



Effect of threshold on ToT and cluster size in Timepix1 test-beam data

Elena Firu

Institute of Space Science, Bucharest



□ Dependences of

- **MPV vs THL**
- **Mean vs THL**

for

a) **cluster size = 1, 2, 3, 4 and all clusters**

b) **WithoutCalibration, GlobalEnergyCalibration and PixelEnergyCalibration.**

c) **Can't fit the cluster size 3 and cluster size 4 hit distributions that's why also**

consider the mean.

□ Summary

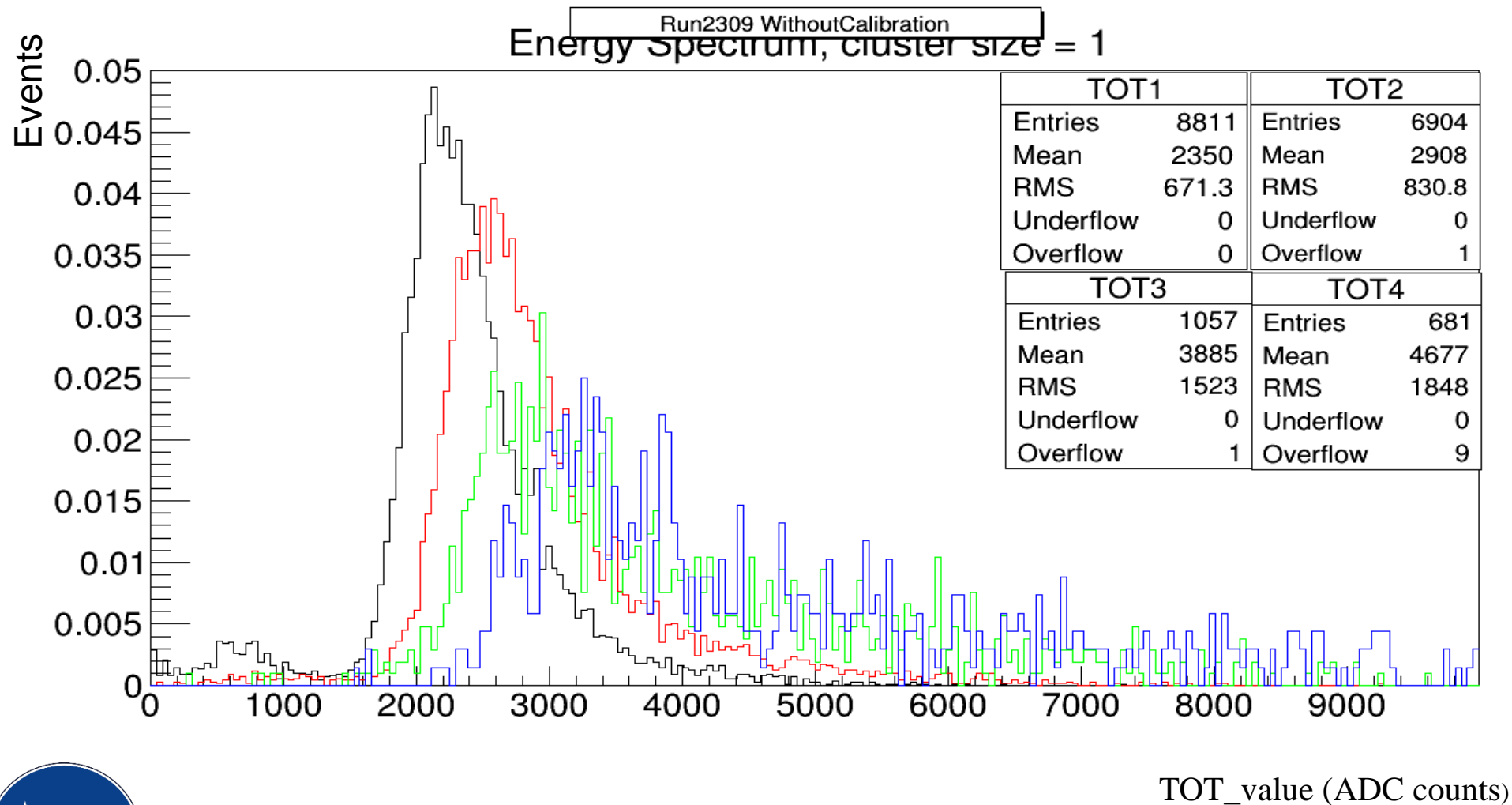
Note: I didn't make alignment.

Number of runs	28 (2300 ... 2364)
Sensor thickness [μm]	200
U_{bias} [V]	50
Threshold scan	Yes

The normal operating threshold was 435



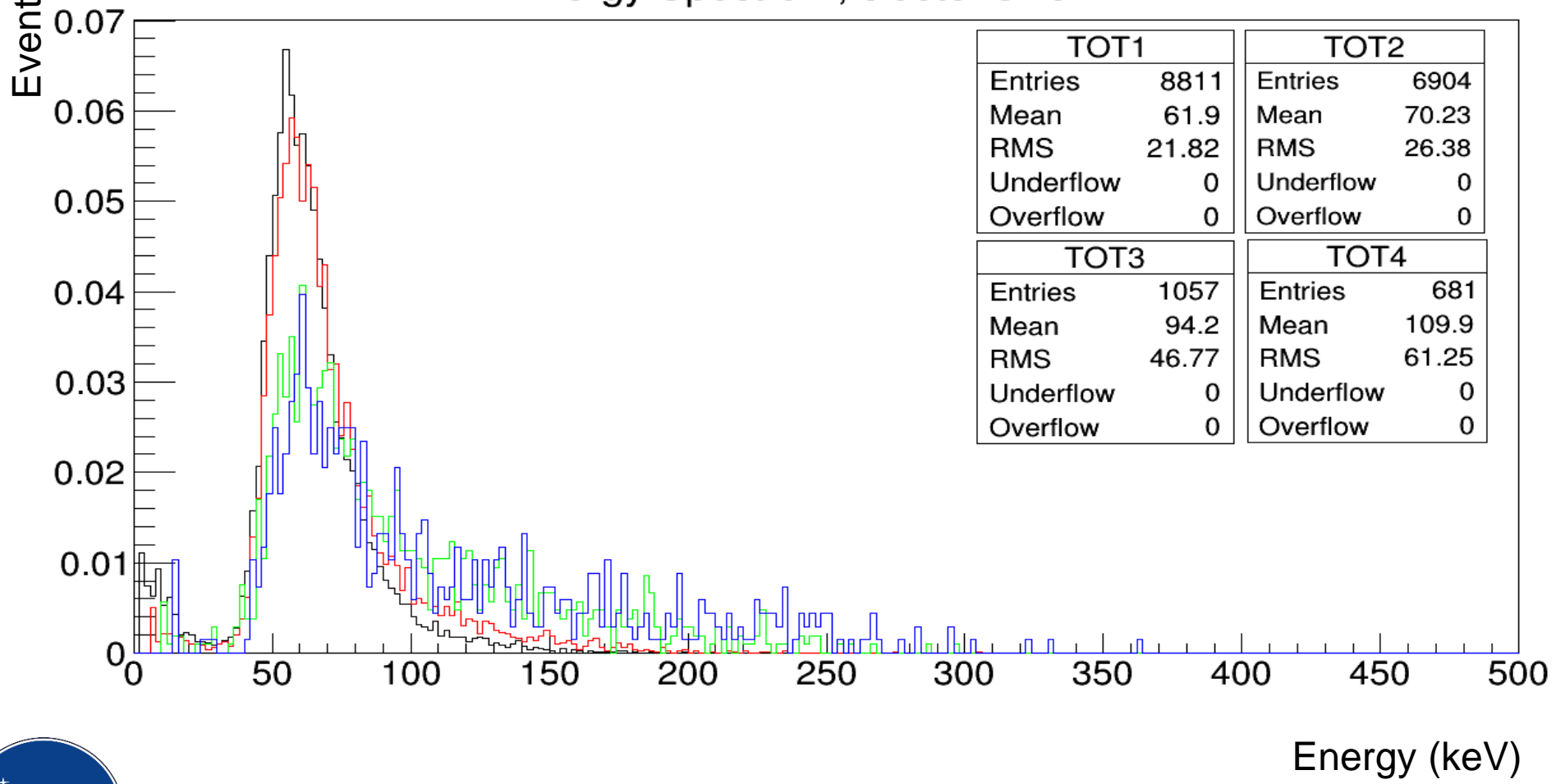
- Cluster size 1 (TOT1)
- Cluster size 2 (TOT2)
- Cluster size 3 (TOT3)
- Cluster size 4 (TOT4)





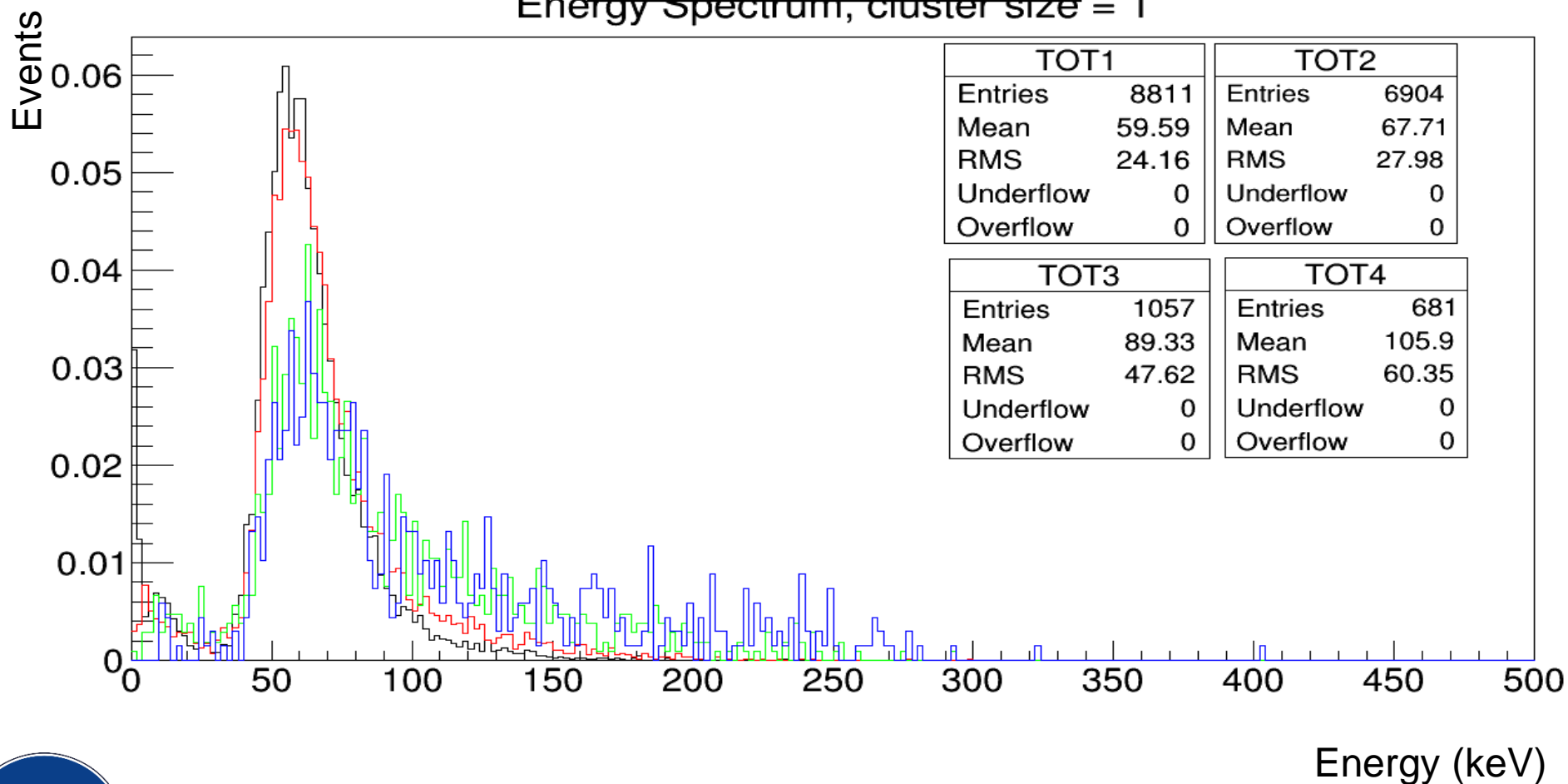
- Cluster size 1 (TOT1)
- Cluster size 2 (TOT2)
- Cluster size 3 (TOT3)
- Cluster size 4 (TOT4)

Run2309 GlobalCalibration
Energy Spectrum, cluster size = 1

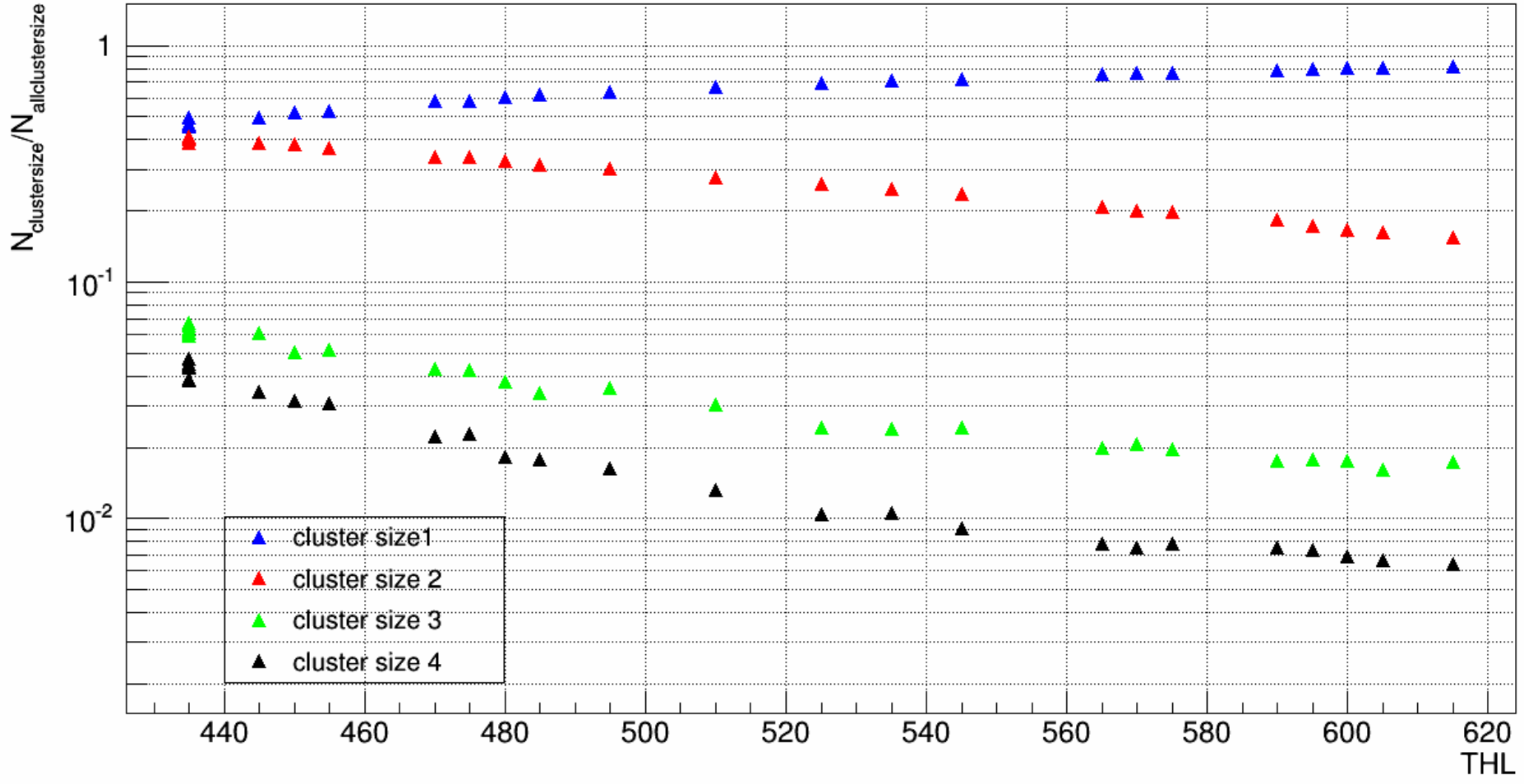


- Cluster size 1 (TOT1)
- Cluster size 2 (TOT2)
- Cluster size 3 (TOT3)
- Cluster size 4 (TOT4)

Run2309 PixelCalibration
Energy Spectrum, cluster size = 1

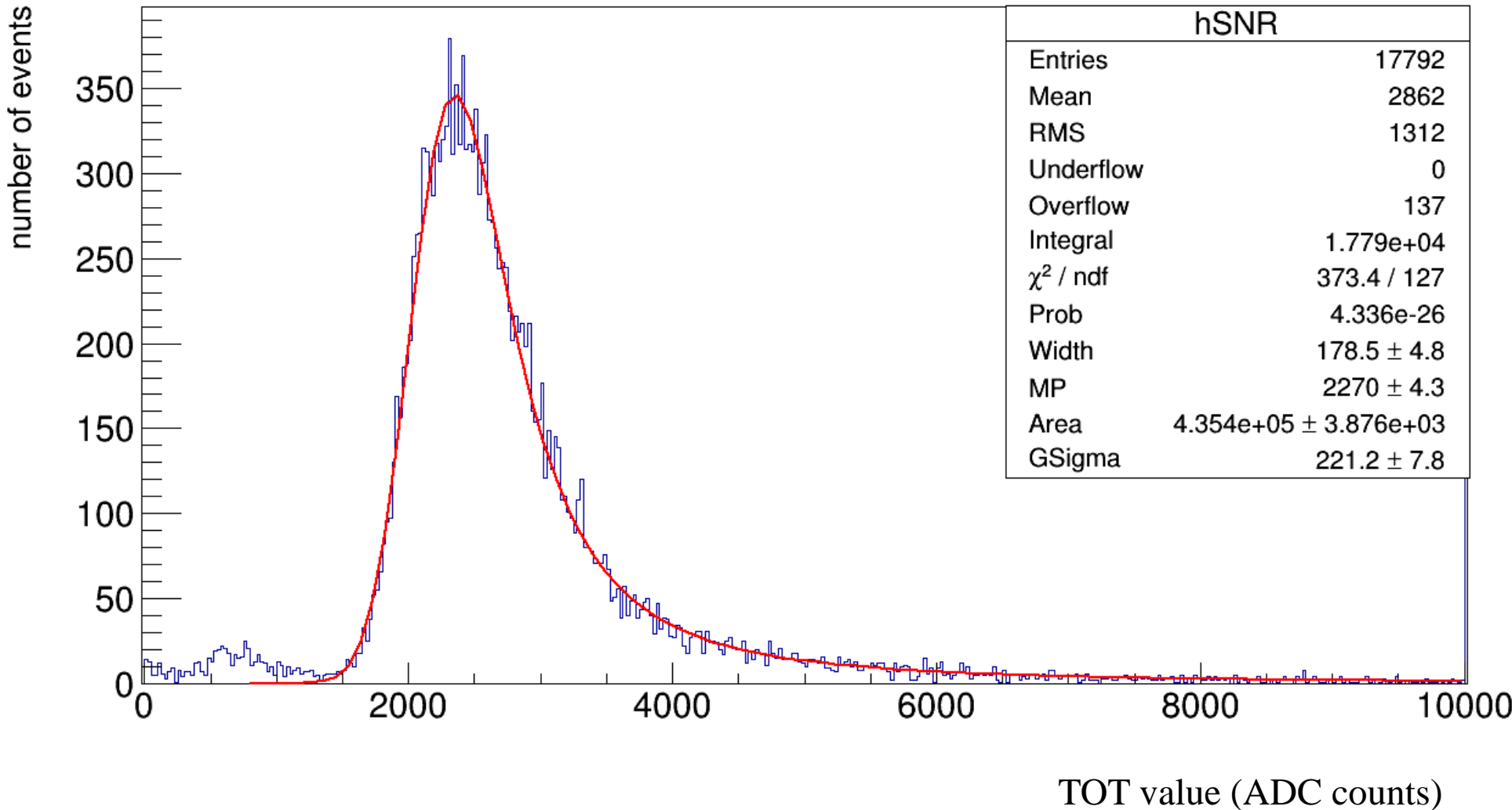


Sensor B06-W0125



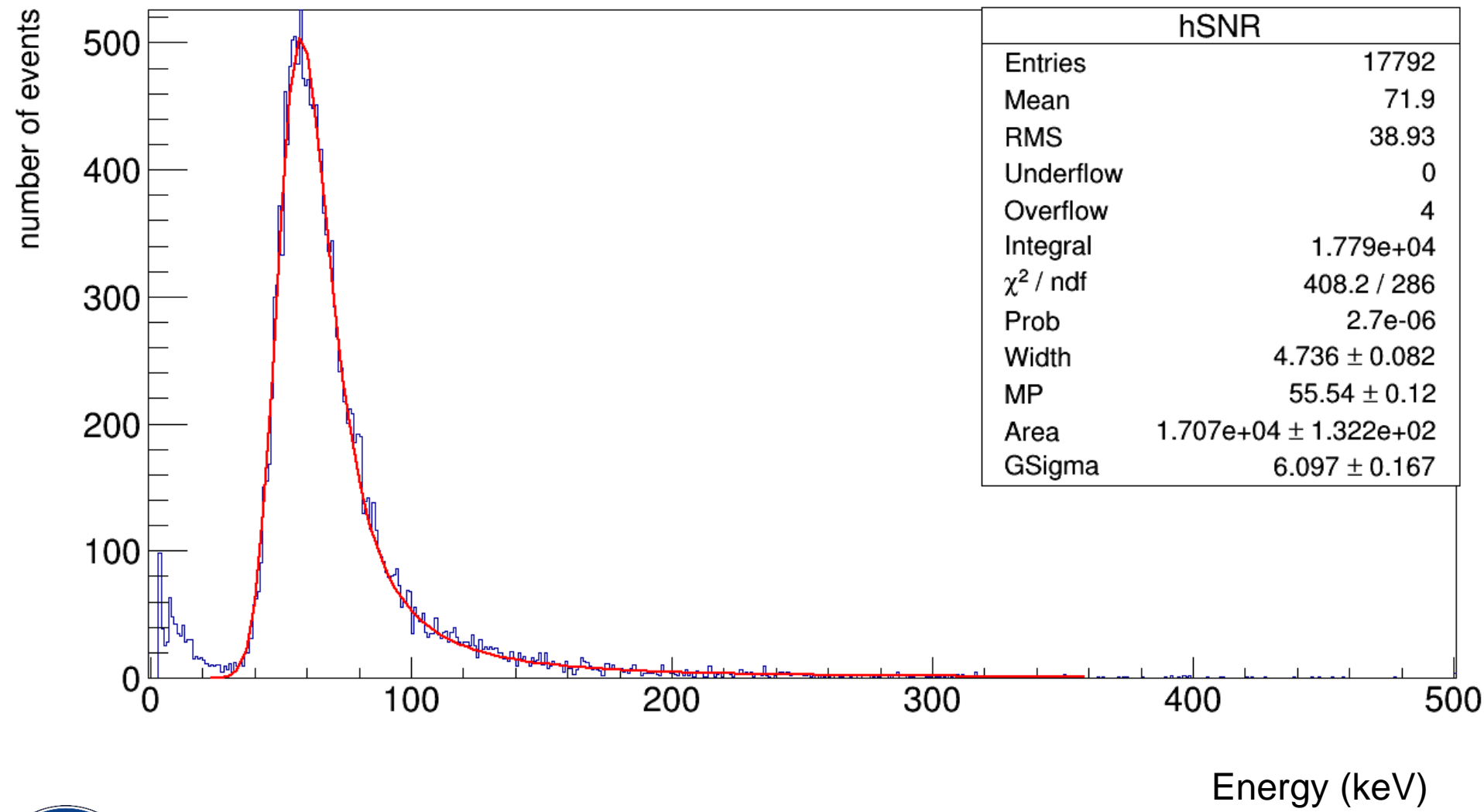


Energy Spectrum, all cluster sizes

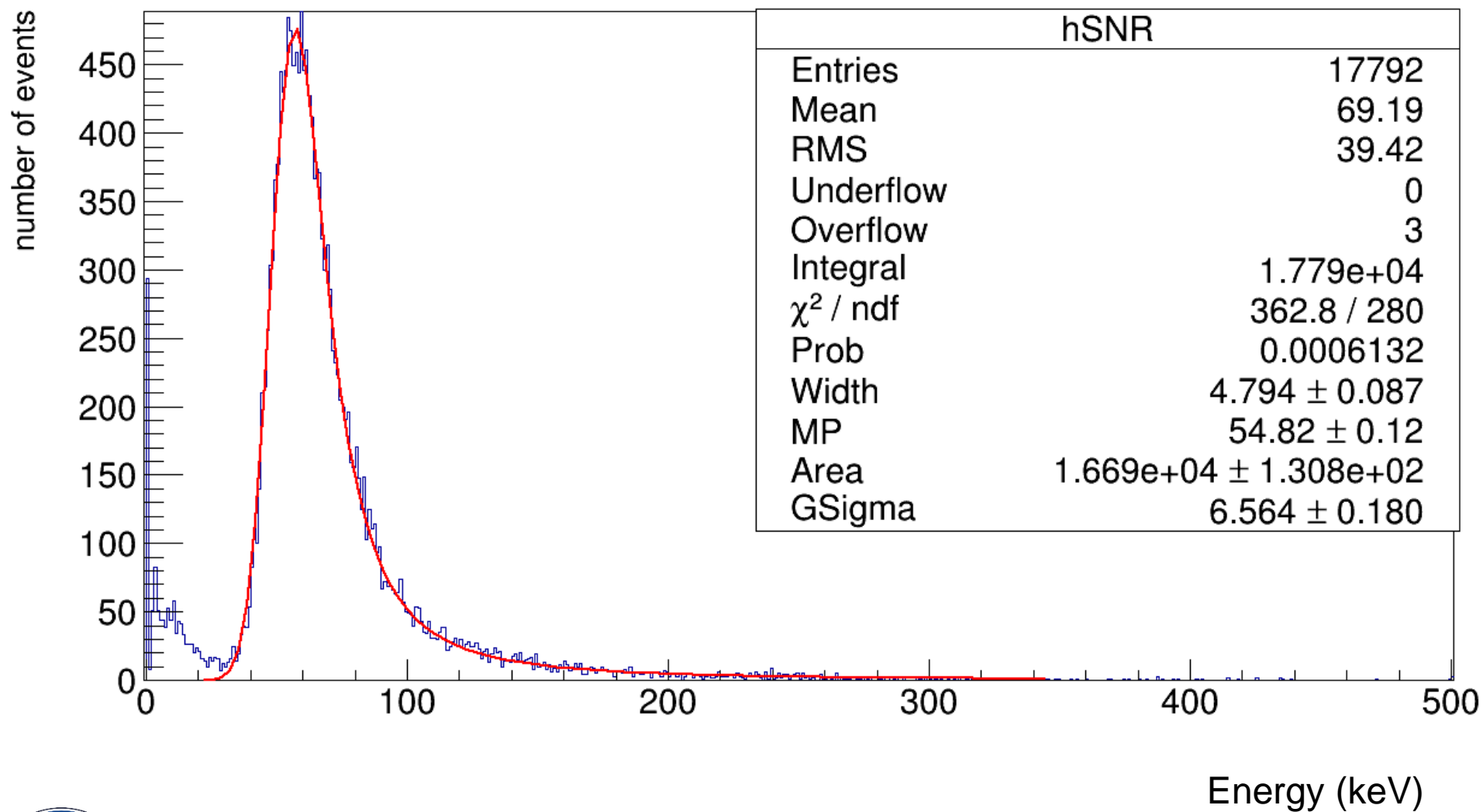




Energy Spectrum, all cluster sizes

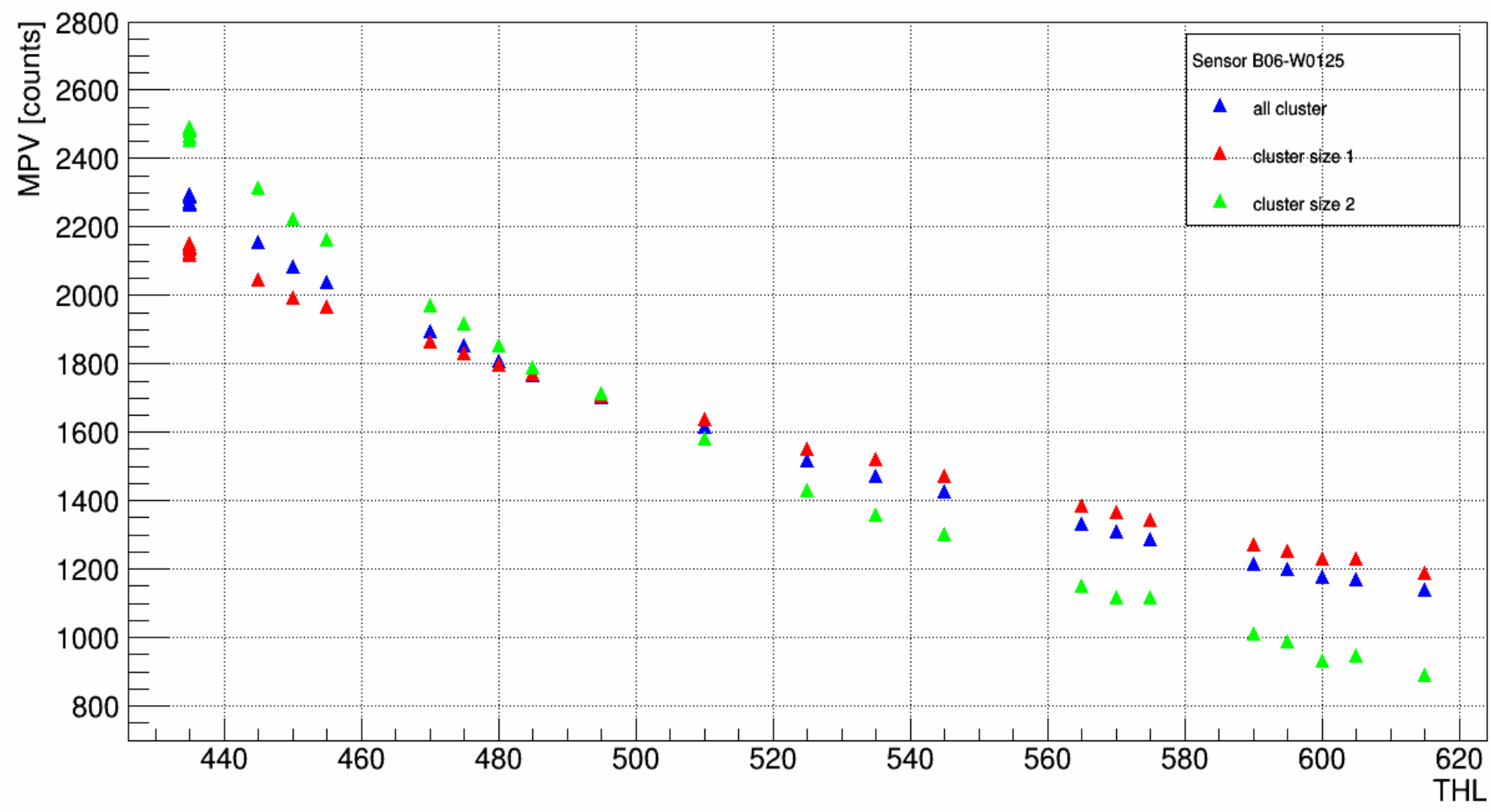


Energy Spectrum, all cluster sizes



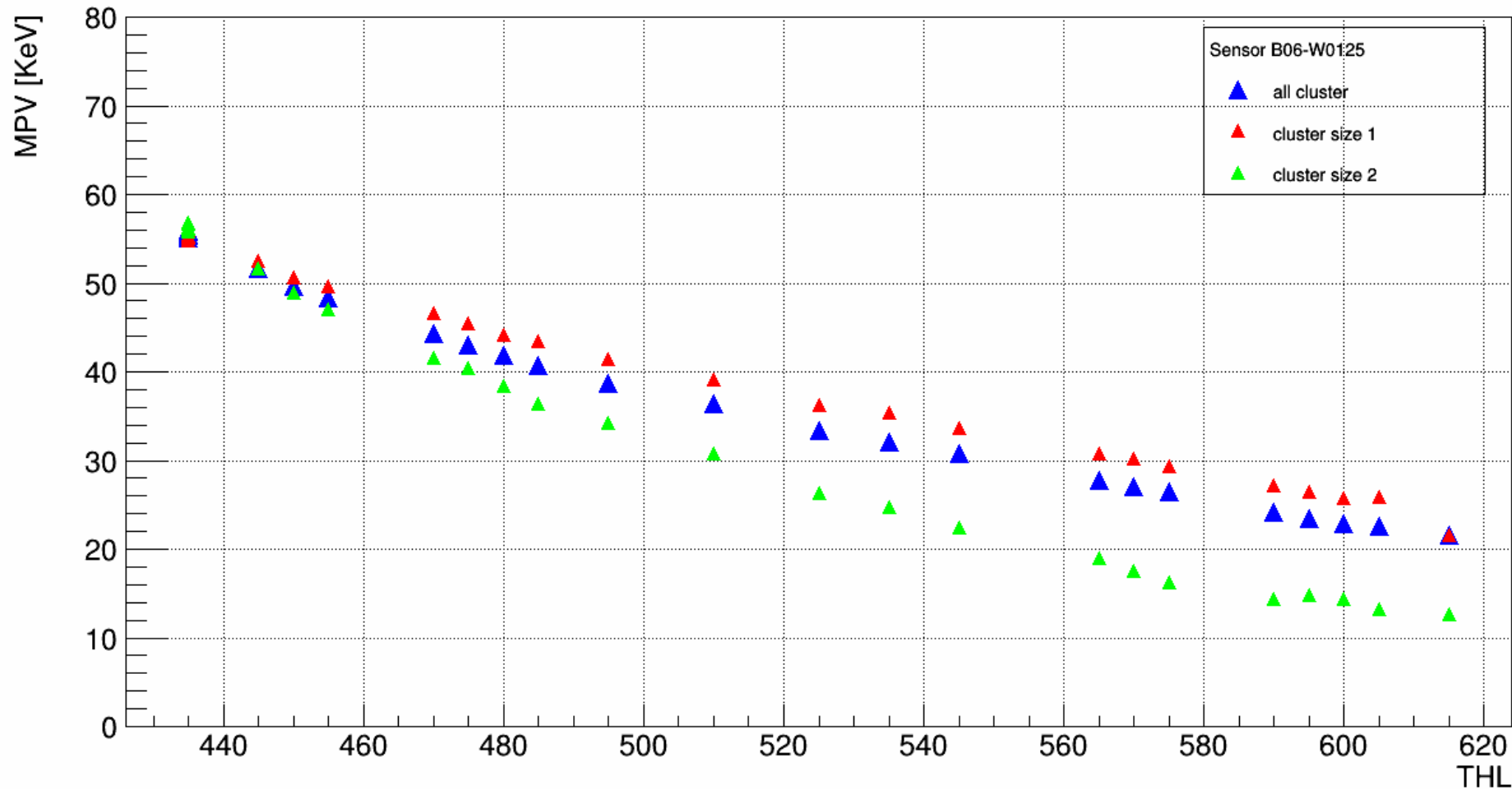


TOT value (ADC counts)





Energy (keV)



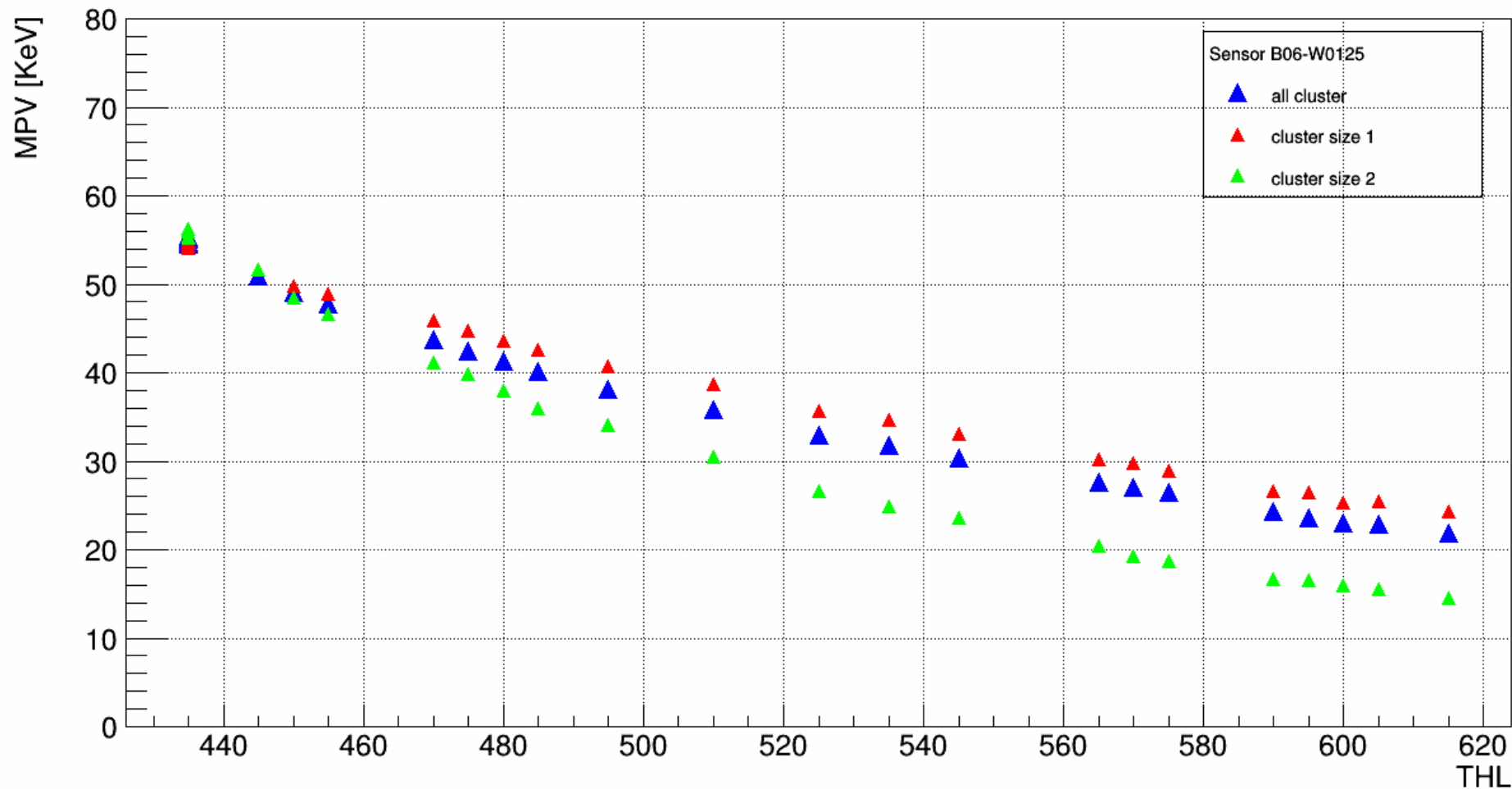
MPV of the Landau - Gauss fits decreases for:

- allTOT from 55.54 keV to 21.61 keV
- TOT1 from 55.29 keV to 21.61 keV
- TOT2 from 56.19 keV to 12.69 keV

The calibration only works properly at the normal operating threshold = 435



Energy (keV)



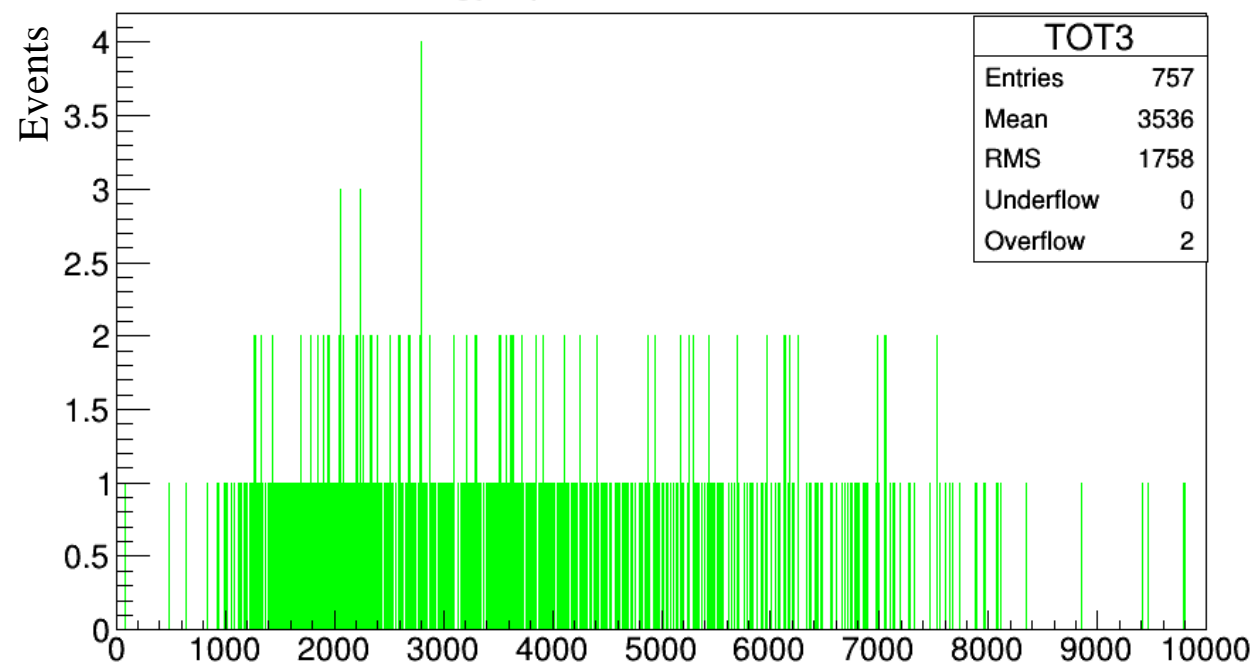
MPV of the Landau- Gauss fits decreases for:

- allTOT from 54.82 keV to 21.93 keV
- TOT1 from 54.72 keV to 24.31 keV
- TOT2 from 55.45 keV to 14.55 keV

The calibration only works properly at the normal operating threshold = 435



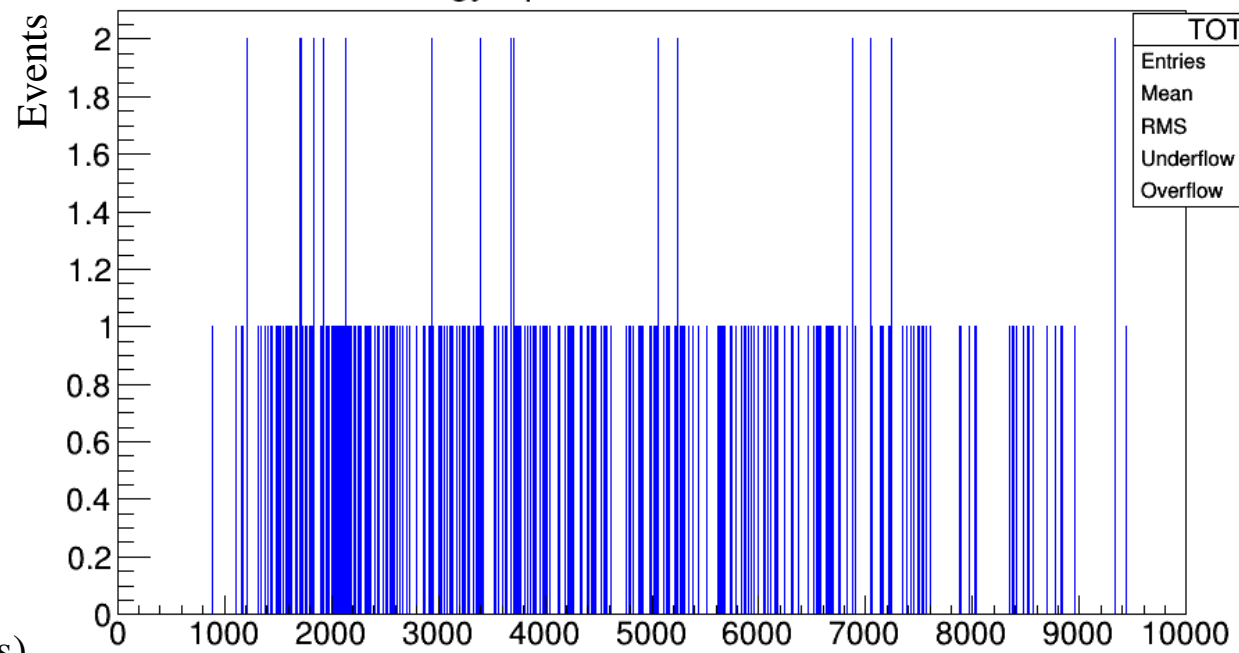
Energy Spectrum, cluster size = 3



TOT3	
Entries	757
Mean	3536
RMS	1758
Underflow	0
Overflow	2

TOT value (ADC counts)

Energy Spectrum, cluster size = 4



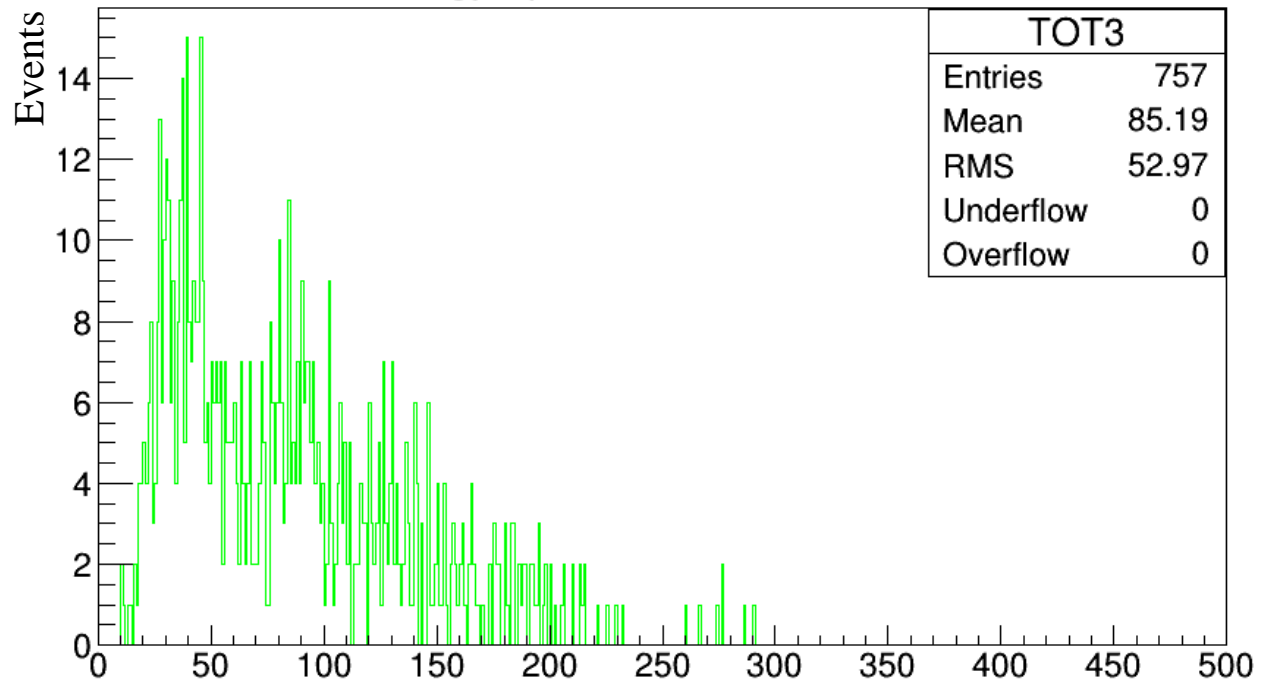
TOT4	
Entries	348
Mean	4253
RMS	2085
Underflow	0
Overflow	10

TOT value (ADC counts)



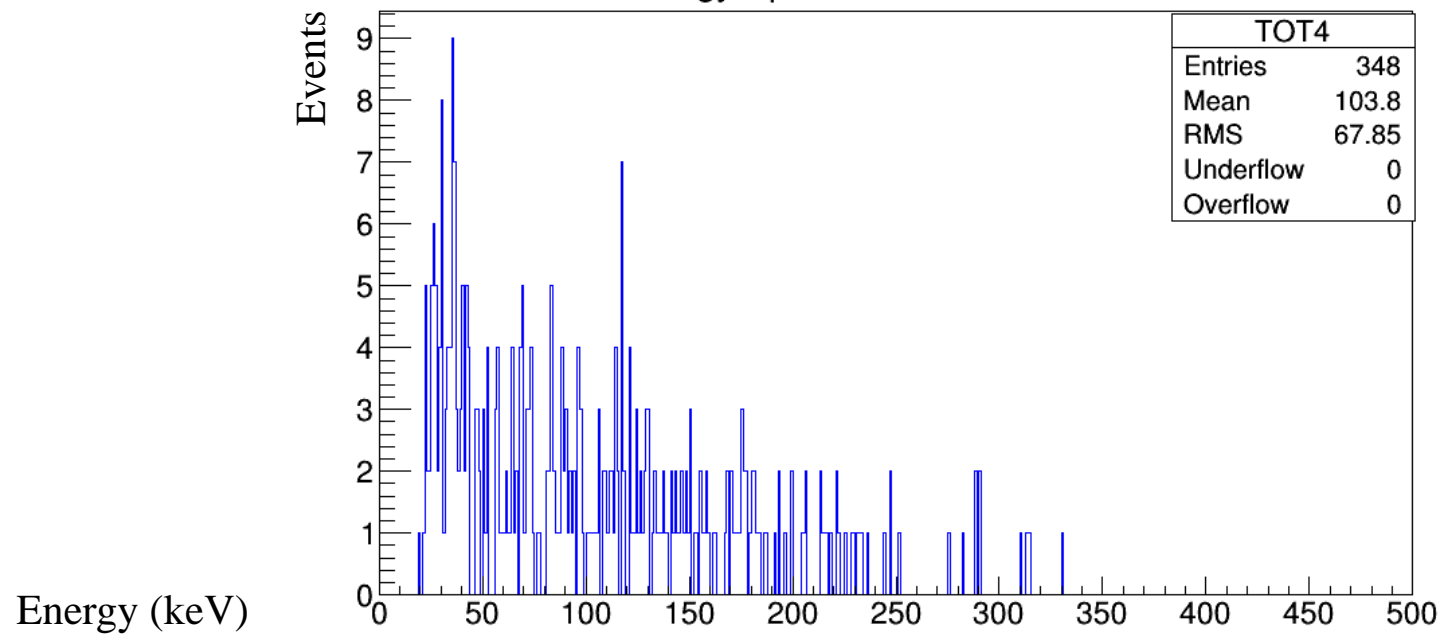


Energy Spectrum, cluster size = 3



TOT3	
Entries	757
Mean	85.19
RMS	52.97
Underflow	0
Overflow	0

Energy Spectrum, cluster size = 4



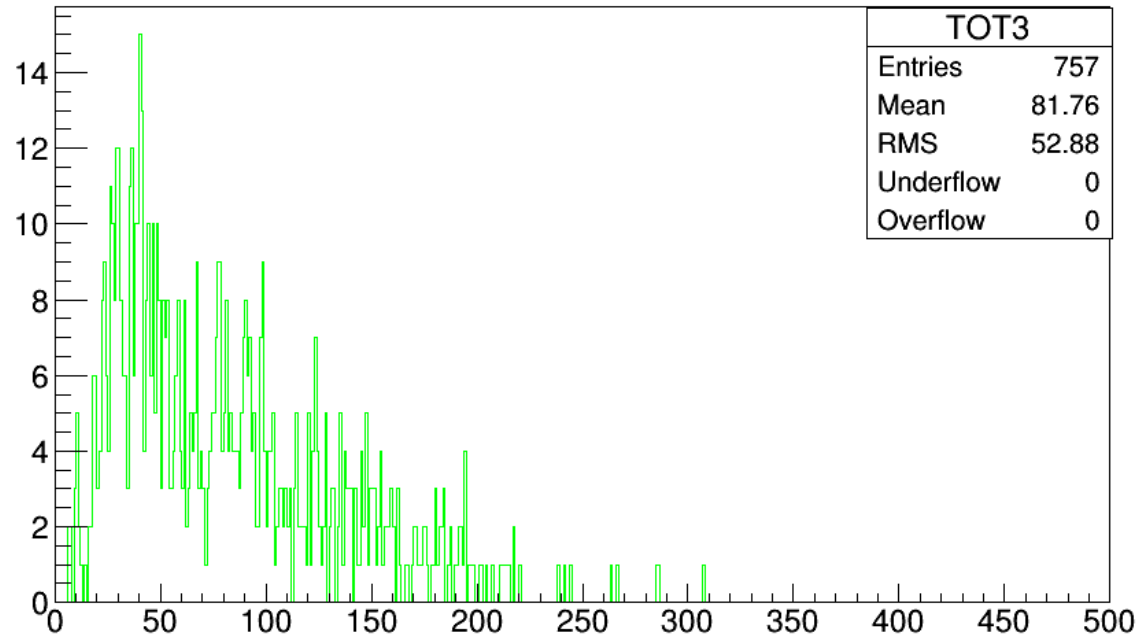
TOT4	
Entries	348
Mean	103.8
RMS	67.85
Underflow	0
Overflow	0





Events

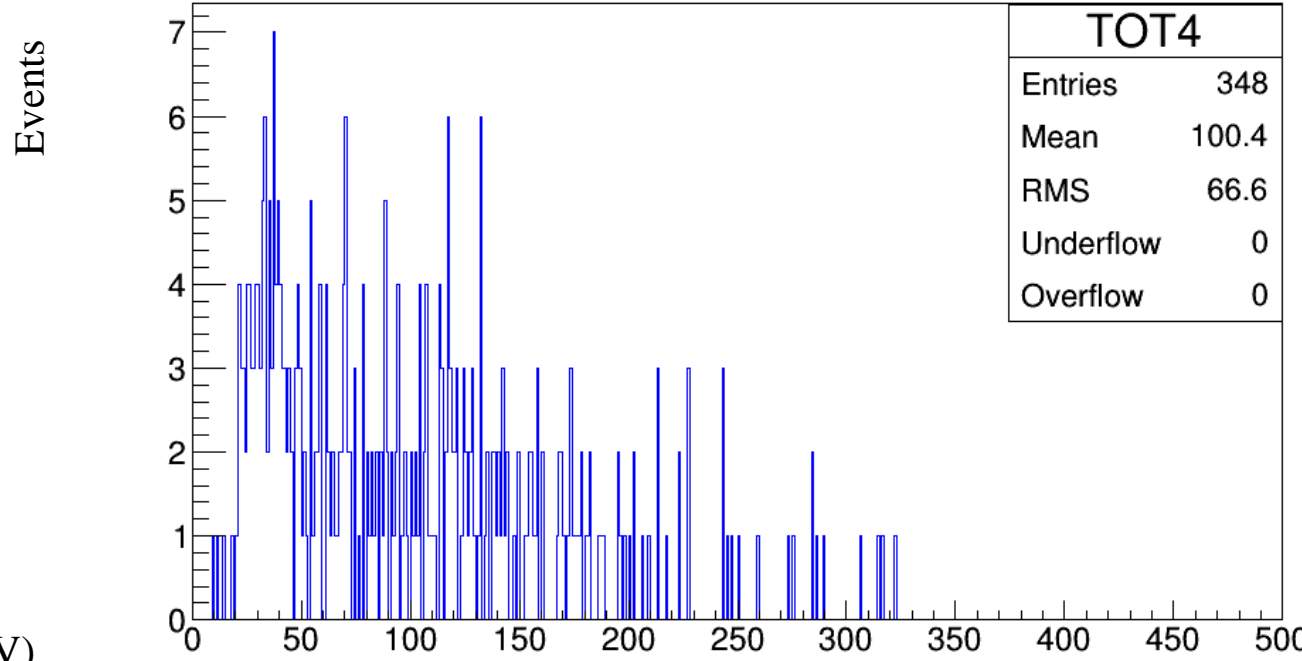
Energy Spectrum, cluster size = 3



TOT3	
Entries	757
Mean	81.76
RMS	52.88
Underflow	0
Overflow	0

Energy (keV)

Energy Spectrum, cluster size = 4



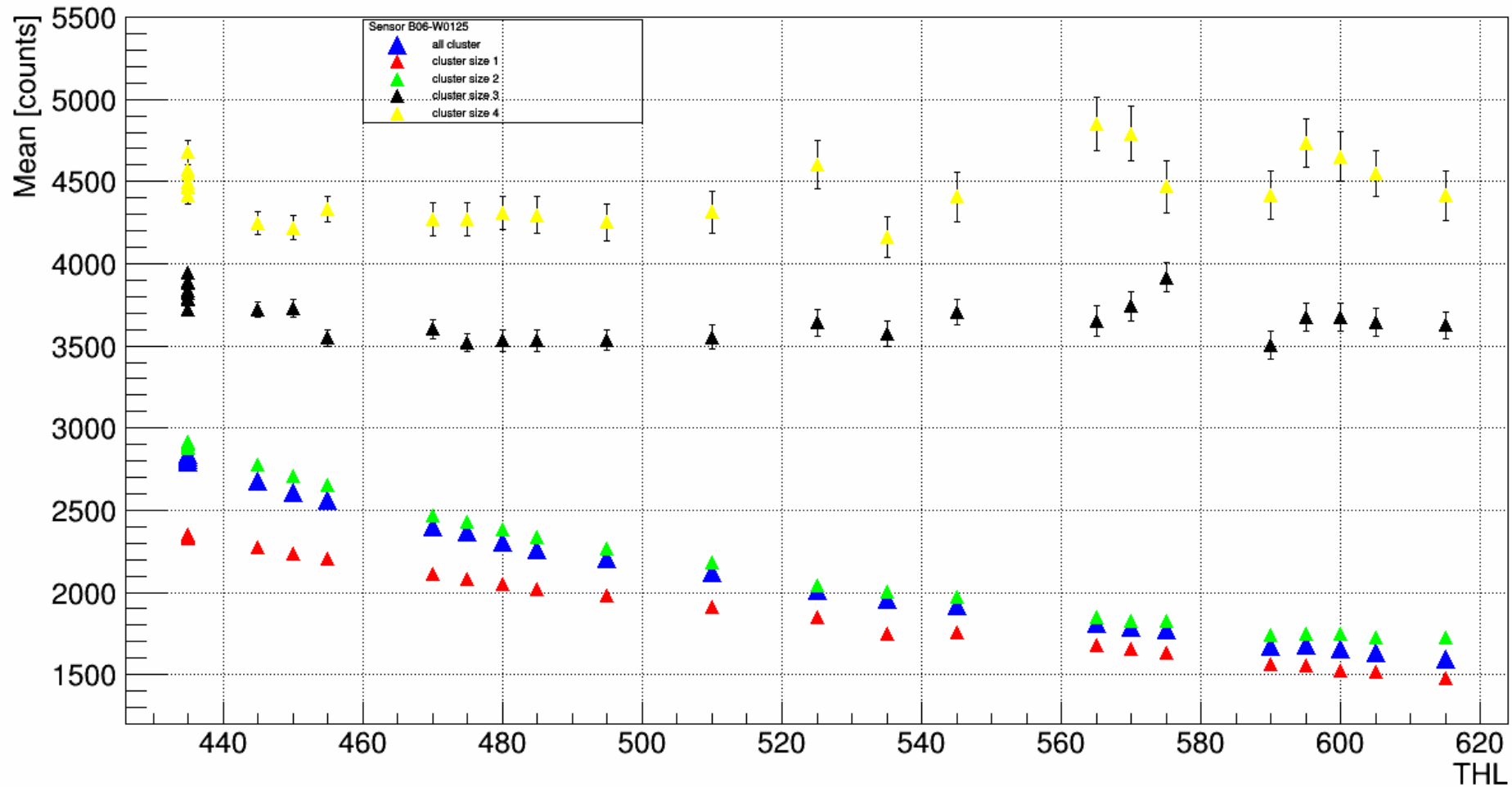
TOT4	
Entries	348
Mean	100.4
RMS	66.6
Underflow	0
Overflow	0

Energy (keV)





TOT value (ADC counts)

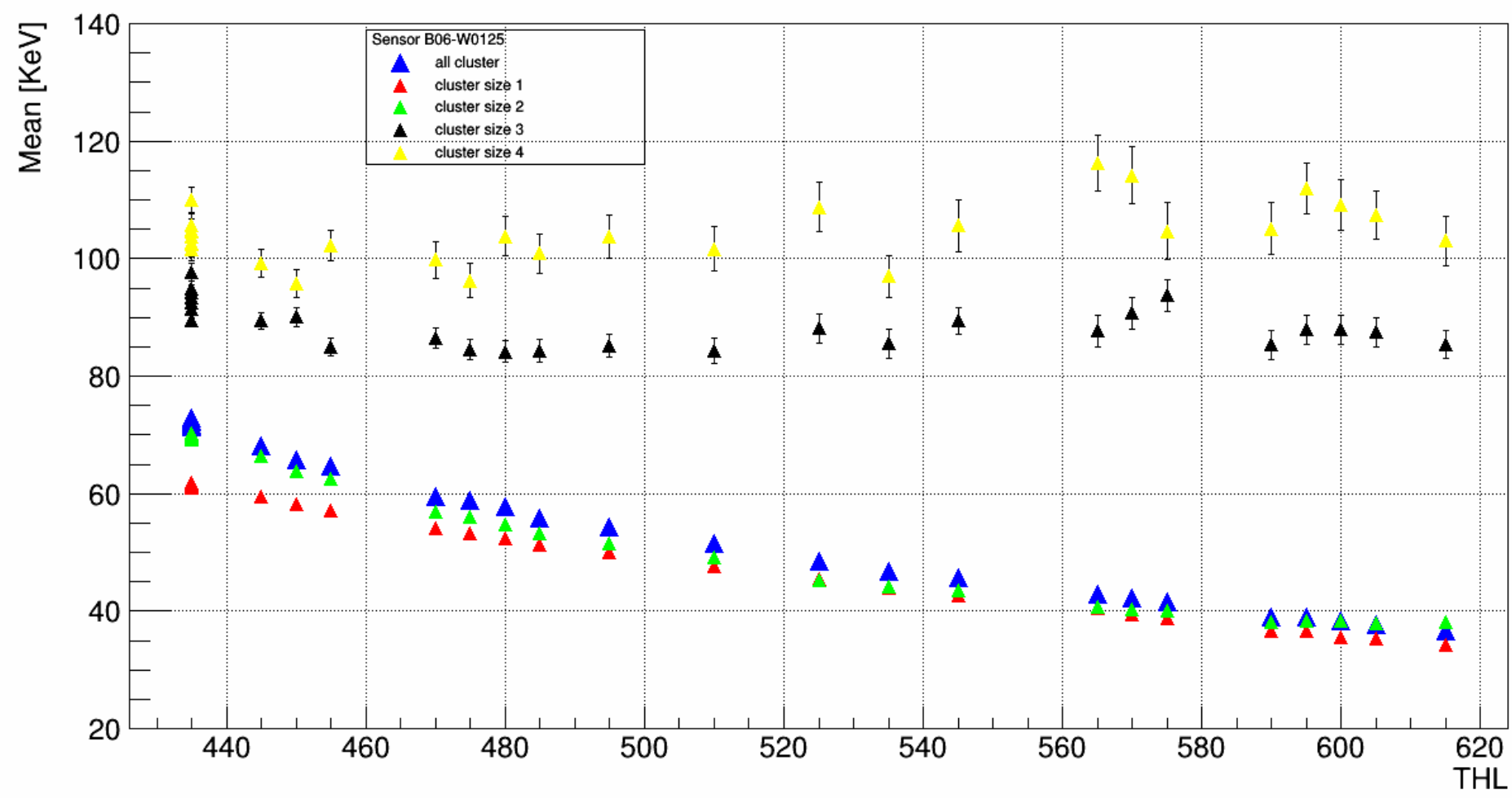


Mean values are almost constant for ClusterSize=3 (TOT3) and ClusterSize 4 (TOT4)





Energy (KeV)

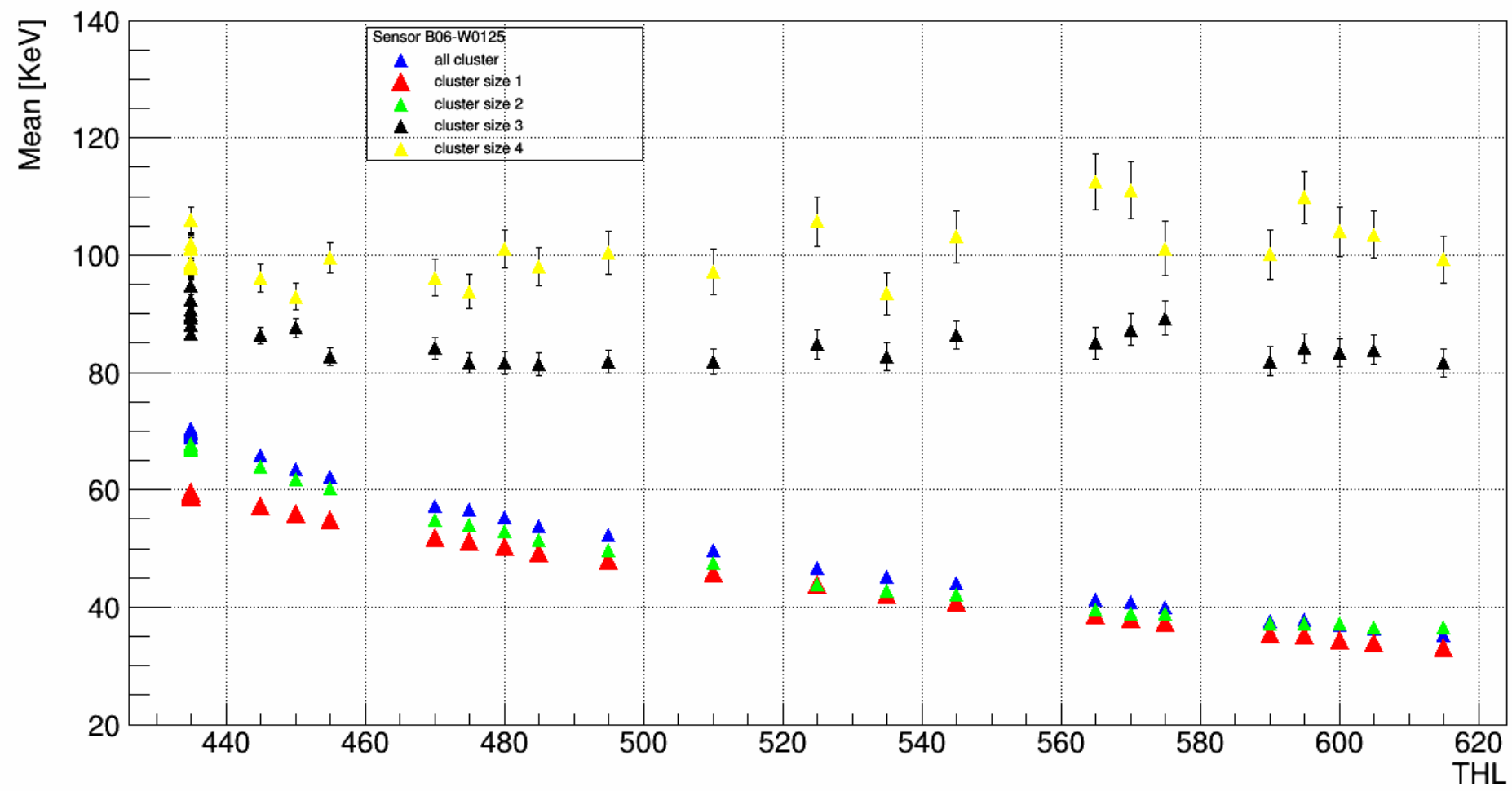


Mean values are almost constant for ClusterSize=3 (TOT3) and ClusterSize 4 (TOT4)





Energy (KeV)



Mean values are almost constant for ClusterSize=3 (TOT3) and ClusterSize 4 (TOT4)



It was studied:

❑ **Dependence of the MPV on THL**

- WithoutCalibration, GlobalEnergyCalibration, PixelEnergyCalibration
- for all ClusterSize = 1 or 2.... or n (allTOT), ClusterSize = 1 (TOT1) and ClusterSize = 2 (TOT2) the MPV value decreases with the THL
- for ClusterSize = 3, 4 (TOT3, TOT4) no fit could be done

❑ **Dependence of the Mean on THL**

- WithoutCalibration, GlobalEnergyCalibration, PixelEnergyCalibration
- for all ClusterSize = 1 or 2.... or n (allTOT), cluster size 1 (TOT1) and cluster size 2 (TOT2) the Mean value decreases with THL
- for ClusterSize = 3 (TOT3) and ClusterSize 4 (TOT4) it is almost constant

It was observed:

- ❑ A similar behavior of MPVs (Means) on THL for all cluster (allTOT), cluster size 1 (TOT1), cluster size 2 (TOT2) in all tree situations (WithoutCalibration, GlobalEnergyCalibration, PixelEnergyCalibration)
- ❑ Mean value is almost constant with the THL change for cluster size 3 (TOT3) and cluster size 4 (TOT4) in all tree situations (WithoutCalibration, GlobalEnergyCalibration and PixelEnergyCalibration)



Thanks!

