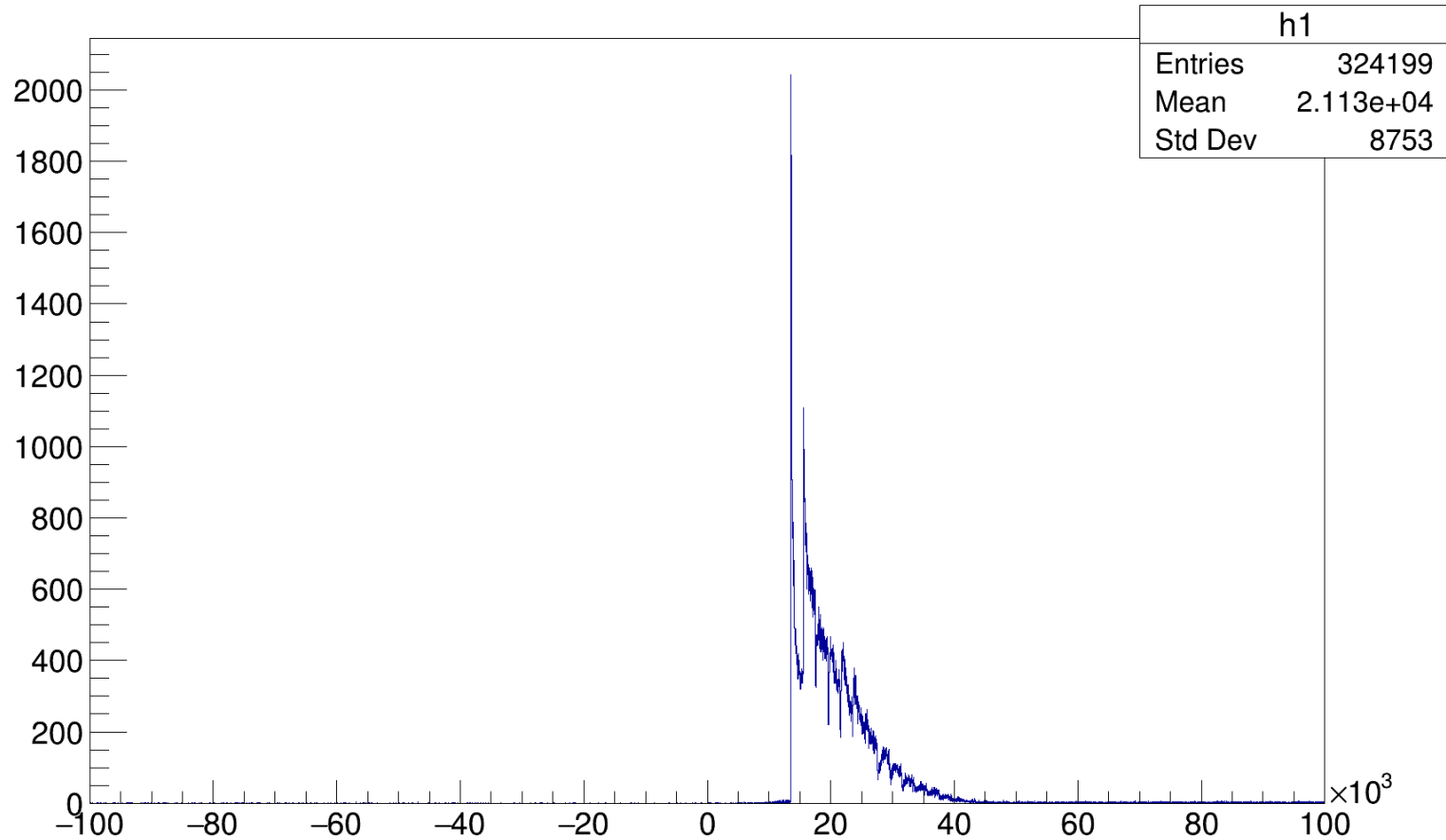


# Preliminary Analysis of AIDA in Beam Test October 2017

Following the replacement of the front side adapter boards. Rev D switched for Rev E.

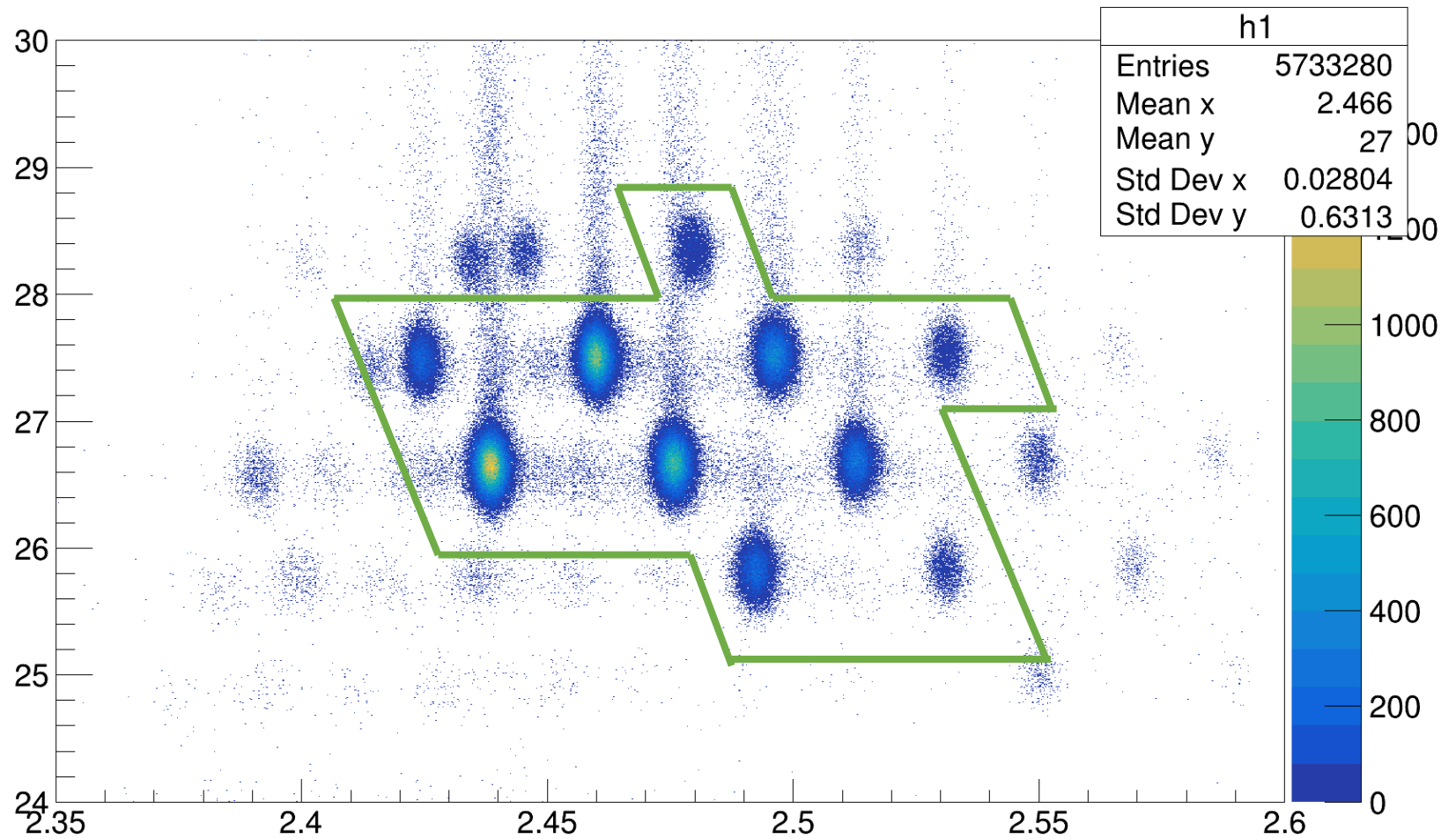
# AIDA BigRIPS Time Correlation

implantation.T-implantation.vectorOfPid.TIME {implantation.T>0}



# PID For Ions Correlated with Betas

beta.vectorOfImp.ZET:beta.vectorOfImp.AOQ {beta.T>0}

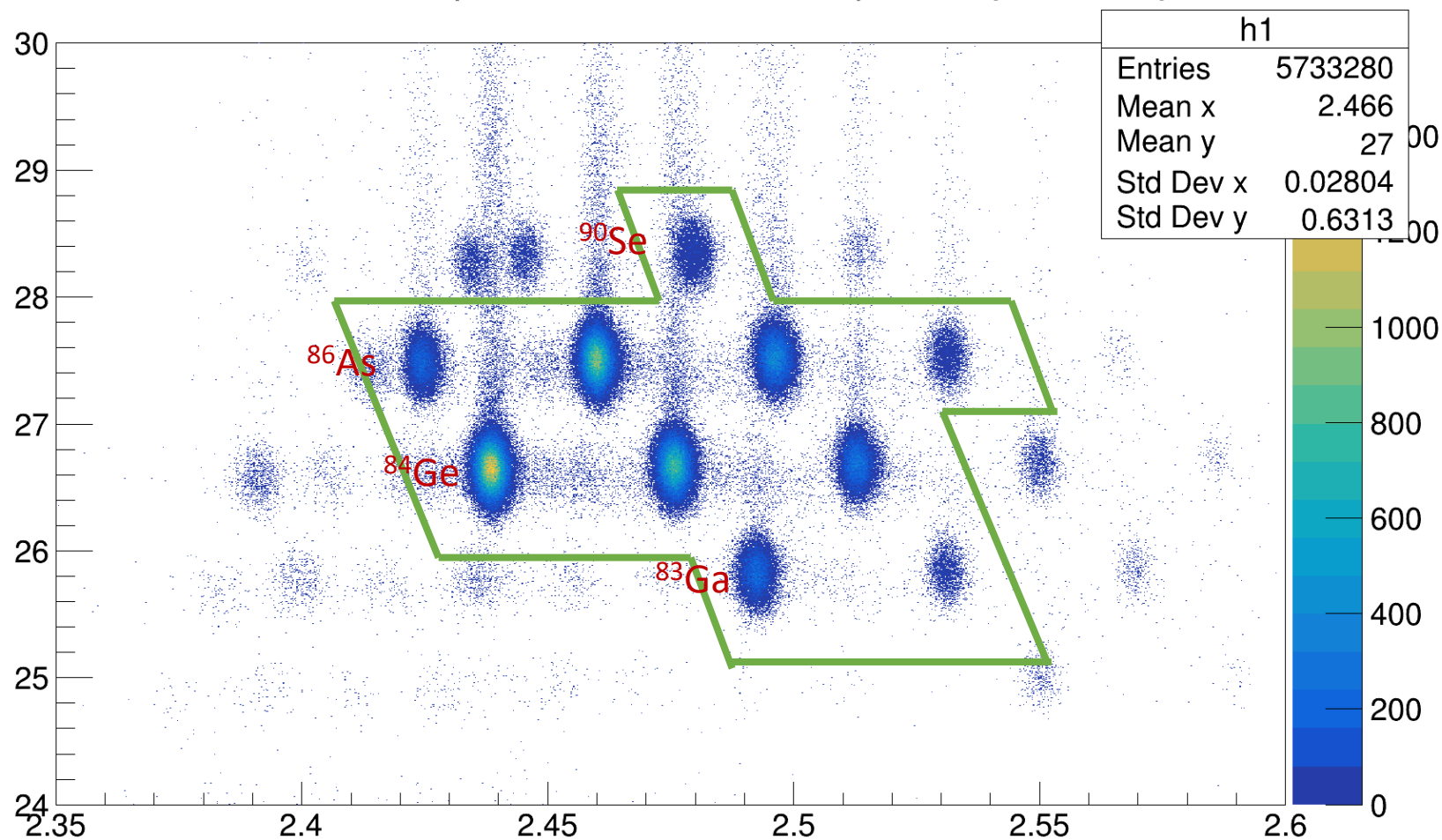


# PID For Ions Correlated with Betas

Z	83Se 70.1 S β-: 100.00%	84Se 3.26 M β-: 100.00%	85Se 32.9 S β-: 100.00%	86Se 14.3 S β-: 100.00%	87Se 5.50 S β-: 100.00% β-n: 0.36%	88Se 1.53 S β-: 100.00% β-n: 0.99%	89Se 0.43 S β-: 100.00% β-n: 7.80%	90Se 195 MS β-: 100.00% β-n	91Se 0.27 S β-: 100.00% β-n: 21.00%
33	82As 19.1 S β-: 100.00%	83As 13.4 S β-: 100.00%	84As 4.02 S β-: 100.00% β-n: 0.18%	85As 2.021 S β-: 100.00%	86As 0.945 S β-: 100.00% β-n: 35.50%	87As 484 MS β-: 100.00% β-n: 15.40%	88As 0.20 S β-: 100.00%	89As >300 NS β-: 100.00% β-n	90As >300 NS β-: 100.00% β-n
32	81Ge 7.6 S β-: 100.00%	82Ge 4.56 S β-: 100.00%	83Ge 1.85 S β-: 100.00%	84Ge 0.954 S β-: 100.00% β-n: 10.20%	85Ge 503 MS β-: 100.00% β-n: 14.00%	86Ge 226 MS β-: 100.00% β-n: 45.00%	87Ge ≈0.14 S β-: 100.00% β-n	88Ge ≥300 NS β-: 100.00%	89Ge ≥300 NS β-: 100.00%
31	80Ga 1.9 S β-: 100.00% β-n: 0.86%	81Ga 1.217 S β-: 100.00% β-n: 11.90%	82Ga 0.599 S β-: 100.00% β-n: 19.80%	83Ga 308.1 MS β-: 100.00% β-n: 62.80%	84Ga 85 MS β-: 100.00% β-n: 74.00%	85Ga 92 MS β-: 100.00% β-n > 35.00%	86Ga 43 MS β-: 100.00% β-n: 60.00%	87Ga >634 NS β-: 100.00% β-n	
30	79Zn 0.746 S β-: 100.00% β-n: 1.70%	80Zn 561.9 MS β-: 100.00% β-n: 1.00%	81Zn 303.5 MS β-: 100.00% β-n: 7.50%	82Zn 228 MS β-: 100.00%	83Zn 117 MS β-: 100.00% β-n	84Zn >633 NS β-: 100.00% β-2n	85Zn >637 NS β-: 100.00% β-n		
	49	50	51	52	53	54	55	56	N

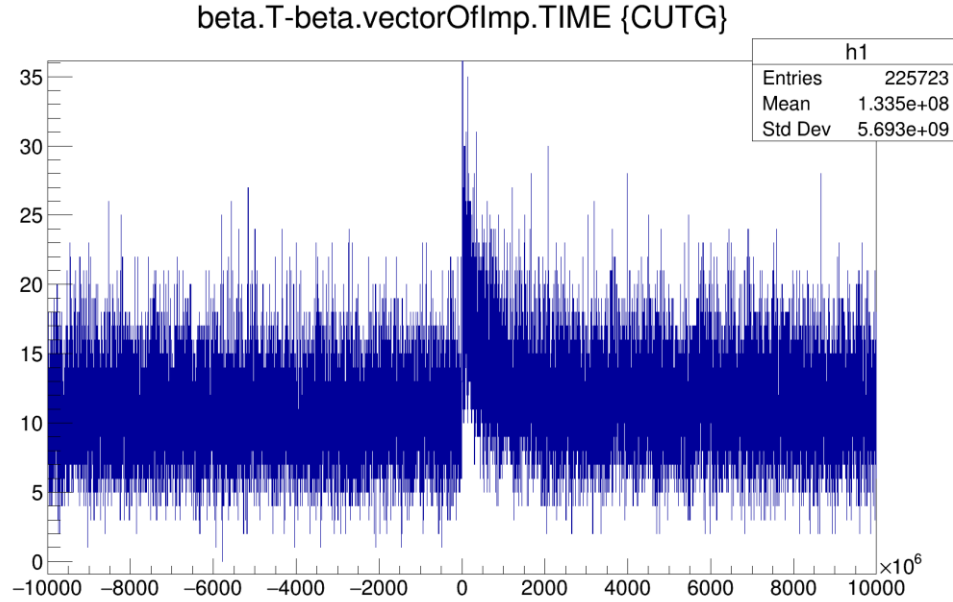
# PID For Ions Correlated with Betas

beta.vectorOfImp.ZET:beta.vectorOfImp.AOQ {beta.T>0}



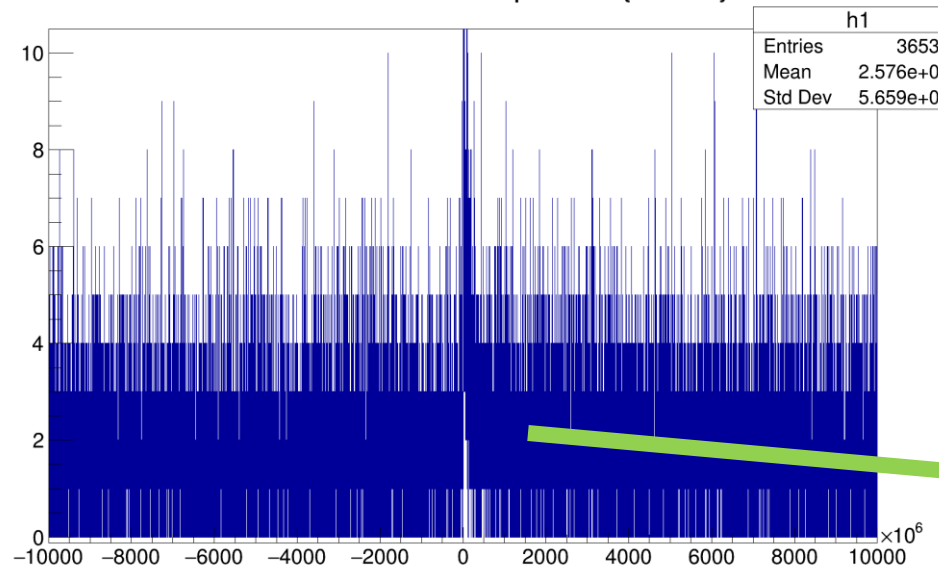
# Ga Decay Curves

All fits are quick and dirty. Fitted with a single exponential on a flat background. Daughters not taken into account. Limited statistics. Uncertainty is large.

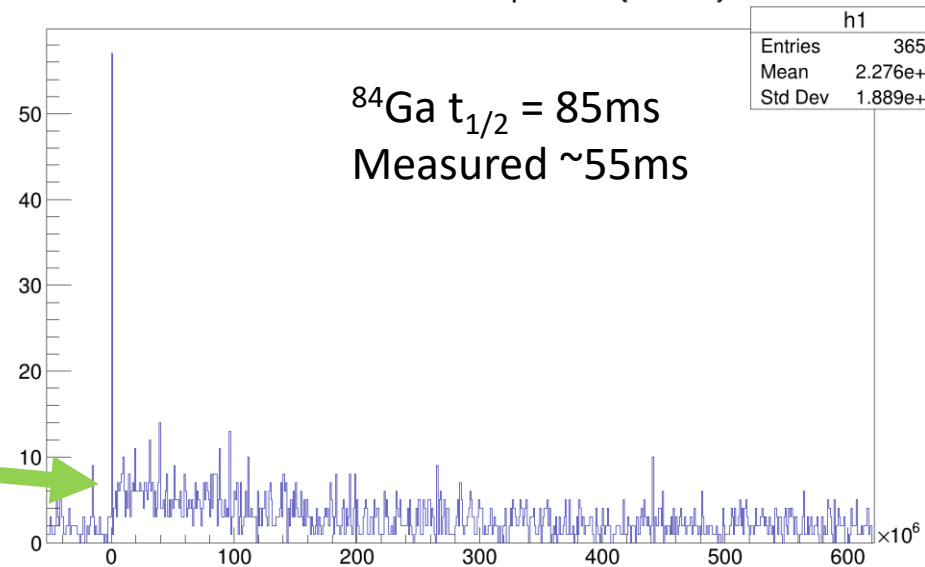


$^{83}\text{Ga } t_{1/2} = 308.1\text{ms}$   
Measured  $\sim 350\text{ms}$

beta.T-beta.vectorOfImp.TIME {CUTG}

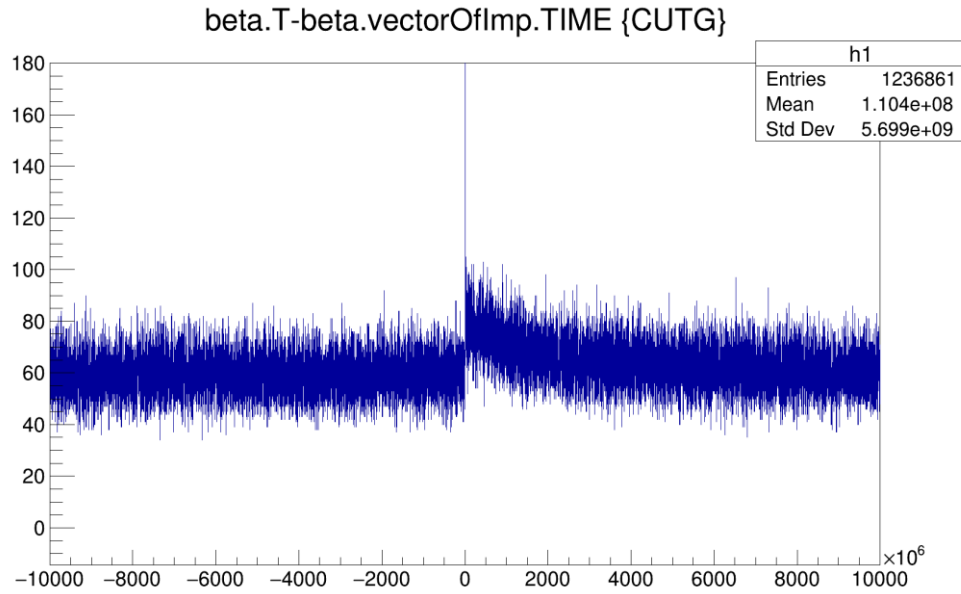


beta.T-beta.vectorOfImp.TIME {CUTG}



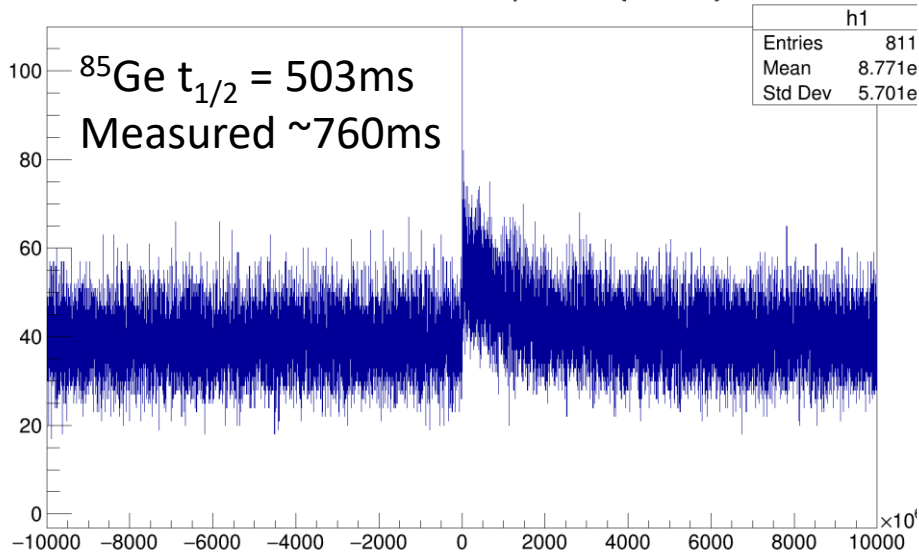
$^{84}\text{Ga } t_{1/2} = 85\text{ms}$   
Measured  $\sim 55\text{ms}$

# Ge Decay Curves



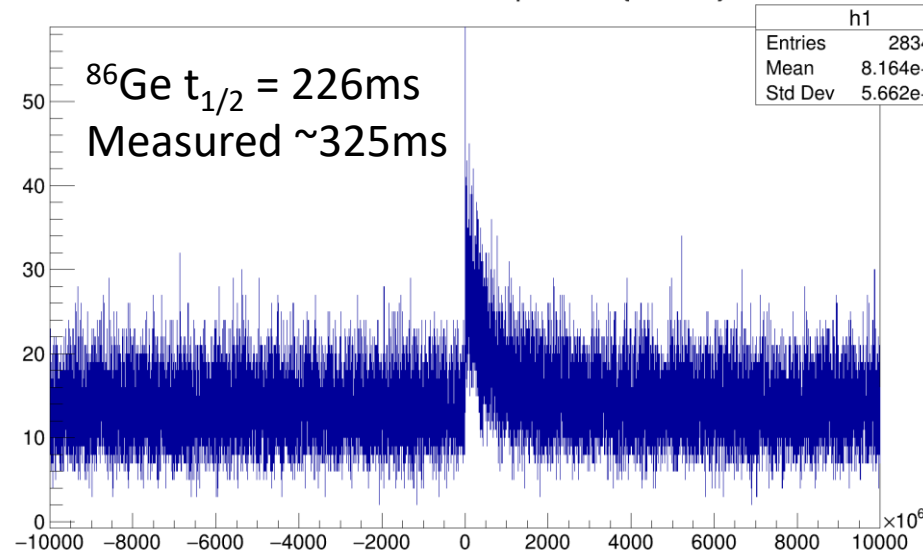
$^{84}\text{Ge } t_{1/2} = 954\text{ms}$   
Measured  $\sim 1010\text{ms}$

beta.T-beta.vectorOfImp.TIME {CUTG}



$^{85}\text{Ge } t_{1/2} = 503\text{ms}$   
Measured  $\sim 760\text{ms}$

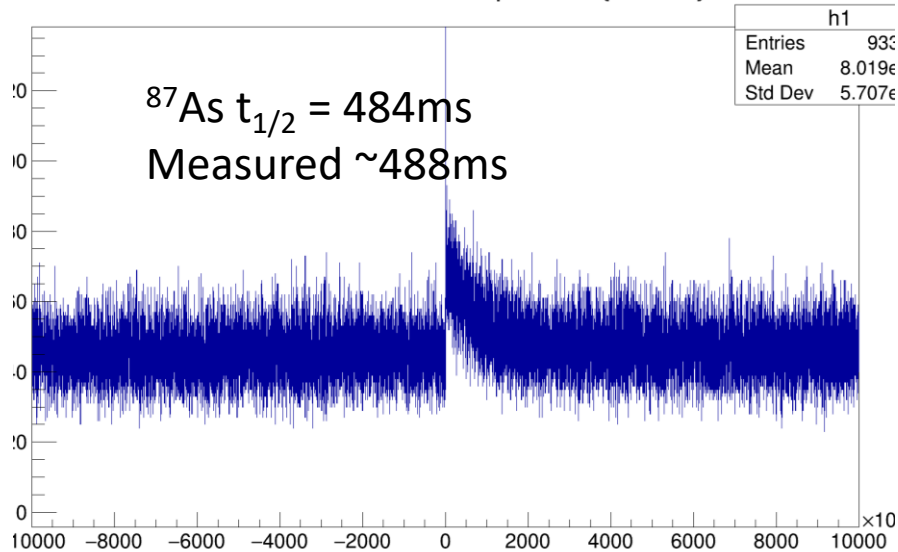
beta.T-beta.vectorOfImp.TIME {CUTG}



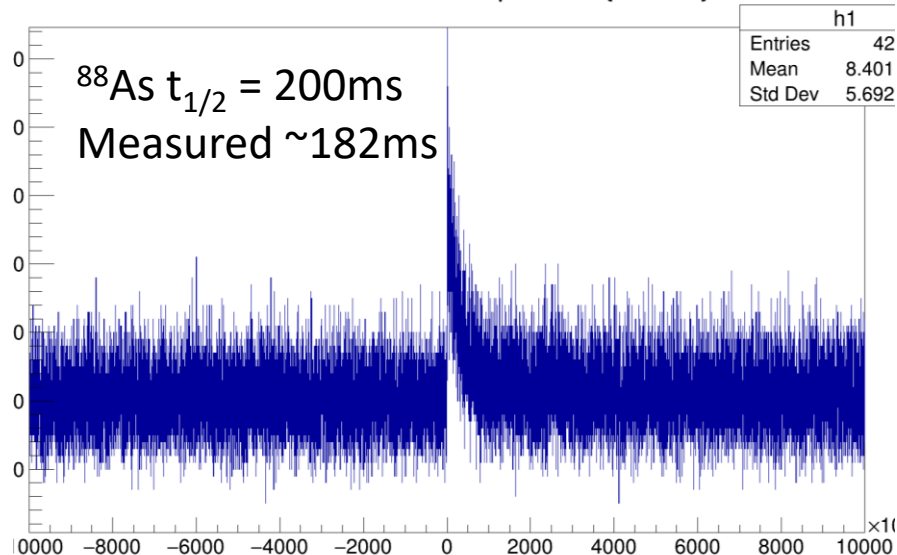
$^{86}\text{Ge } t_{1/2} = 226\text{ms}$   
Measured  $\sim 325\text{ms}$

# As Decay Curves

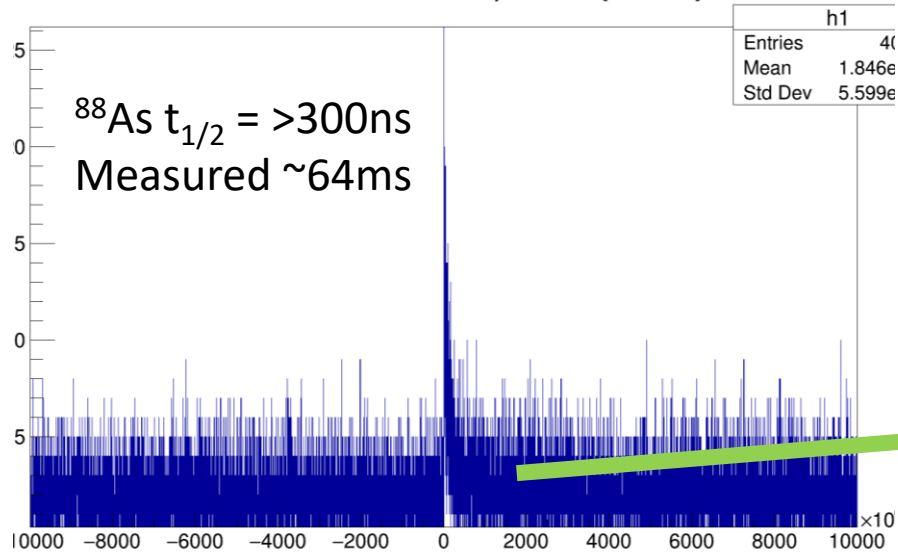
beta.T-beta.vectorOfImp.TIME {CUTG}



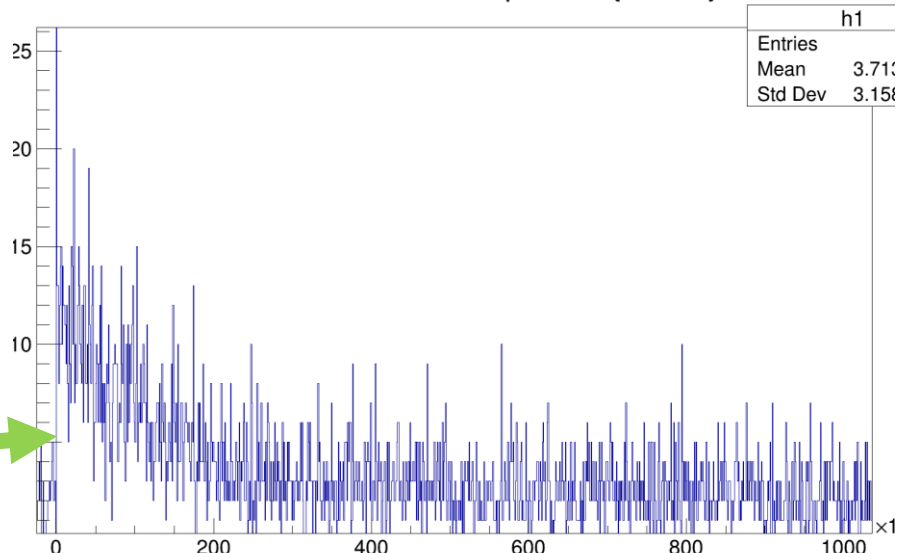
beta.T-beta.vectorOfImp.TIME {CUTG}



beta.T-beta.vectorOfImp.TIME {CUTG}



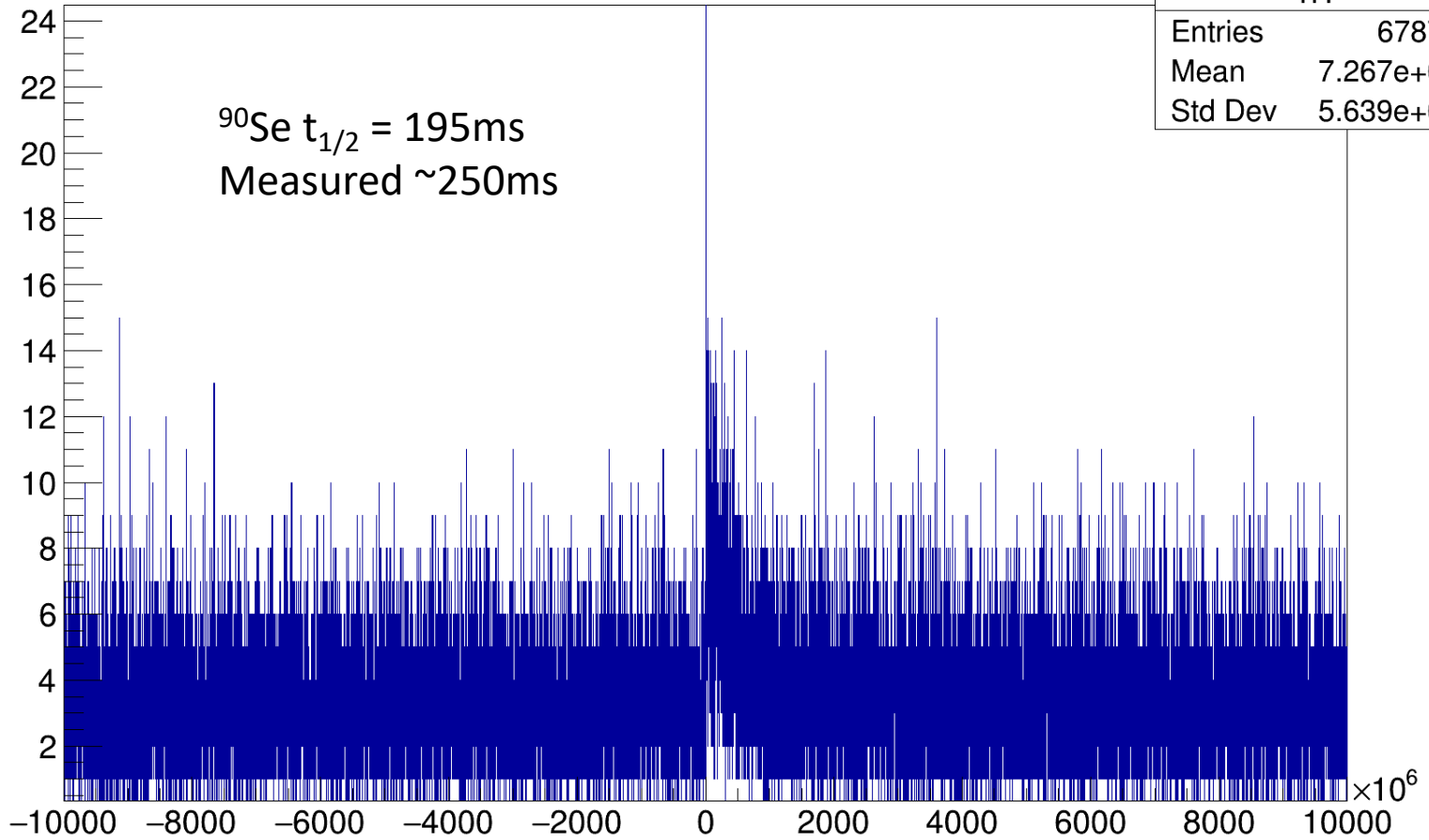
beta.T-beta.vectorOfImp.TIME {CUTG}





# Se Decay Curve

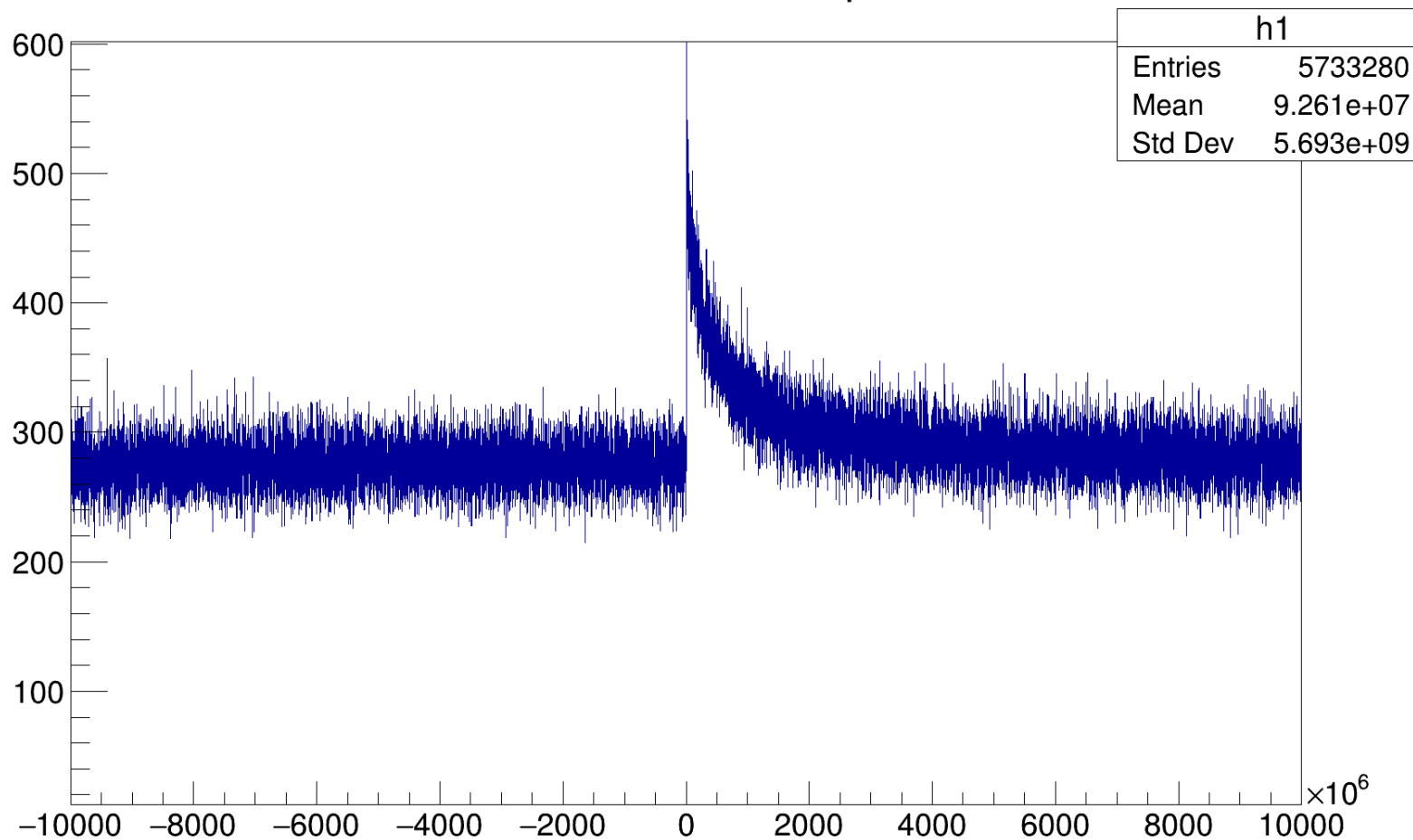
beta.T-beta.vectorOfImp.TIME {CUTG}



# Sum Correlation – Every Beta Correlated with all Ions

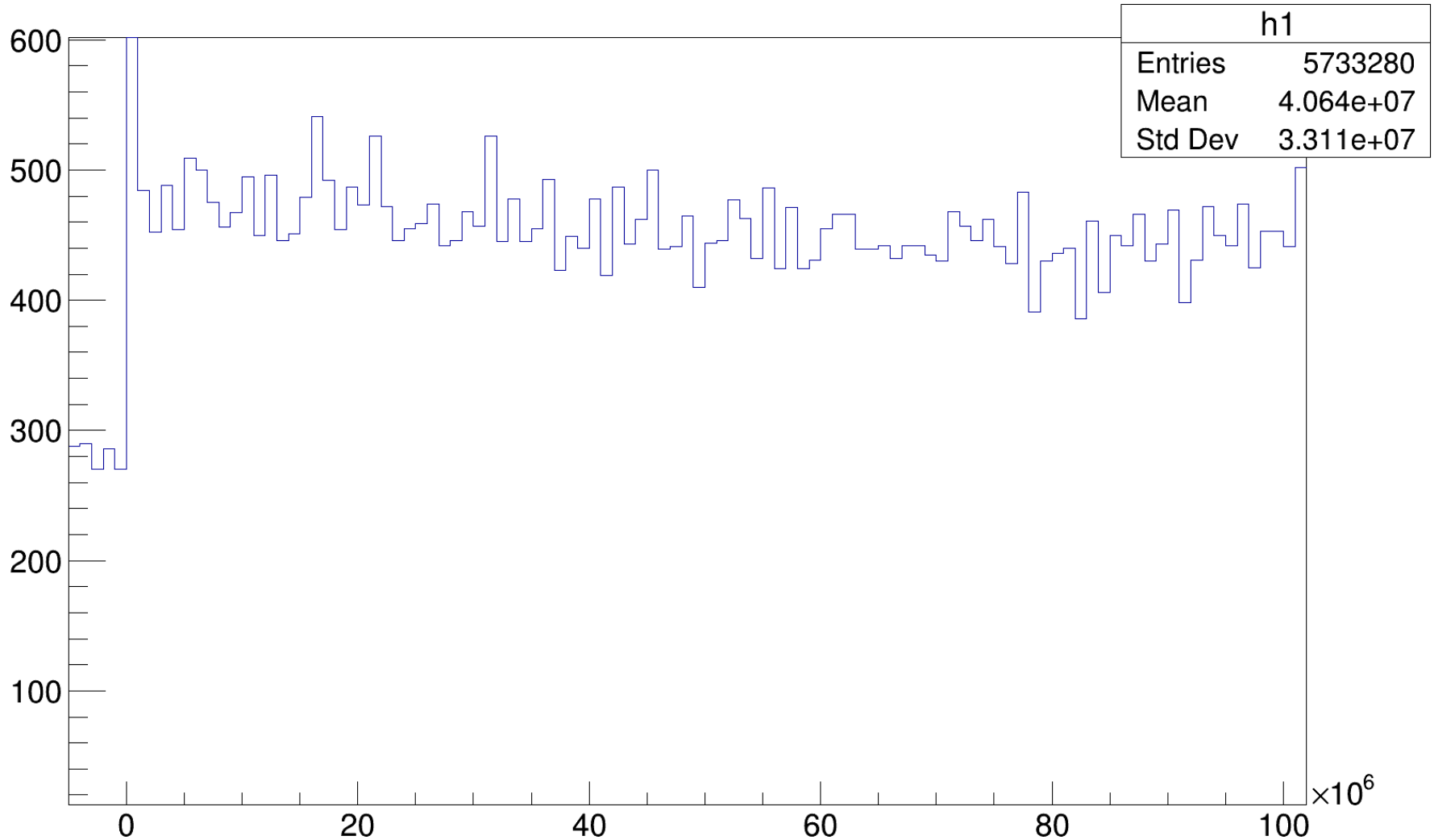
All beta correlations, no particle ID in curve

beta.T-beta.vectorOfImp.TIME



# Sum Correlation – Every Beta Correlated with all Ions

## beta.T-beta.vectorOfImp.TIME



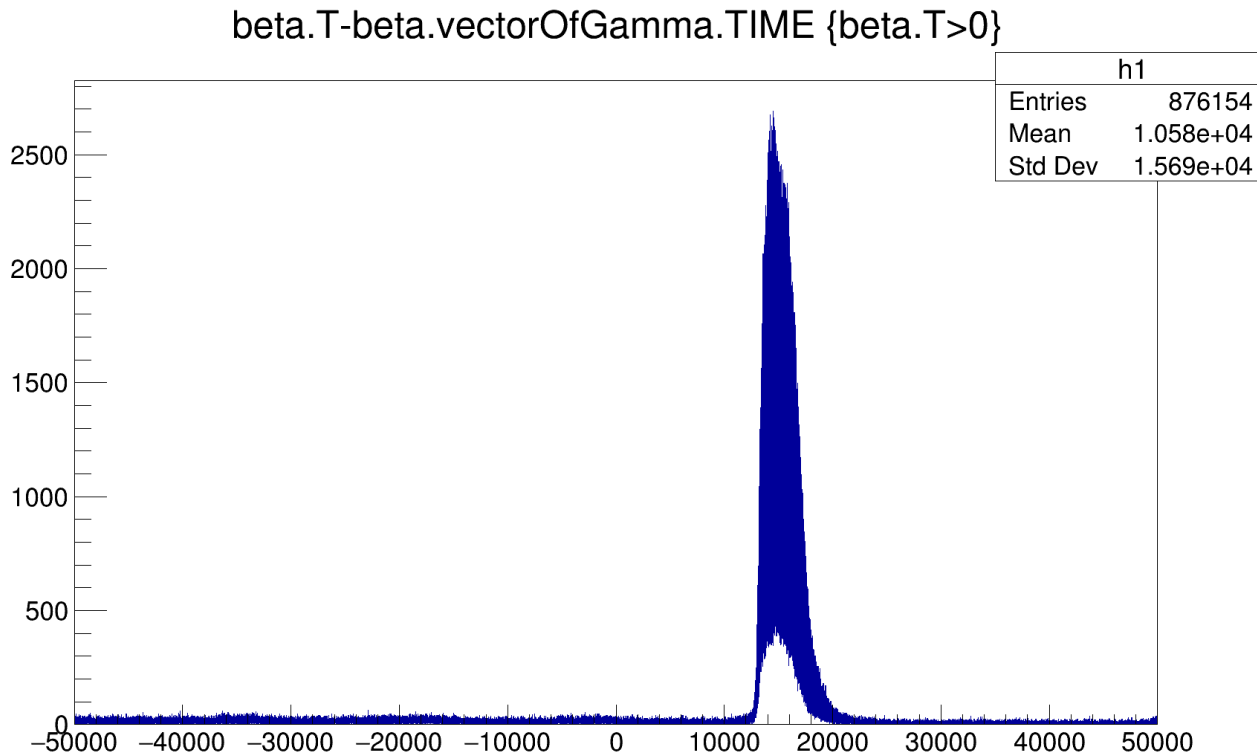
# Beta-Gamma Correlation

Betas and Gammas show a prompt correlation peak between 12000 and 20000us

Peak is not corrected for multiplexed read out

Despite AIDA being ~20cm downstream from the centre of the clovers correlations still observed though efficiency will be poor

Highest yield observed is  $^{84}\text{Ge}$  in AIDA



# Particle gated $^{84}\text{Ge}$ Gamma Spectrum

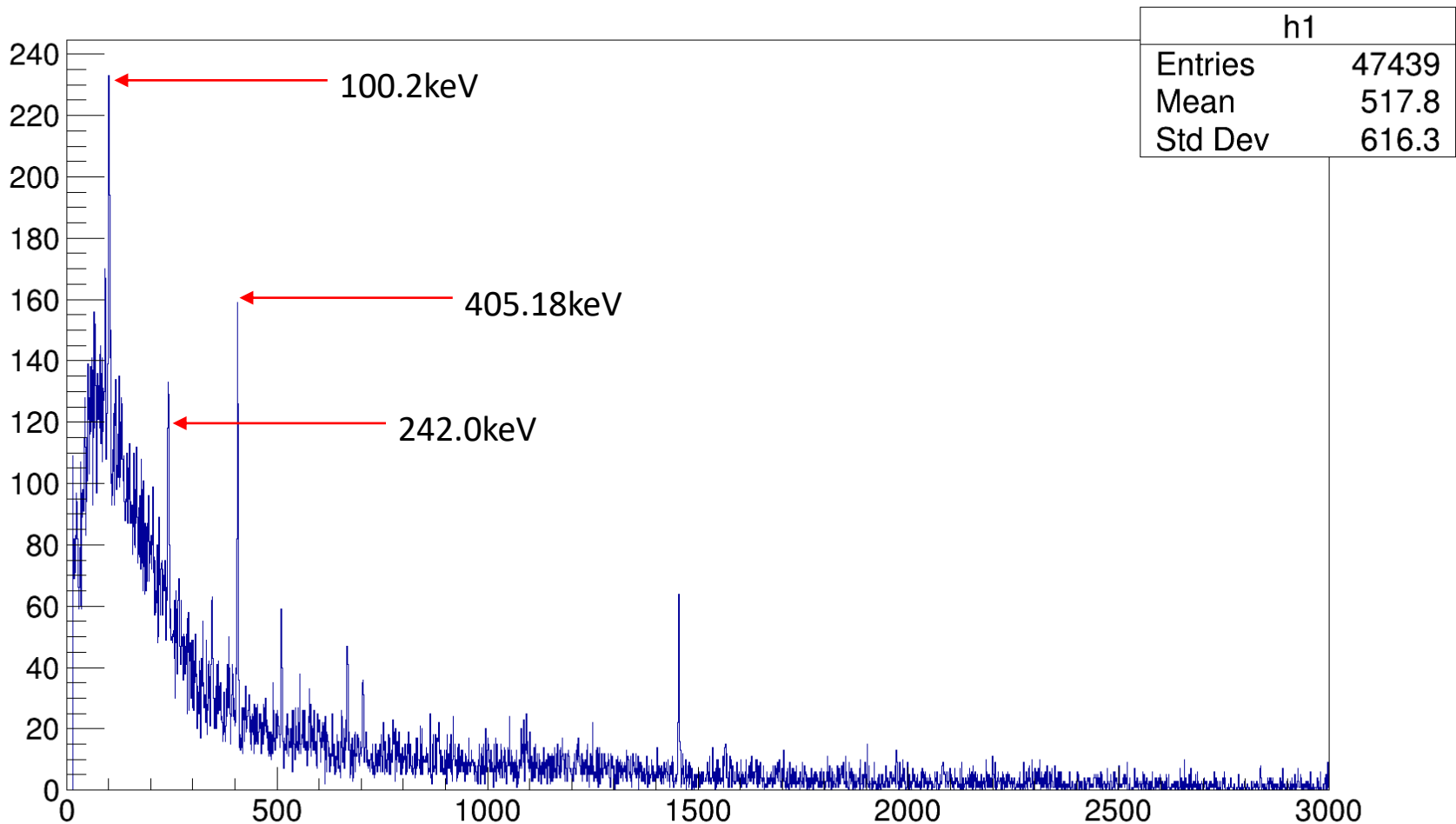
Prompt gammas within the 12-20us window

Many  $^{84}\text{Ge}$  lines visible. Highest intensity are the 100.2keV and 242.0keV with relative intensities of 41 and 55 respectively

405.18keV line is from the decay of  $^{83}\text{Ge}$  and  $\beta\text{n}$  of  $^{84}\text{Ge}$  populating states in  $^{83}\text{As}$ .

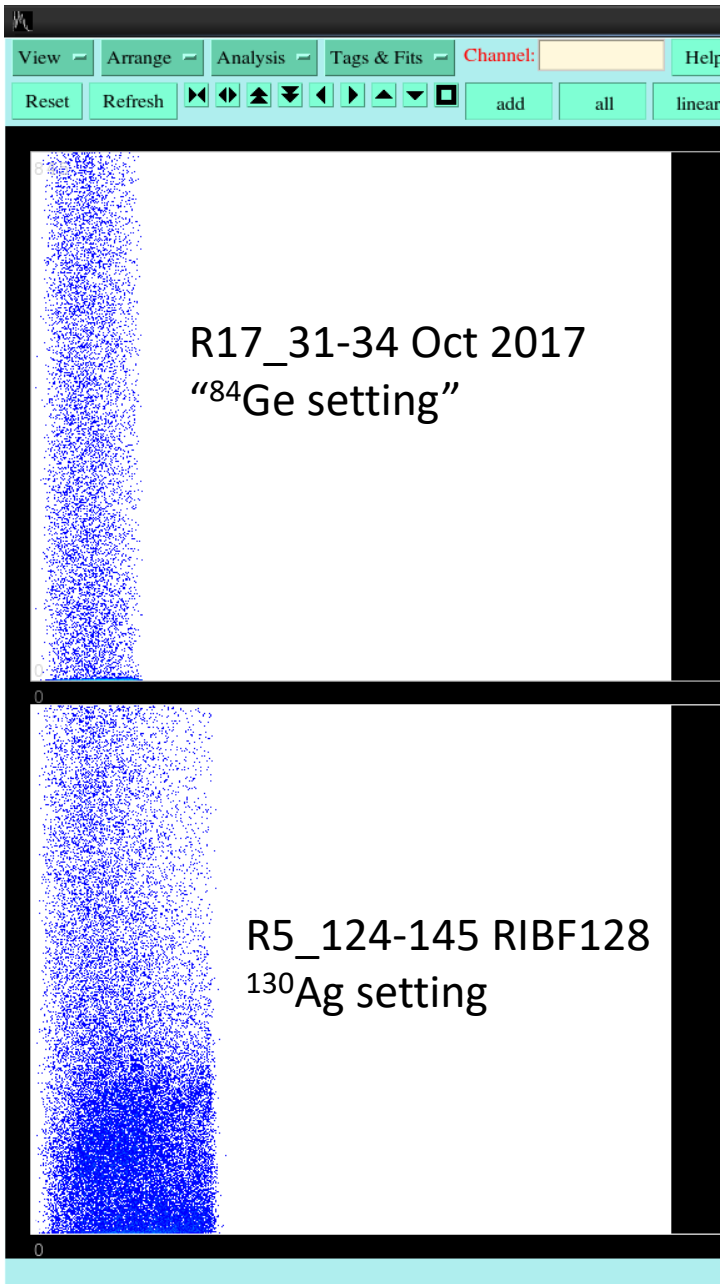
Prevalent as background across most isotopes

`beta.vectorOfGamma.EN {beta.T>0 && (beta.T-beta.vectorOfGamma.TIME)>12e3 && (beta.T-beta.vectorOfGamma.TIME)<20e3 && CUTG}`



# Comparisons to June 2017

# Implant Energies vs Time



Time is implant-beta decay correlation time, per pixel, no particle ID and no software thresholds.

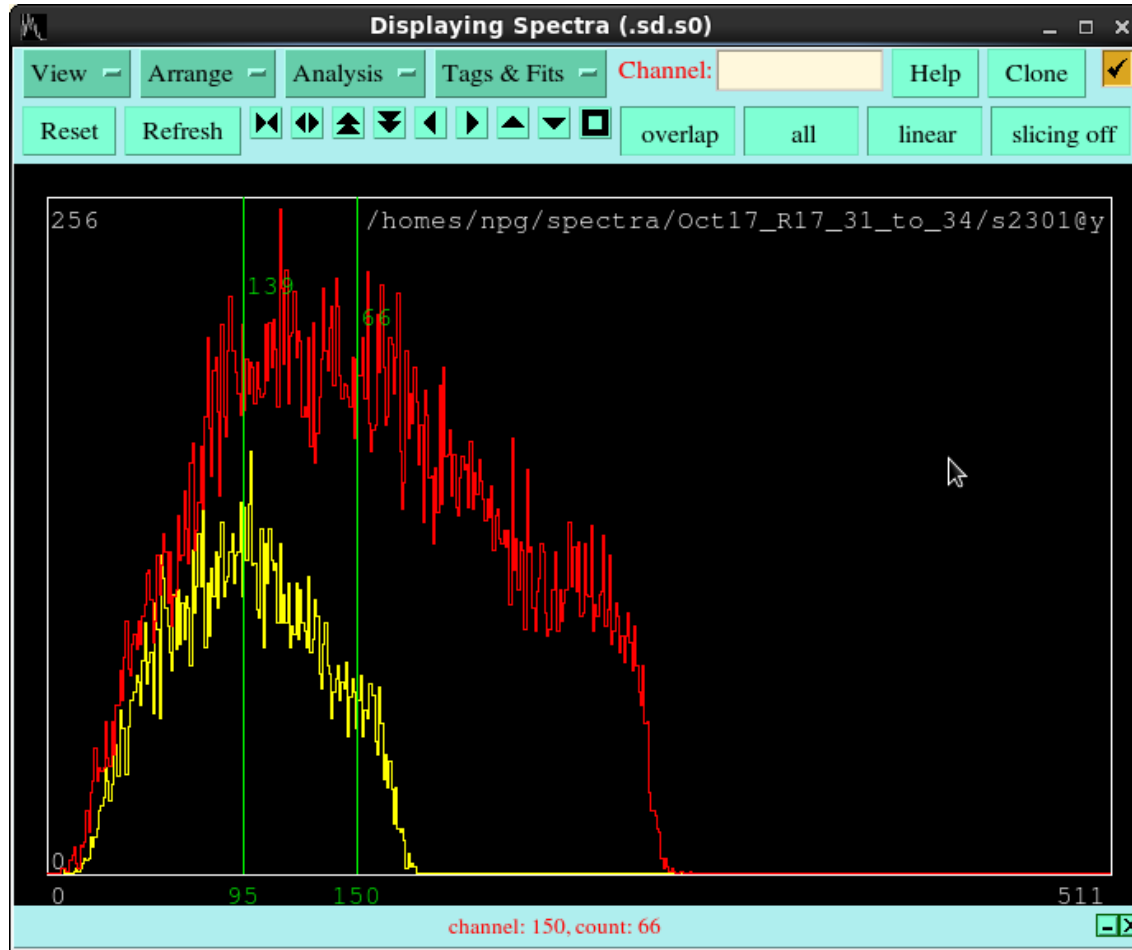
R17 shows a uniform field for energies vs time

RIBF128 shows a bump in the spectra shown as the increased density of points in the lower quarter of the spectra

y axis has binning of 163.84 $\mu$ s per channel.  
X axis is 20MeV per channel

If “20ms bump” were present we would have observed it at the implantation energies of October test

# Implantation Energies



Energy deposited by implants in the stopping layer of the DSSD stack  
20MeV per channel.

Red R5\_124-145 RIBF128  $^{130}\text{Ag}$  setting

Yellow R17\_31-34 Oct17 " $^{84}\text{Ge}$  setting"

Overlap of energies. If we were going to observe bump it would have been in the test.



## Evidence of 20ms Bump

Per pixel correlation implant-beta time correlation ( $163.84\mu\text{s}$  per channel) with no software thresholds and no PID.

Red RIBF128 R5\_124-154  $^{130}\text{Ag}$  setting.

Yellow R17\_31-34 Oct17 " $^{84}\text{Ge}$  setting".

Bump appears around 20ms in the red but not present in yellow.

