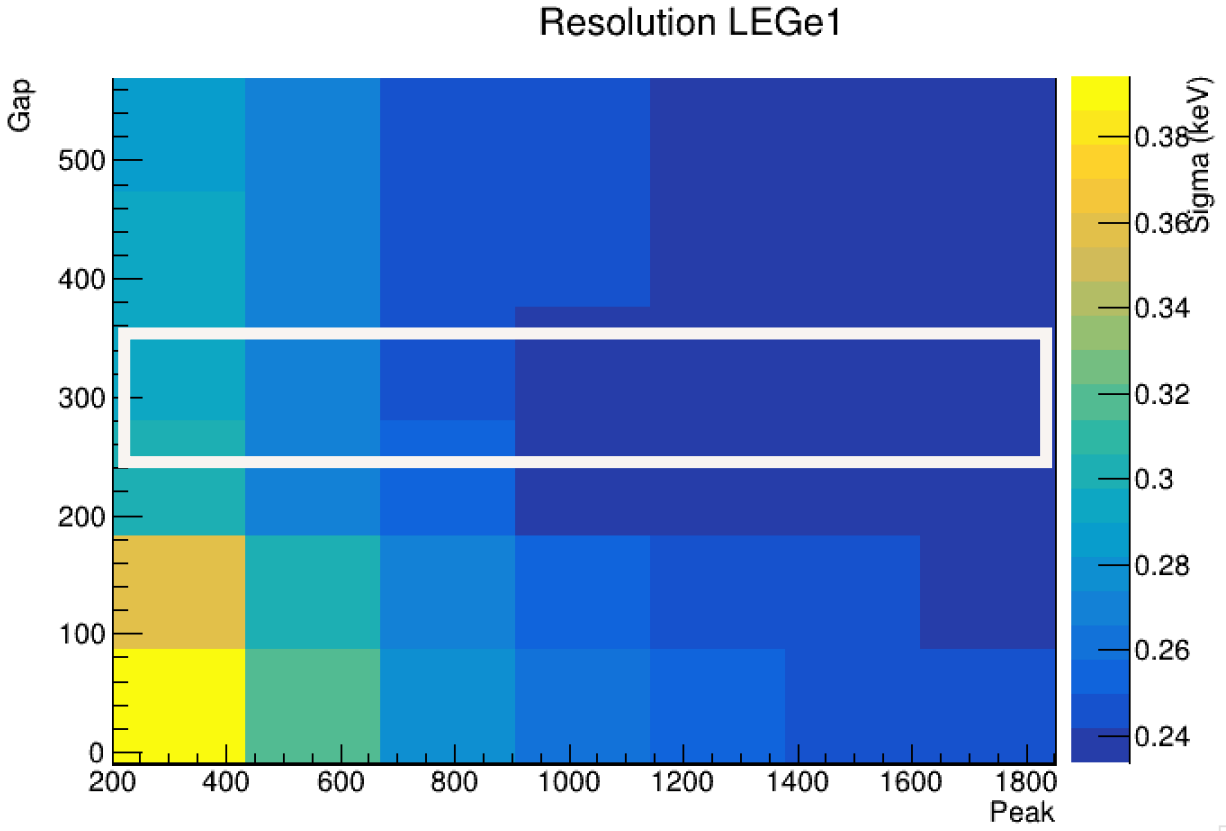
- Running the trapezoid filter with Michaels Trapezoidal Optimization code.

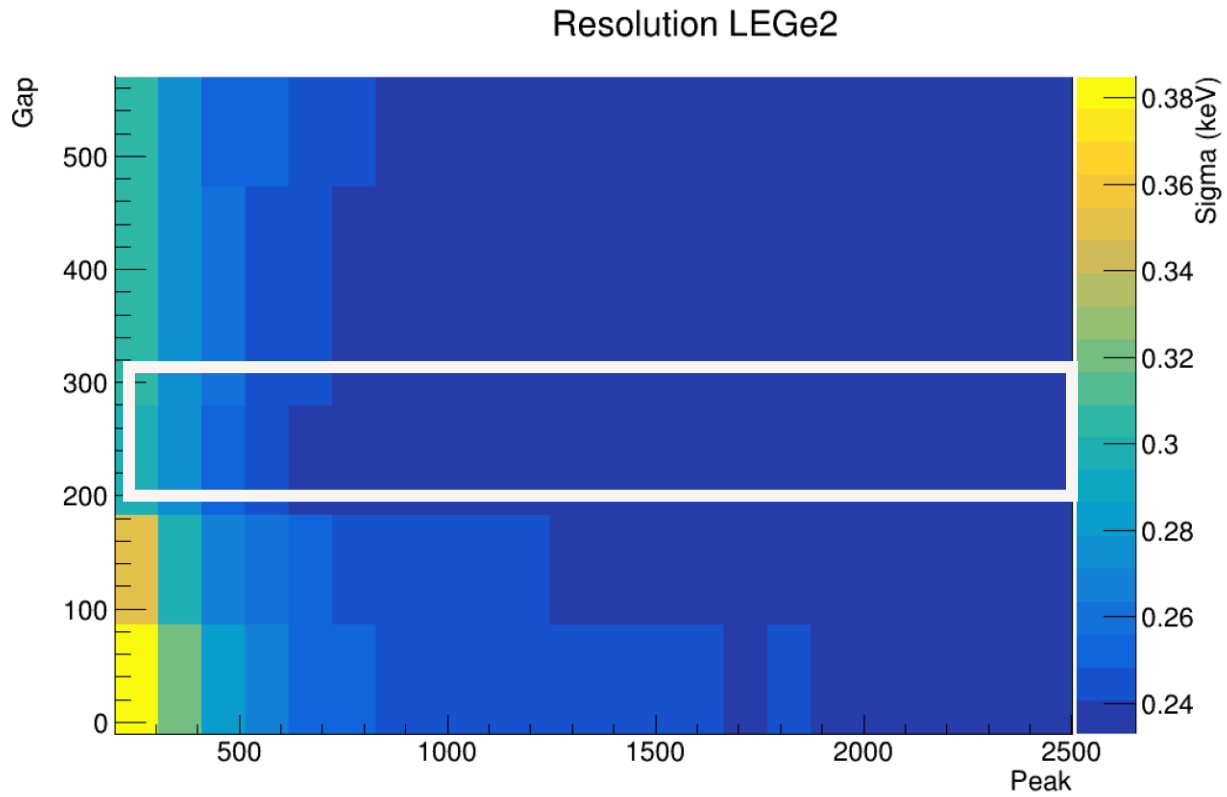




GAP AND PEAKING

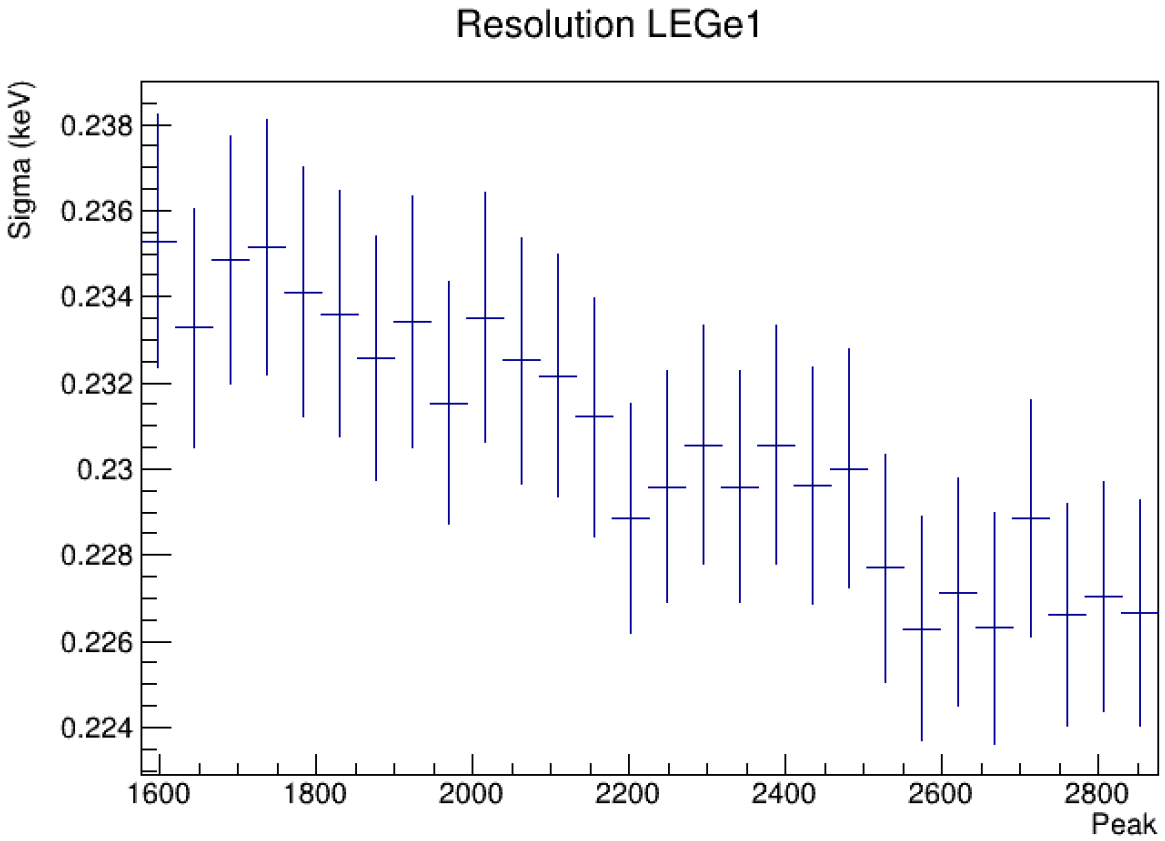
- Choosing gap at 300 for LEGe1 and 250 for LEGE2.

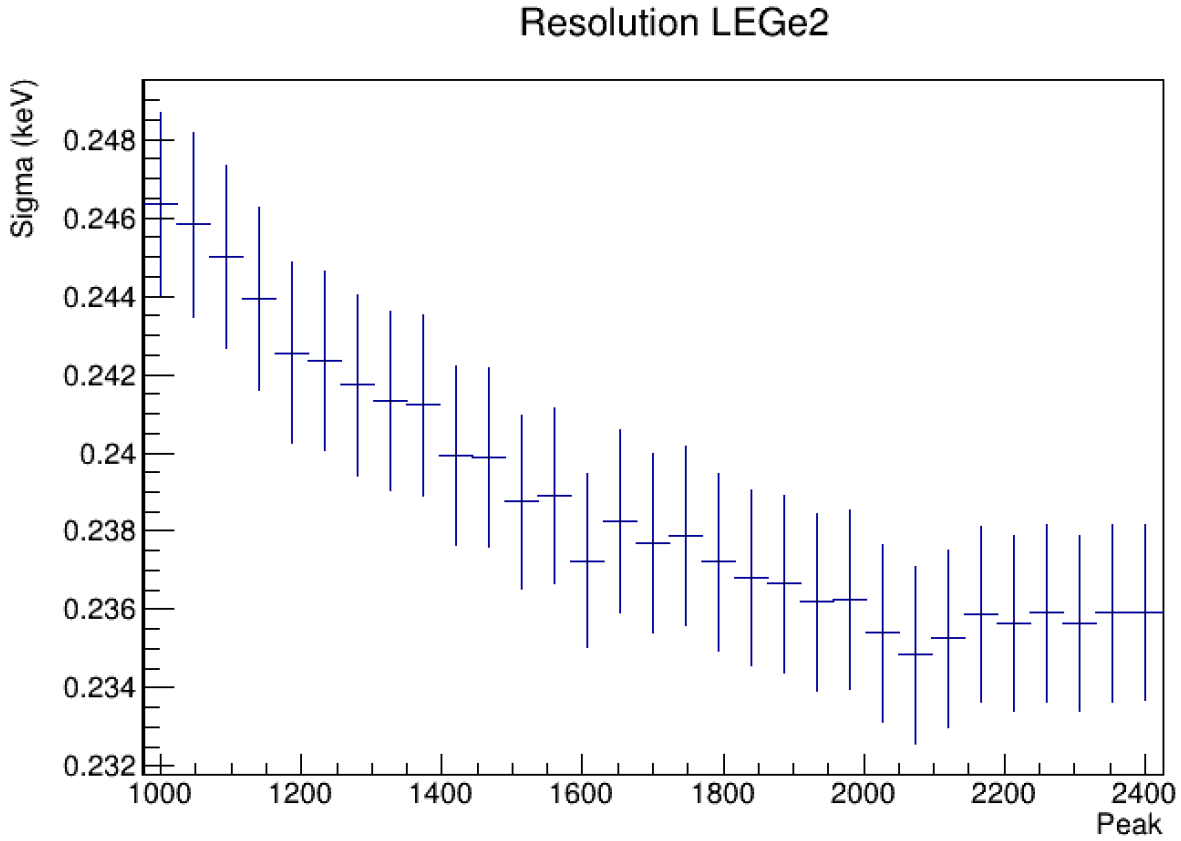




GAP AND PEAKING

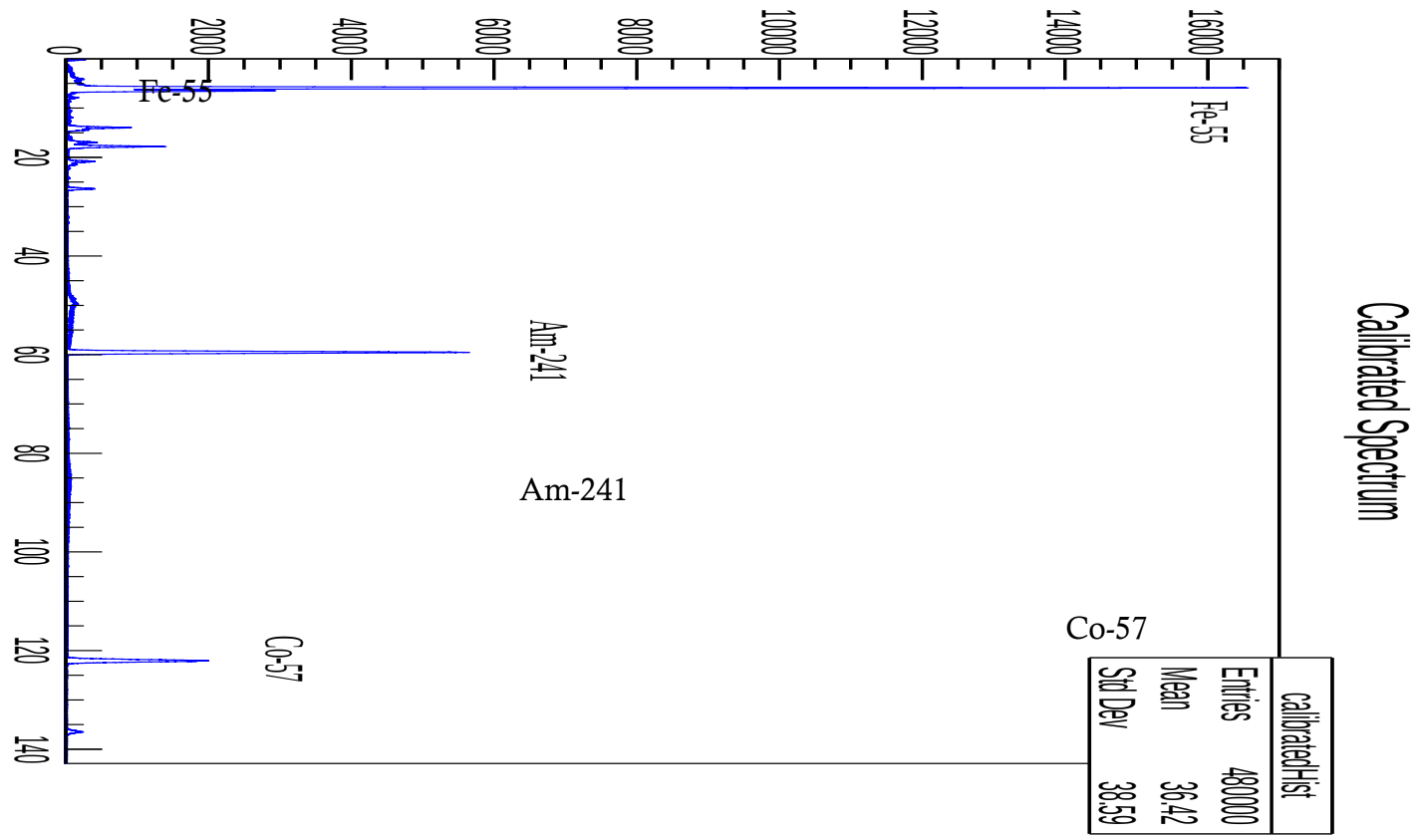
- Fixing the Gap we study the minimum resolution for the Peak parameter





SPECTRA

- Using three sources at the same time: Fe-55, Co-57 and Am-241



RESOLUTION PROBLEM SOLVED

Reminder We observed bad resolution especially at low energies:

Source	Calculated FWHM (eV)	Manufacturer FWHM (eV)
Fe-55	320	220

Solution

- In the case of low energies (Fe-55) electronic noise is dominant and by subtracting the energy with the baseline correction (HitObjects.h) we double count this electronic noise (error propagation)

```
222   //float GetEnergyADC_BLR() {return sis3316trigger->energy - baselineCorrection;} // Here removing the baseline correction!!!!!
223   float GetEnergyADC_BLR() {return sis3316trigger->energy ;}
```

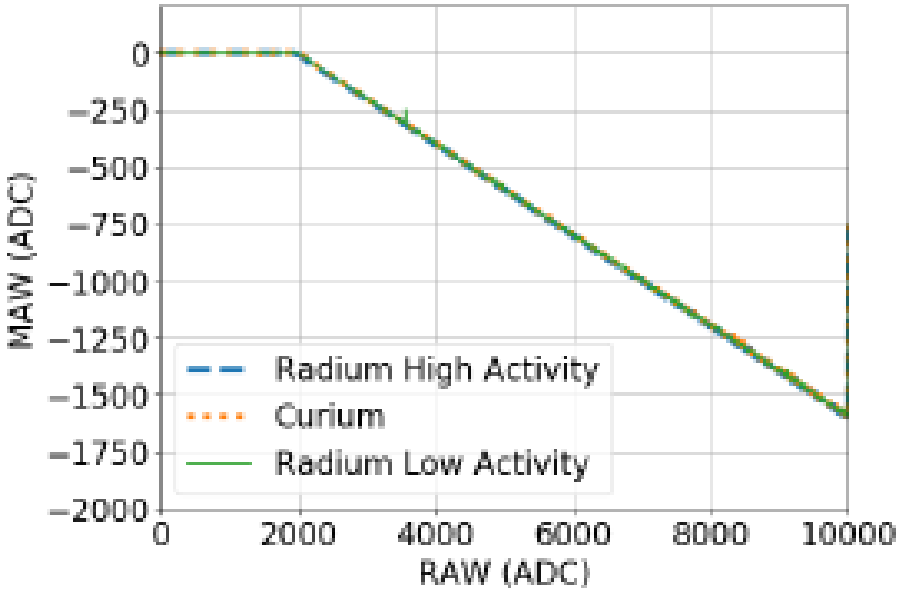
- For higher energies (Co-57 and Am-241) electronic noise is not so dominant so we kept the baseline correction for the MAW filter

➢ That's why, as a temporary solution, we removed the baseline correction of the MAW filter only for the low energy, Fe-55 source

Conclusion: The double counting of the electronic noise from the baseline correction affected the resolution and it was particularly obvious at low energies (Fe-55)

FUTURE ENDEAVOR

Create baseline correction plots of MAW vs RAW (ADC)

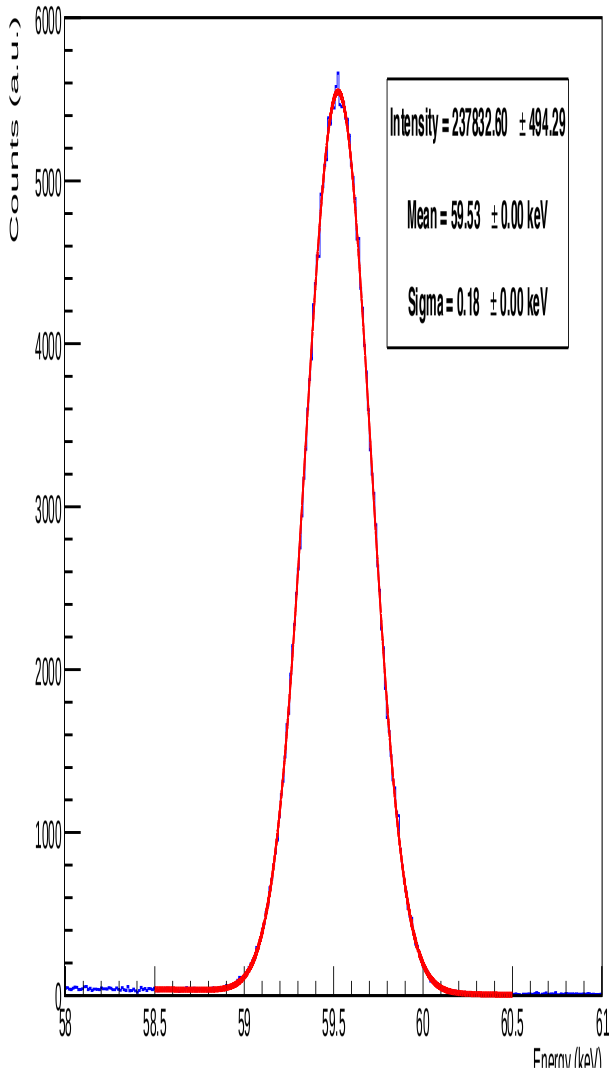


(b) MB14B

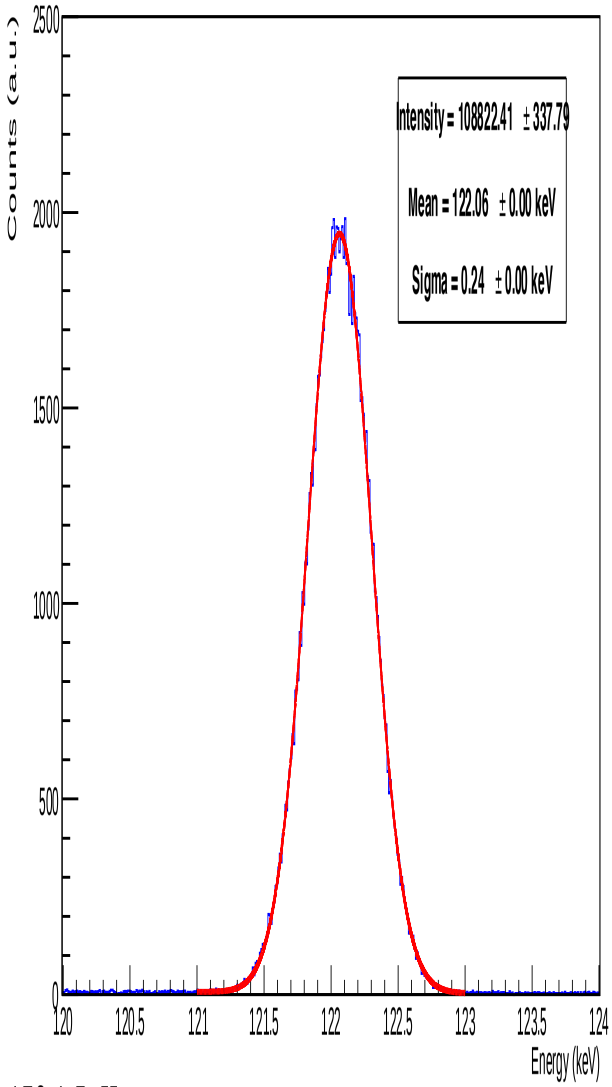
* Development of a new method to perform muonic atom spectroscopy with microgram targets, Skawran PhD Thesis

FITTING THE PEAKS

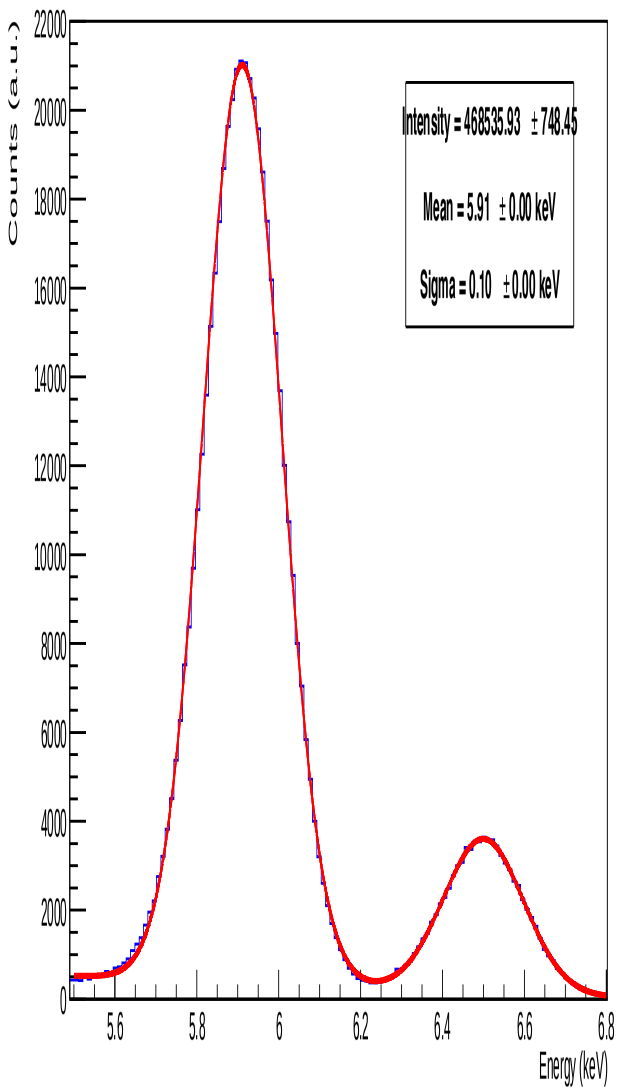
LEGe1, Am-241



LEGe1, Co-57

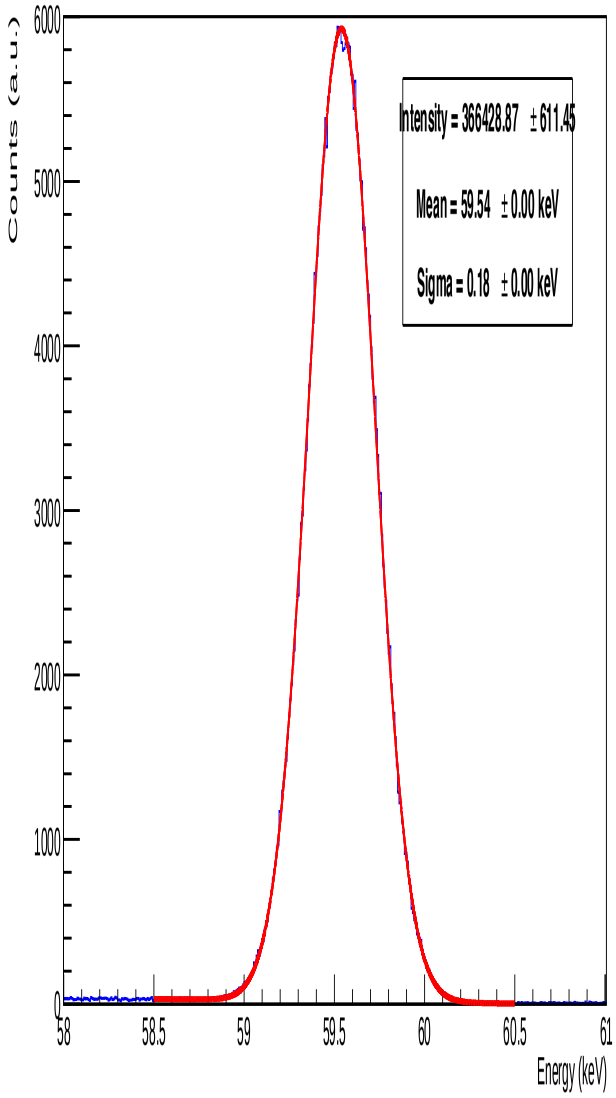


LEGe1, Fe-55

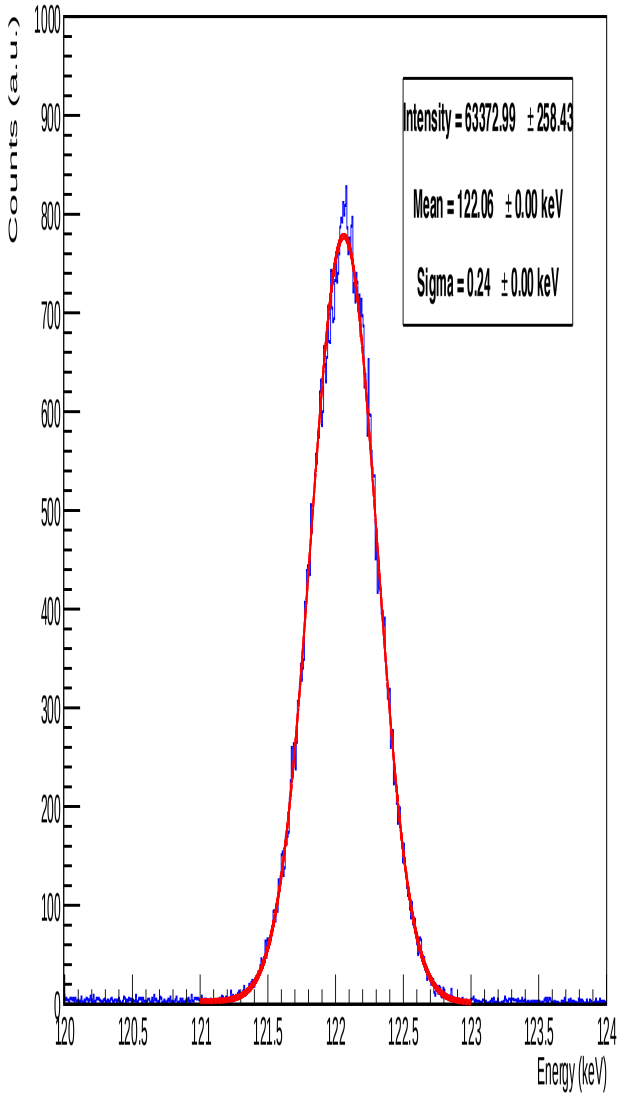


FITTING THE PEAKS

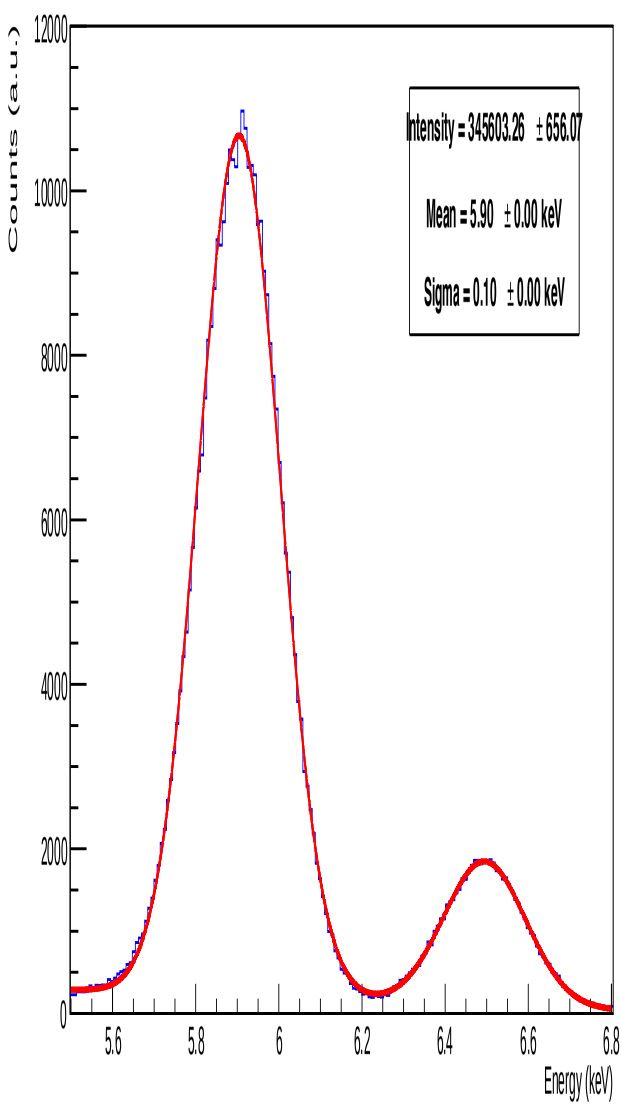
LEGe2, Am-241



LEGe2, Co-57



LEGe2, Fe-55

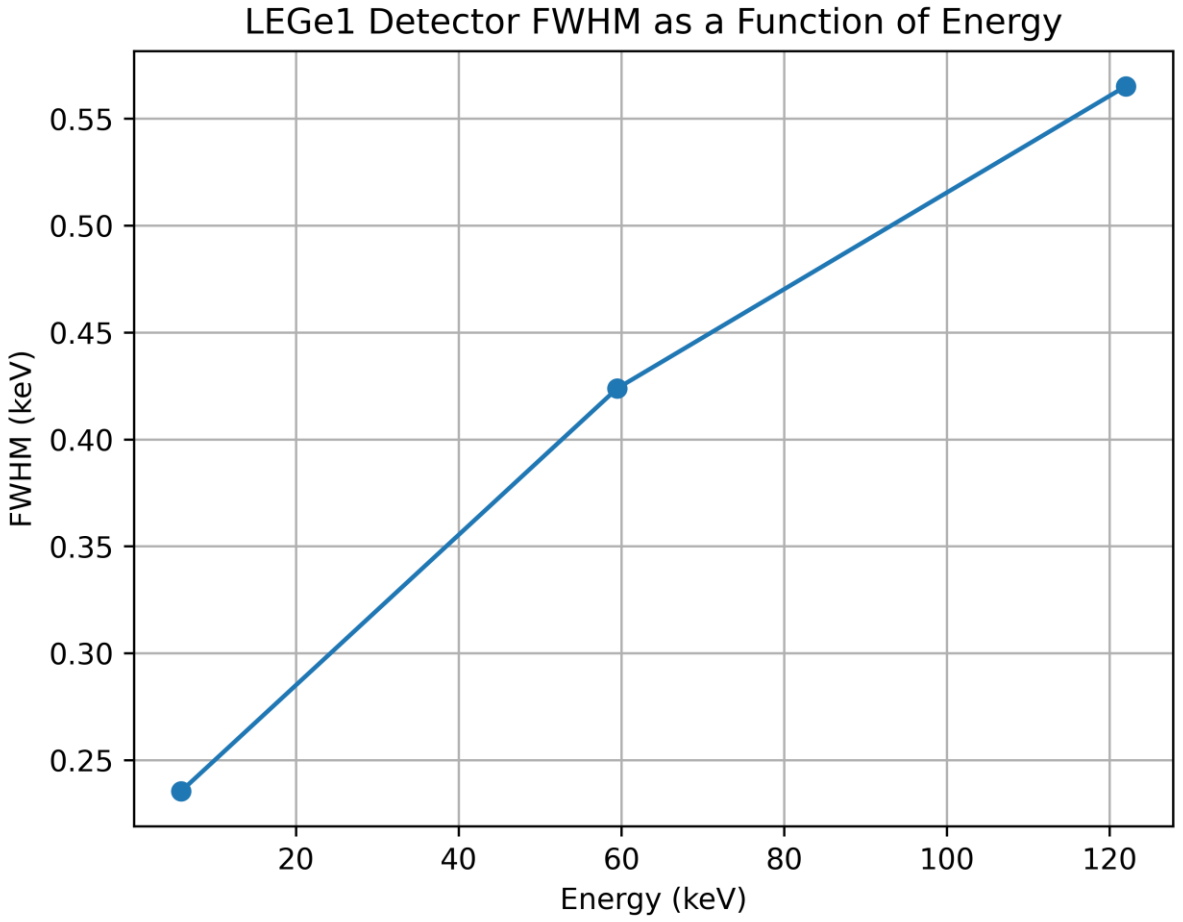


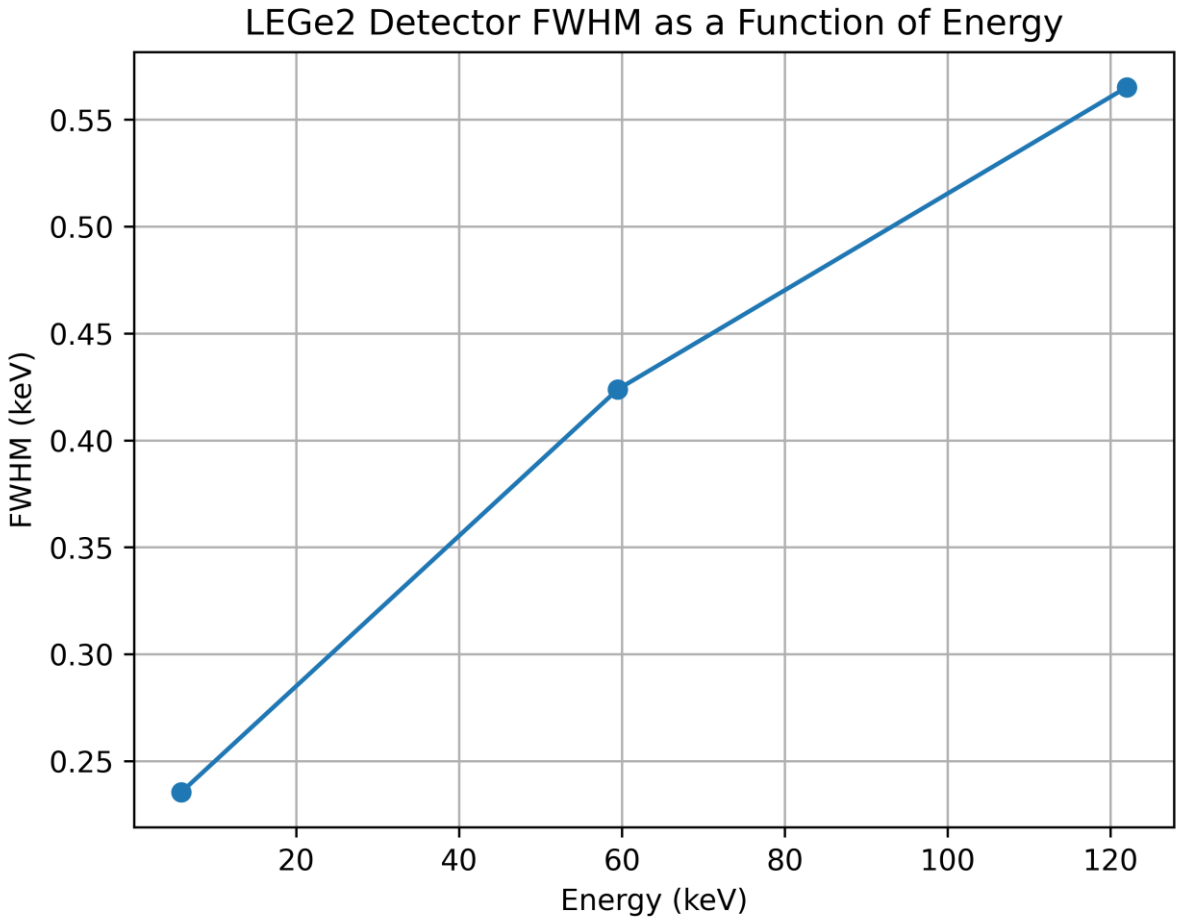
RESOLUTION

LEGe 1			
Isotopes	Fe-55	Am-241	Co-57
Energy (keV)	5.9	59.54	122
Calculated (eV)	235	423	564
Manufacturer (eV)	220	-	525

LEGe 2			
Isotopes	Fe-55	Am-241	Co-57
Energy (keV)	5.9	59.54	122
Calculated (eV)	235	423	564
Manufacturer (eV)	220	-	525

RESOLUTION


LEGe1 Detector FWHM as a Function of Energy
FWHM (keV)
0.55
0.50
0.45
0.40
0.35
0.30
0.25
20
40
60
80
100
120
Energy (keV)


LEGe2 Detector FWHM as a Function of Energy
FWHM (keV)
0.55
0.50
0.45
0.40
0.35
0.30
0.25
20
40
60
80
100
120
Energy (keV)

EFFICIENCY

Calculated intrinsic efficiency, considering the X-ray attenuation for Be window and plastic support around sources ~ 1mm.

$$\epsilon = \frac{Counts}{Activity * Time * Yield * \Omega * Attenuation}$$

EFFICIENCY

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