1. Identify Bad Channels
2. Timing Calibration

Lei Zheng
02/27/2019

Data

Run_0265.dat.24-07-18_20h22m45s

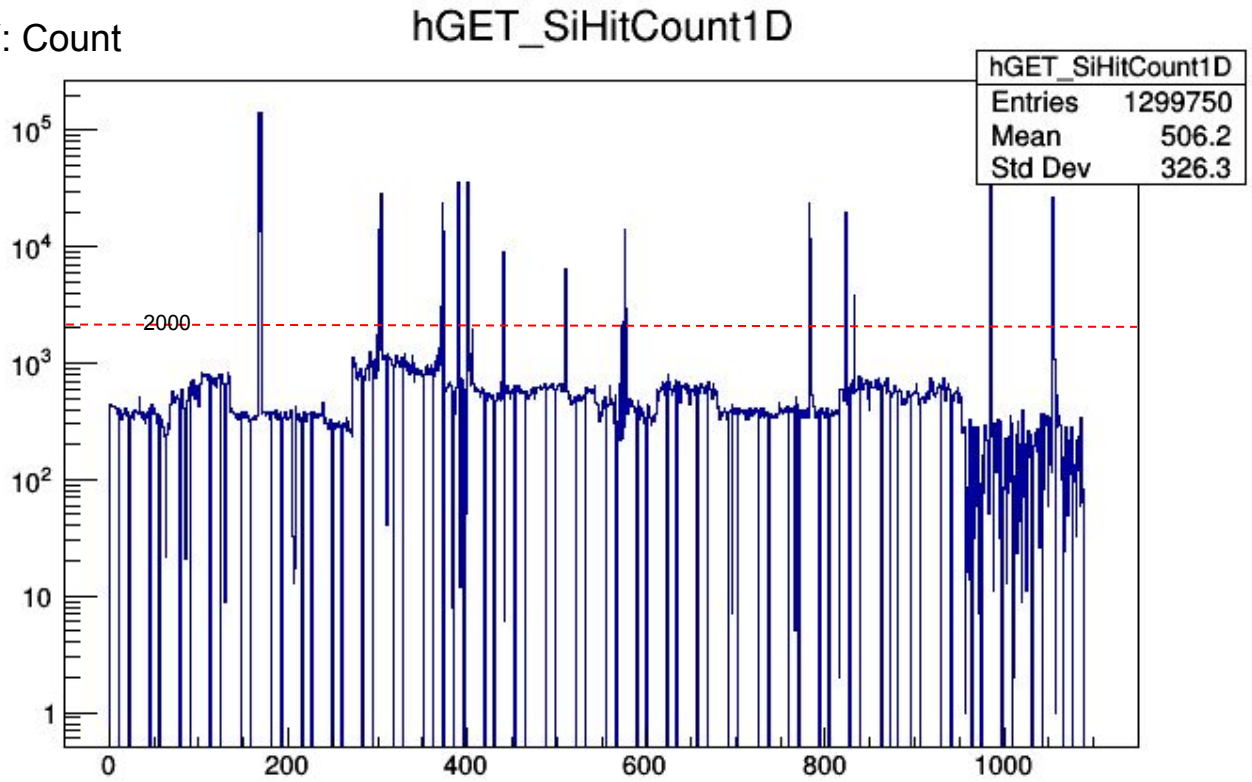
This run is gas-in run and contains 11 datafiles in total

Collected in 24/07/2018

1. Identify Bad Channels
   1.1 Identify bad channels, Si
   1.2 Identify bad channels, CsI

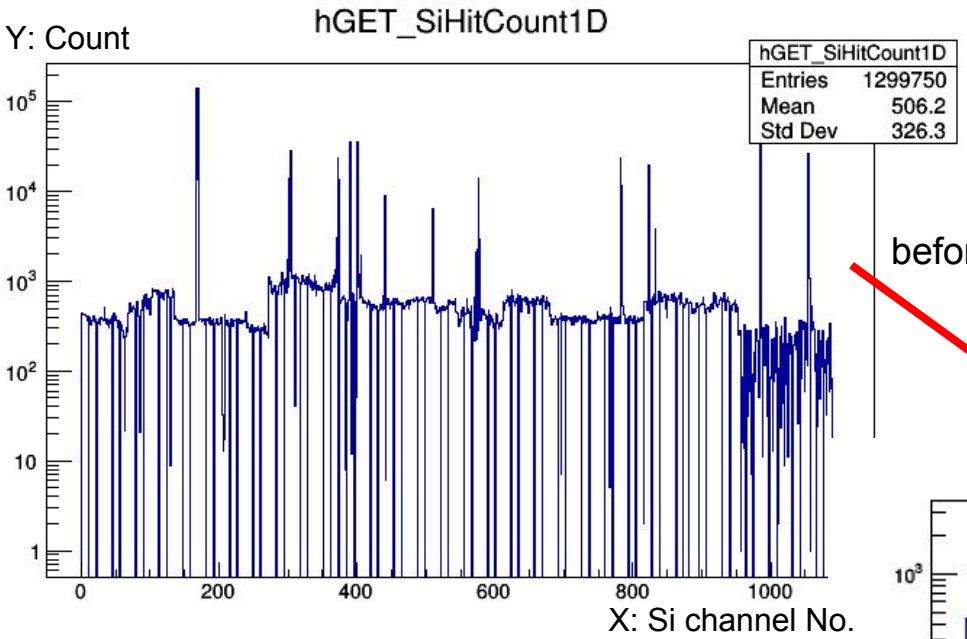
Some possible busted channels(strips) in Si detectors

Y: Count



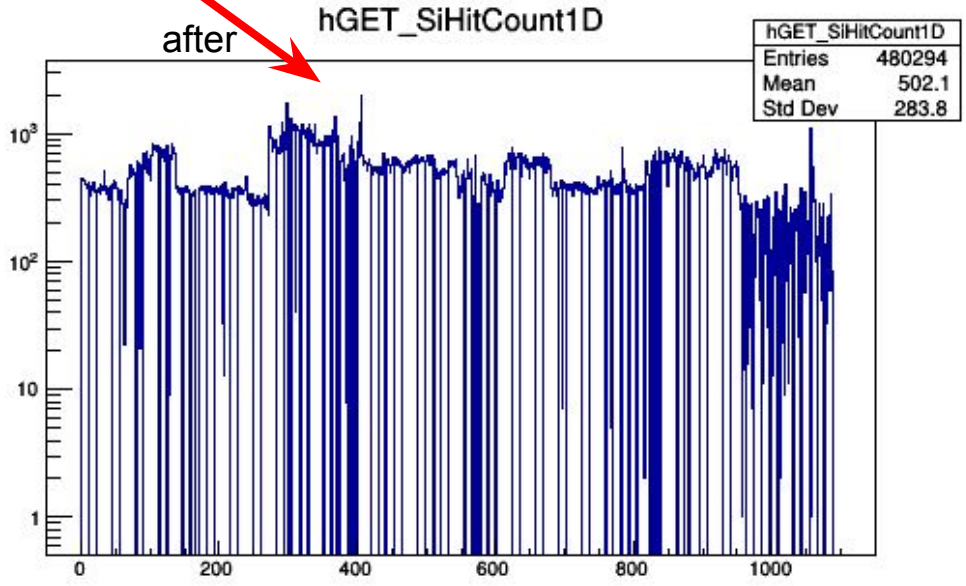
X: Si channel No.

Bin	CoBo	AsAd	Aget	Chan
166	0	0	2	30
167	0	0	2	31
168	0	0	2	32
169	0	0	2	33
300	0	1	0	28
302	0	1	0	30
304	0	1	0	32
305	0	1	0	33
370	0	1	1	30
372	0	1	1	32
374	0	1	1	34
390	0	1	1	50
400	0	1	1	60
440	0	1	2	32
510	0	1	3	34
572	0	2	0	28
574	0	2	0	30
576	0	2	0	32
577	0	2	0	33
782	0	2	3	34
783	0	2	3	35
822	0	3	0	6
823	0	3	0	7

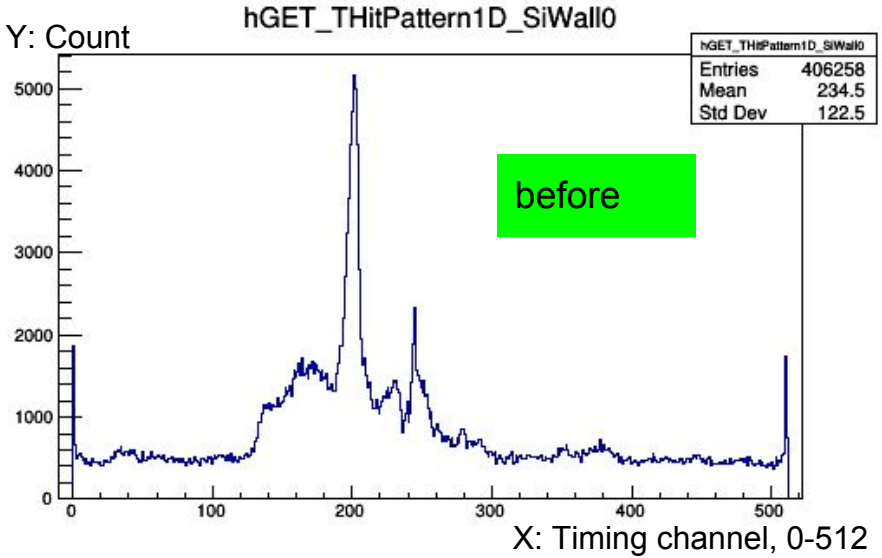


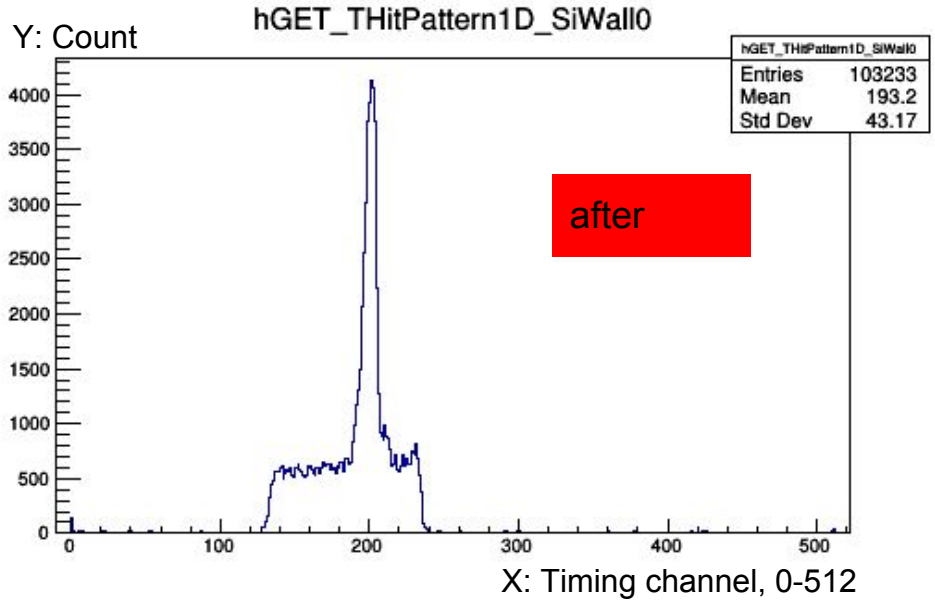
before

after



Timing of Si_Wall0,
before and after removing bad channels





1. Identify Bad Channels
    1.1 Identify bad channels, Si
    1.2 Identify bad channels, CsI

Event Count for ALL CsI Crystals

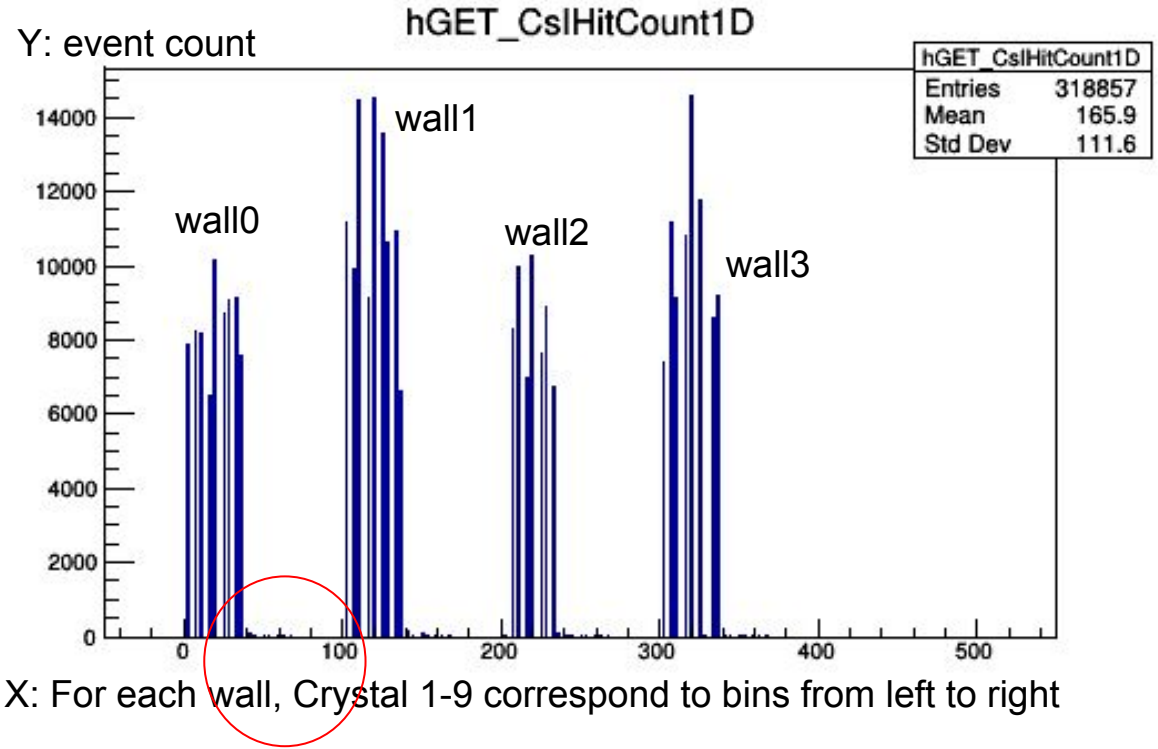
Wall0: 9 Crystals all work

Wall1: 9 Crystals all work

Wall2: 7 Crystals work,
2 crystals are dead

Wall3: 8 Crystals work,
1 crystal is dead

No HOT channels



2. Timing Calibration

2.1 Timing Calibration, Si

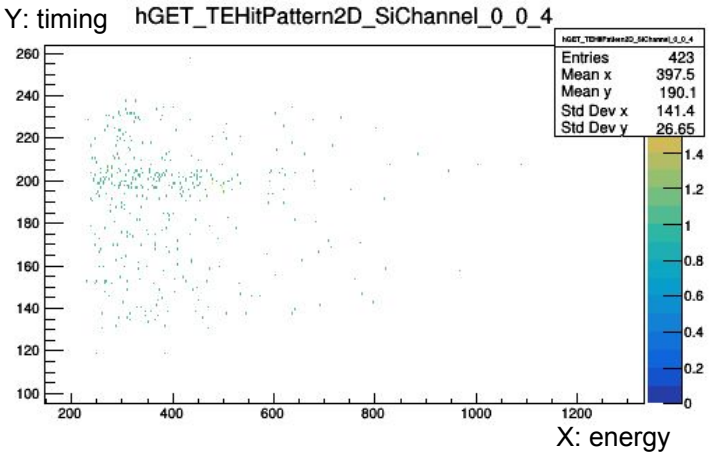
2.2 Timing Calibration, CsI

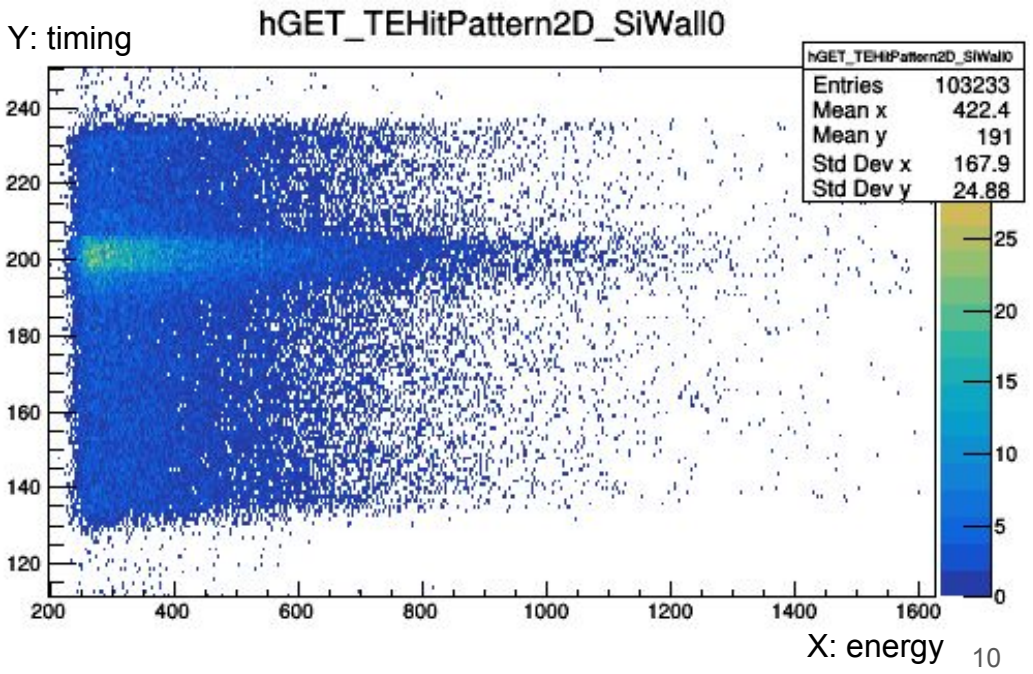
2.1 Timing of Si

TvsE plots: Observed timing doesn't have an energy dependence.

Left: one Si strip in Wall0

Right: Si Wall0



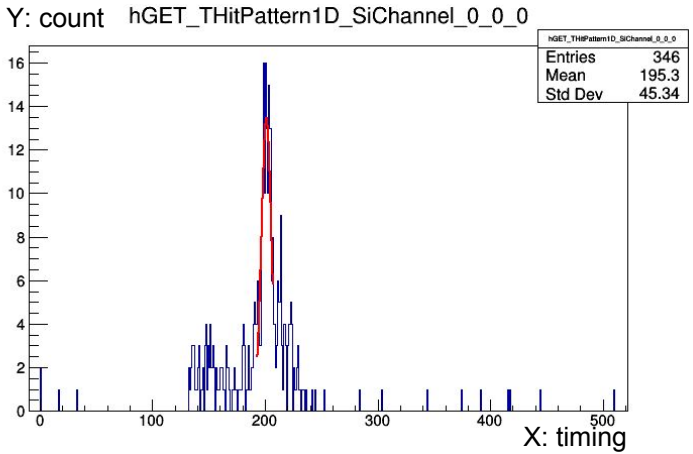


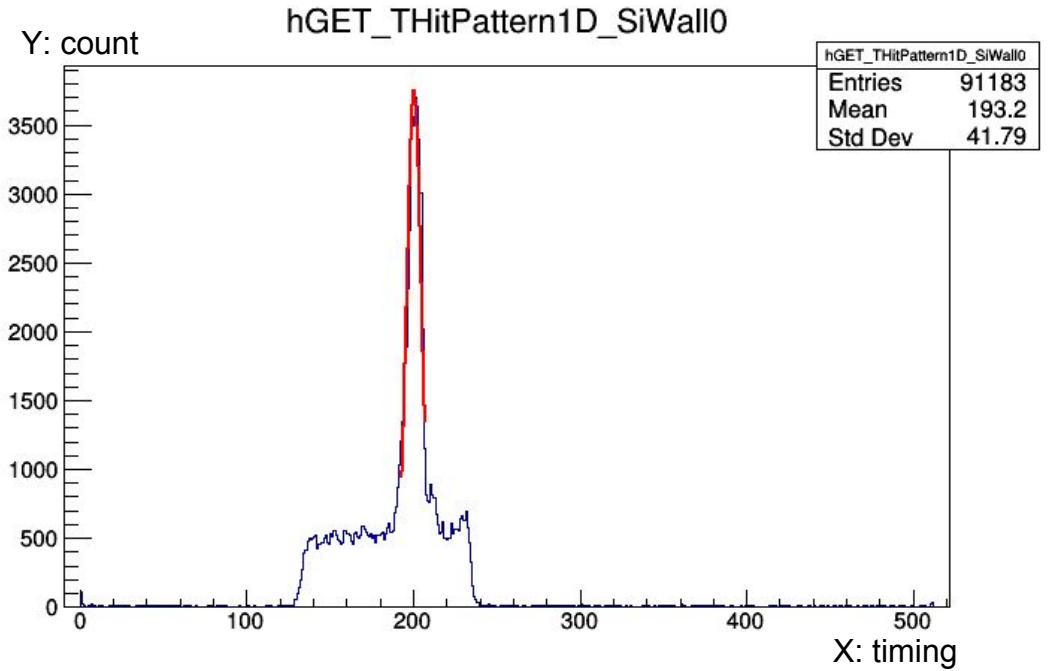
2.1 Timing of Si

Timing plots

Left: one Si strip in Wall0

Right: Si Wall0





	mean	m_error	sigma	s_error
Si0_0	201.2	0.6	4.4	0.7
wall 0	200.52	0.03	4.48	0.04

Fitting of Timing

	mean	m_error	sigma	s_error
Si0_0	201.2	0.6	4.4	0.7
wall 0	200.52	0.03	4.48	0.04
Si1_0	202.6	0.4	4.6	0.4
wall 1	202.24	0.04	5.03	0.04
Si2_0	203.0	0.6	3.6	0.5
wall 2	203.22	0.09	5.95	0.08
Si3_0	202.8	0.7	5.3	0.9
wall 3	202.67	0.07	5.38	0.07

It looks like there is evidence of variation within Wall2.

Conclusion:

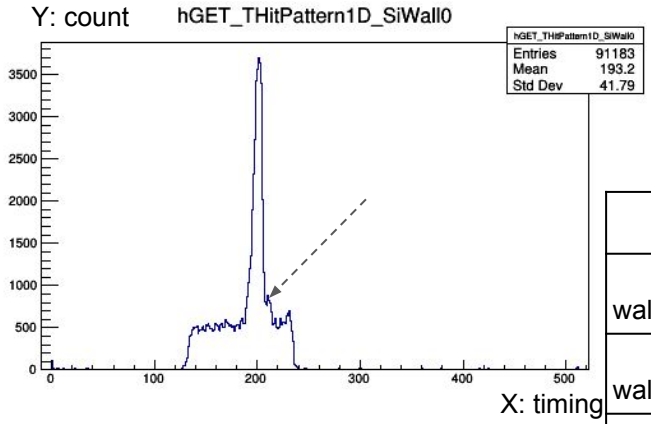
1. **Different calibration constants for each wall**
2. **The fitting result of a wall is consistent with the strips that belong to it**

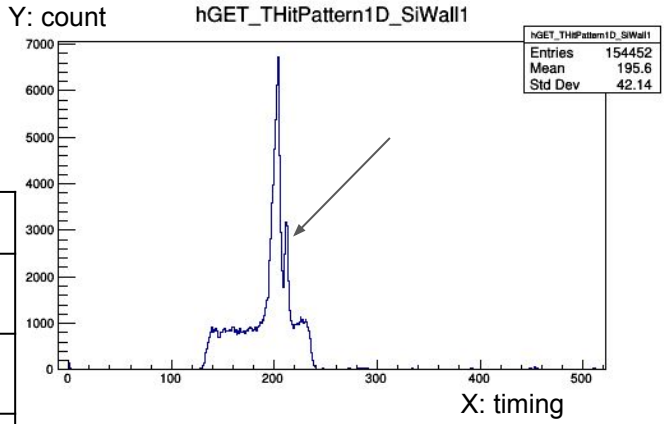
Calibration in the code

Wall0: 200.52
Wall1: 202.24
Wall2: 203.22
Wall3: 202.67

	Mean	Sigma
Wall 0	200.52	4.48
Wall 1	202.23	5.03
Wall 2	203.22	5.95
Wall 3	202.67	5.38

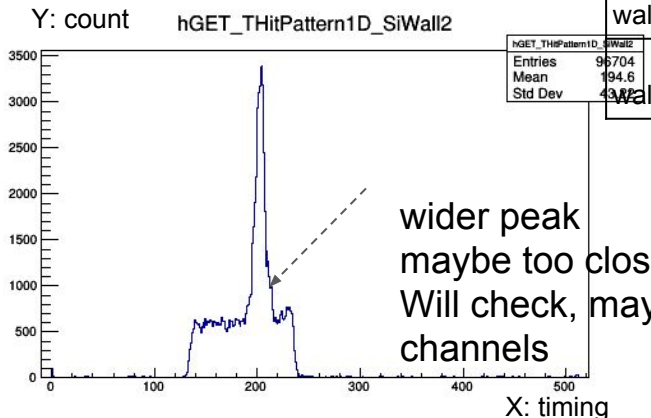
Before Correction



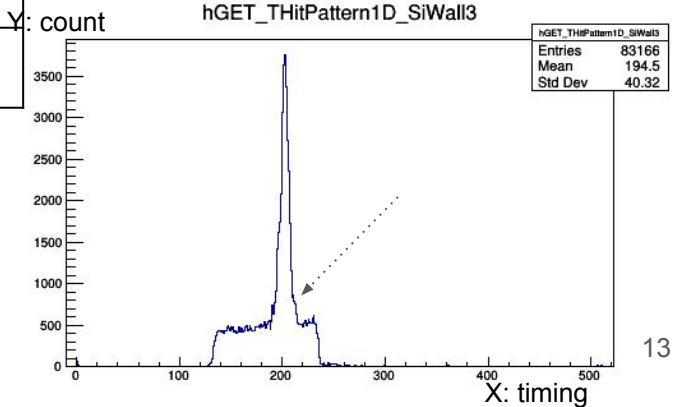


	mean	m_error	sigma	s_error
wall 0	200.52	0.03	4.48	0.04
wall 1	202.24	0.04	5.03	0.04
wall 2	203.22	0.09	5.95	0.08
wall 3	202.67	0.07	5.38	0.07

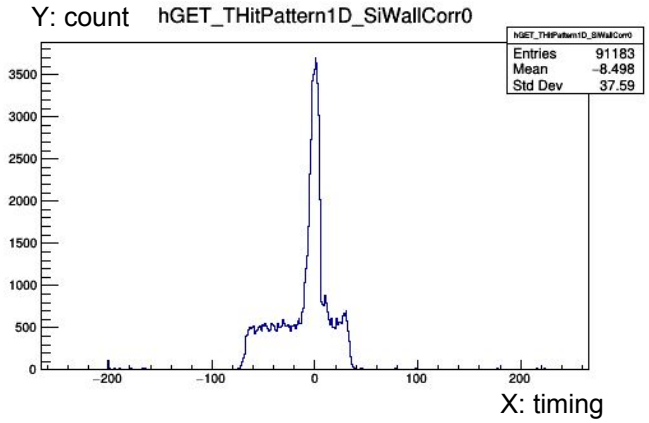
correction factor

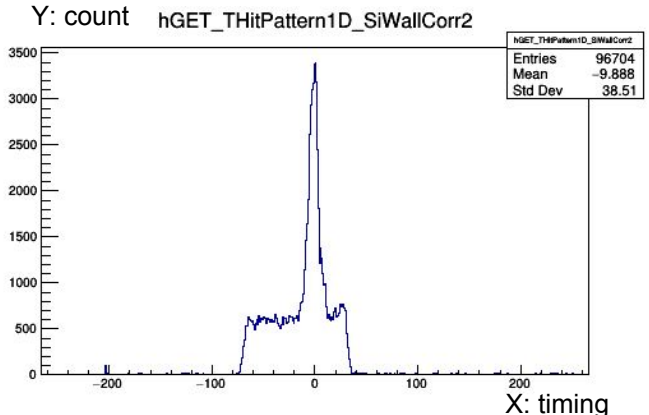


wider peak
maybe too close to the main peak
Will check, maybe due to individual channels



After Correction

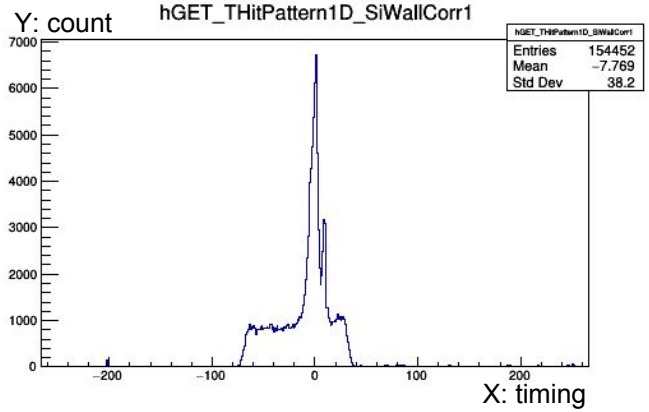


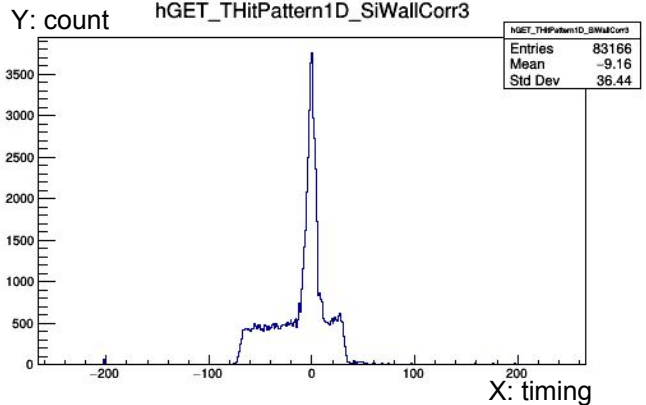


T_corr = T_obs - C_wall

	mean	m_error	sigma	s_error
wall 0	-0.55	0.03	4.37	0.03
wall 1	-0.87	0.02	4.71	0.03
wall 2	-1.30	0.04	5.20	0.05
wall 3	-0.67	0.03	4.53	0.03

still figuring out why the peaks aren't exactly at zero





2. Timing Correction

2.1 Timing Calibration, Si

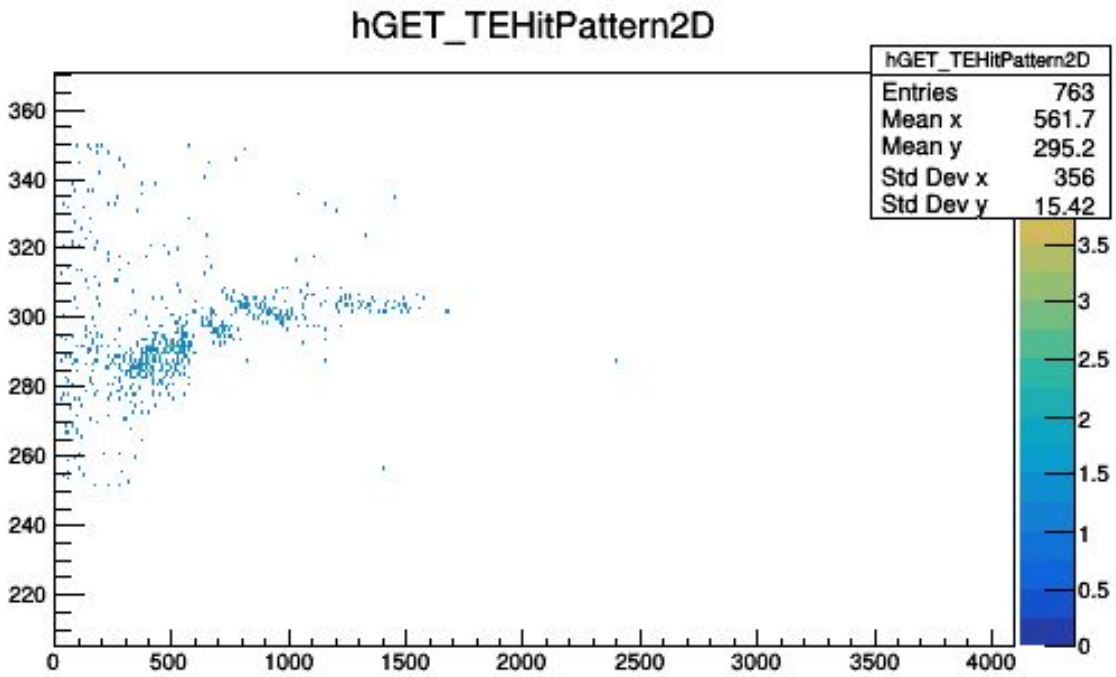
2.2 Timing Calibration, CsI (In Progress)

TvsE for CsI_0_1

Tendency:

t_corr = t_obs + C_0wall + C_1wall/E

Will use this equation as correction for timing calibration



X: Energy Y: Timing

Next: Correlations

Si_X, Si_Y and Csi.

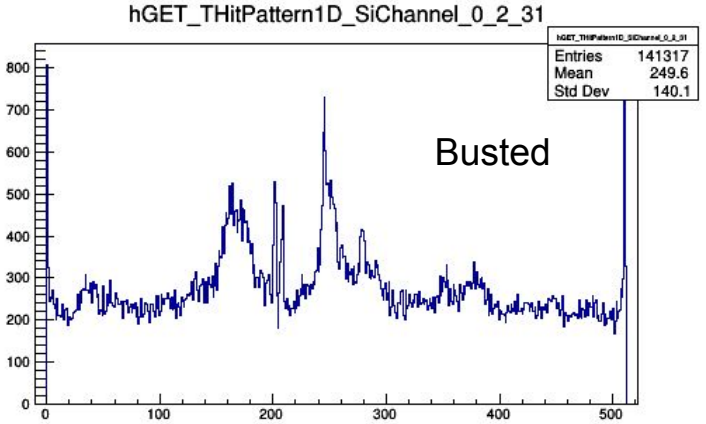
- Within Si_X, show

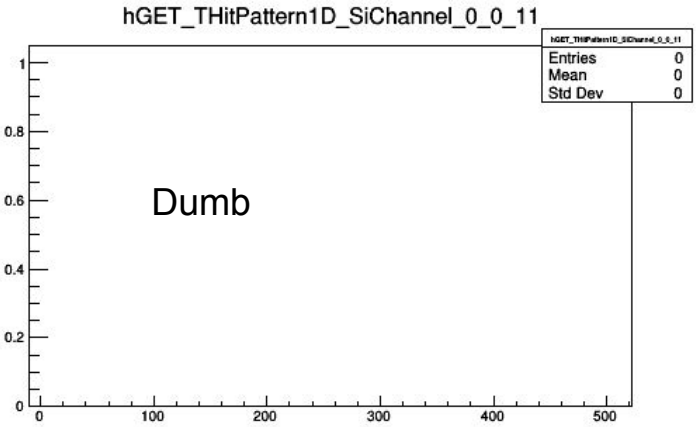
Appendix

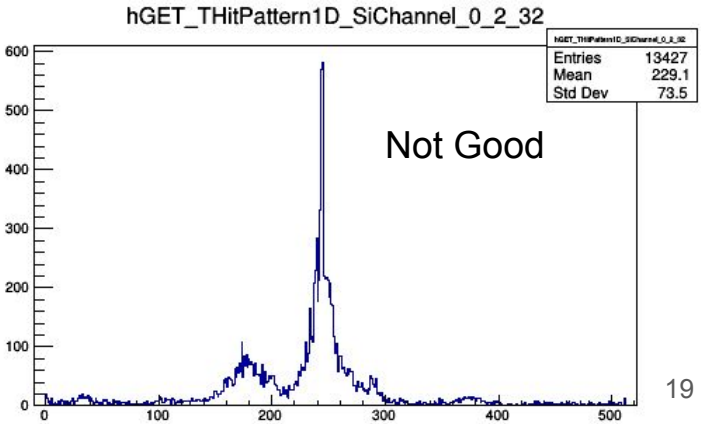
1. Plots of bad channels, Si and CsI
2. Checked Si_Multiplicity 2, where the 2 hits come from
3. Timing plots of CsI before and after calibration

Timing of Single Si Strips, BAD

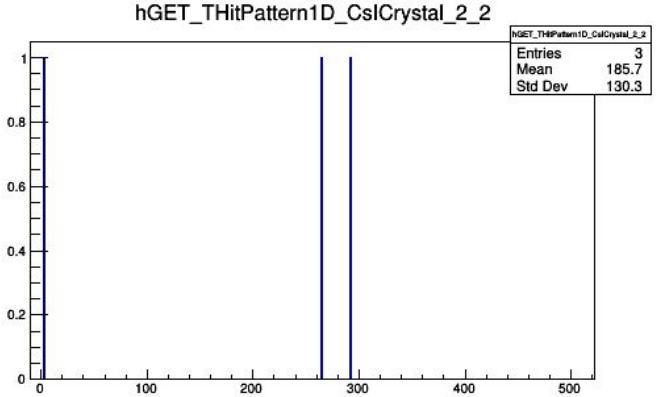
X-axis: Timing channels, 0-512

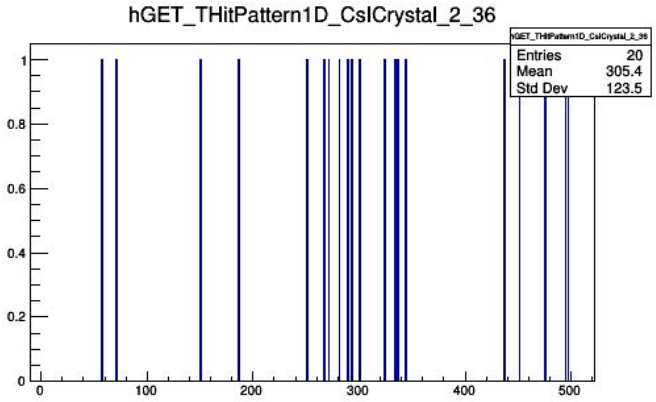


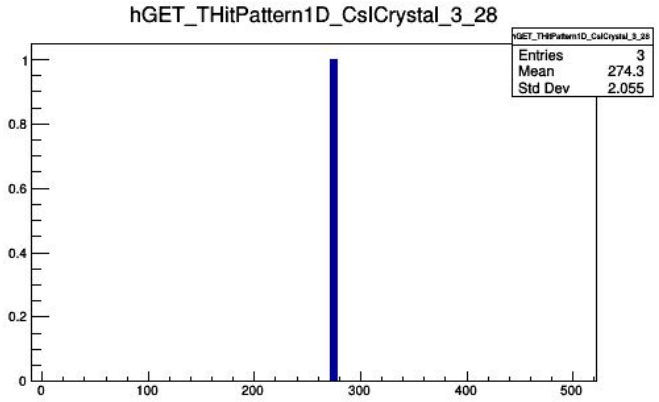




Timing of Single CsI Crystals, BAD Channels



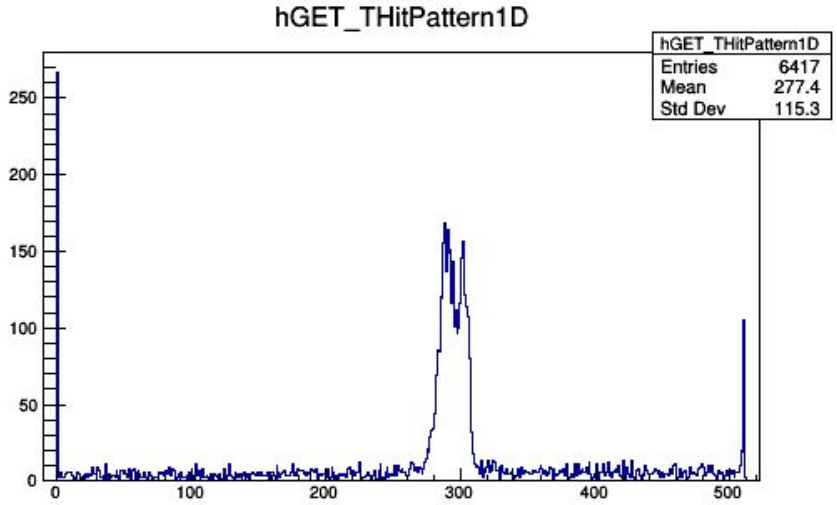


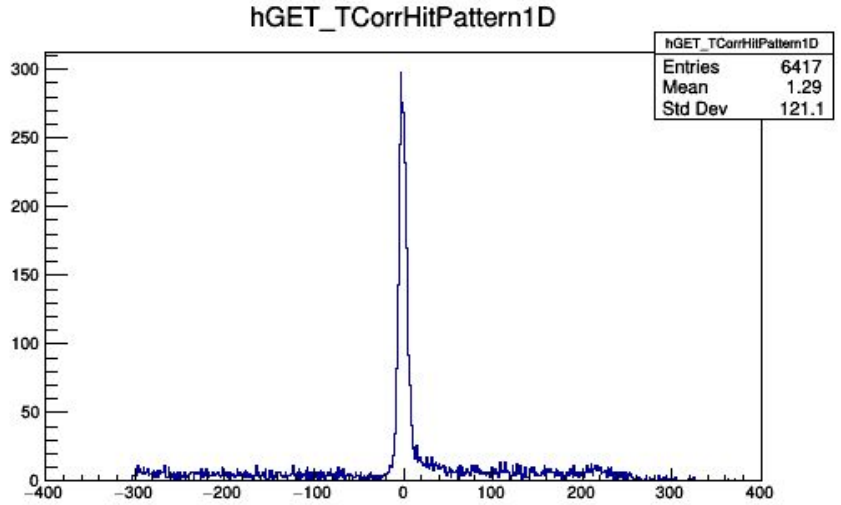


The numbers of Entry of these Channels(3, 3, 20) are extraordinarily smaller than others(~10^3)

BAD Channels: W2C1, W2C9, W3C7
(W for Wall and C for Crystal)

Timing of CsI_0_1, before and after calibration

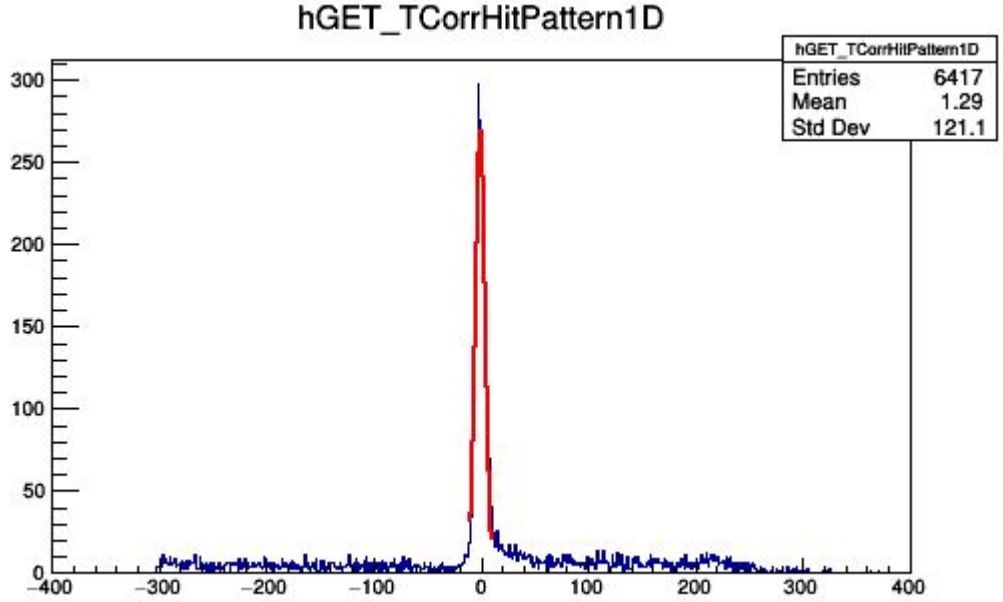




t_corr = t_obs - C_0wall - C_1wall/E

t_corr = t_obs - 310 - 8700/E

Timing of CsI_0_1 after calibration with fitting results



	mean	m_error	sigma	s_error
CsI0_0	-0.45	0.09	4.53	0.09

```
root [2] TF1 *f1= new TF1("f1","gaus", -10, 10)
(TF1 *) 0x4a875e0
root [3] hGET_TCorrHitPattern1D->Fit("f1","R")
 FCN=40.9571 FROM MIGRAD    STATUS=CONVERGED      67 CALLS          68 TOTAL
                     EDM=3.38688e-09    STRATEGY= 1      ERROR MATRIX ACCURATE
  EXT PARAMETER                                   STEP         FIRST
  NO.   NAME      VALUE            ERROR          SIZE      DERIVATIVE
```