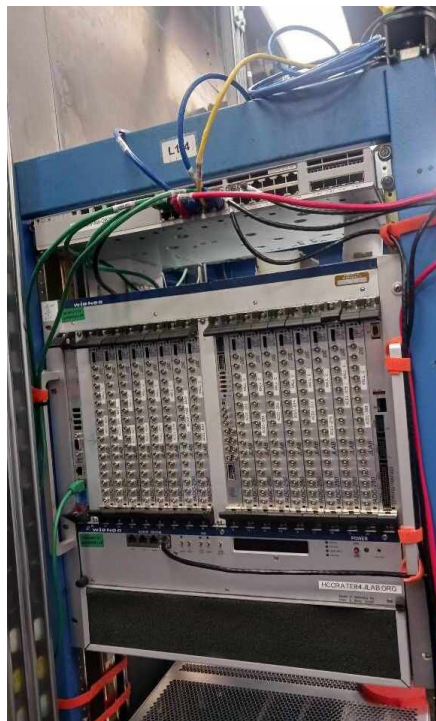


VTP CLUSTERING + FADC DATA STREAM

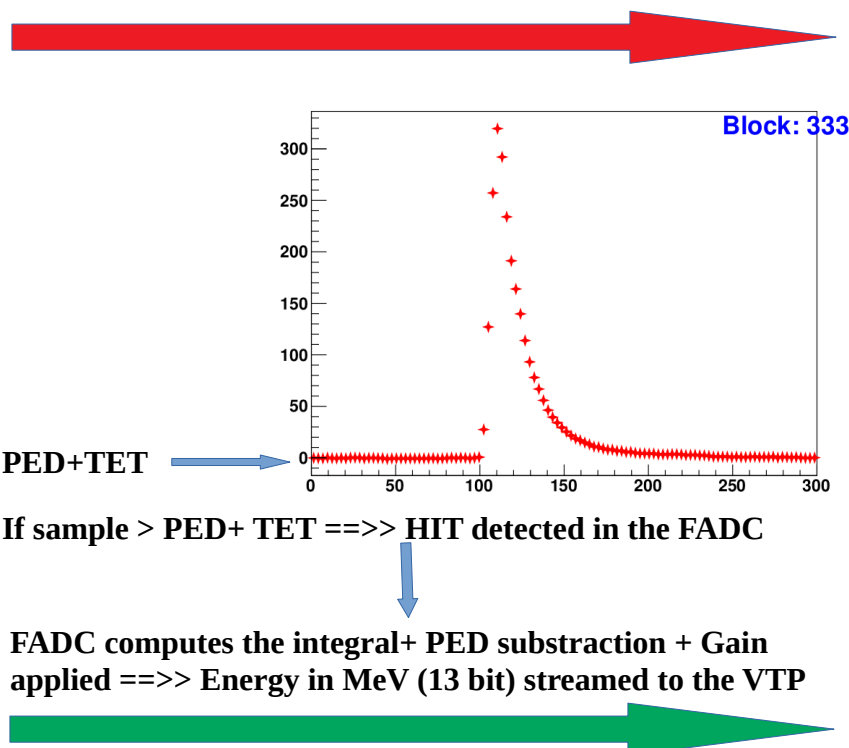
1) FADC DATA STREAM

5 FADC crates

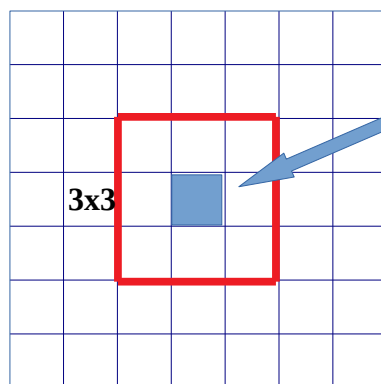


Data is stored in an 8 us buffer memory and always streamed (8GB/s) every 4 ns to the VTP
(No hit seen by the FADC)

5 VTP's (one inside each FADC crate)



2) VTP CLUSTERING



a) BASIC STEPS:

- 1) If the seed Energy is above the “VTP_NPS_ECALCLUSTER_SEED_THR” value (70 MeV) ✓
- 2) If the seed energy is a local maximum with respect to the 8 neighbors within the “VTP_NPS_ECALCLUSTER_HIT_DT” value of the window (+- 20 ns from the seed) ✓
- 3) The Cluster Energy is calculated by summing up all the energies from the 9 blocks ✓

==>> The x pos, y pos, the time of the seed block and the total energy of the 3 by 3 cluster is reported by the VTP ==>> Coda words ==>> ROOTfile variables !!!

a) Cluster Triggers and Readout Threshold:

- We have 3 main cluster triggers:
- Single photon cluster trigger (S.P.T)
 - Pair cluster trigger (same crate)
 - Pair cluster trigger (different crates)

Single photon cluster trigger:

First step: The first Basic Steps + The Cluster Energy Is Above The S.P.T (1400 MeV)
==>> We have a DVCS cluster in hand

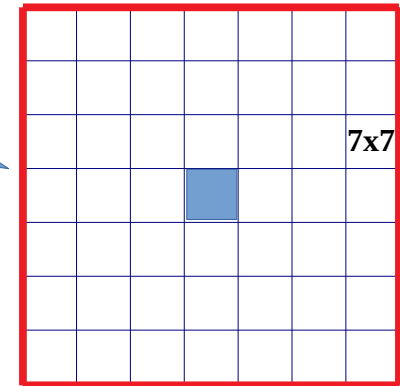
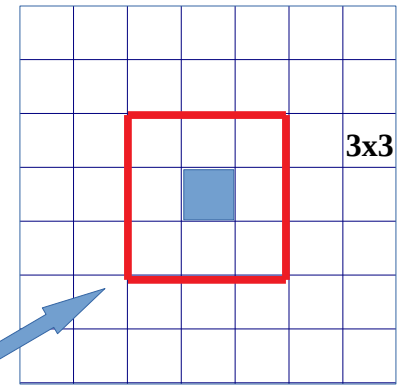
Second step: 3 Criteria ==>> We use the readout threshold (400 MeV)
==>> We use the 7x7 Clustering around the same seed block obtained with the 3x3 clustering scheme
==>> The VTP sends the “Mask” of all the channels in the 7x7 to the FADC in order to read out

(NOTE: Does the VTP now sees a 7x7 cluster energy? No!! the VTP doesn't take the 7x7 scheme in account, only the FADC will take the 7x7 clustering scheme, hence an energy of a 7x7 cluster not 3x3)

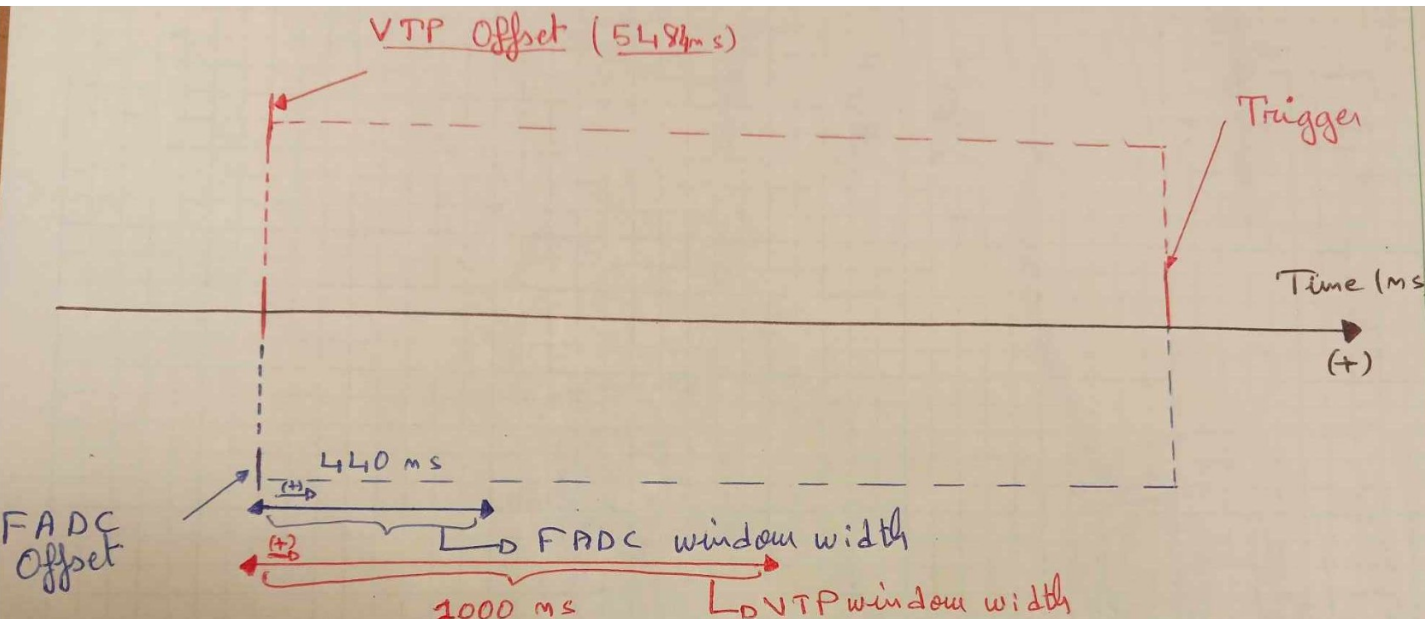
- What does a readout of 7x7 mean? What are we reading out?

==>>> The FADC will readout the raw waveforms of all these channels in the 7x7 cluster and we then do the offline clustering analysis

- If the FADC is reading out **more channels** hence the **cluster energy** formed is **larger** than the VTP ? **Yes!!** that can be the case for some not all. Can it be the **opposite way** ? Also **Yes!!** Why?... For the upcoming reasons listed in the following slides



- The VTP window (**1000ns**) is larger than the FADC (**440 ns**)
- The VTP clustering window (**+ - 20 ns from the seed block**) is twice larger than the FADC (**+ - 10 ns from the seed block**)
- The VTP clustering scheme algorithm is different from the FADC offline (hcana) clustering one (**cluster overlap**)



What to do to compare them ?

==>> We must compare the clusters with the same **seed block information** which means the same **x, y position, same size of the cluster, + - 5 ns from 150 ns** and a loose cut on the **energy** (around 10 MeV).

Why the loose cut on energy ?

==>> One of them can be **larger** than the other as explained.

A more accurate comparison to set the the time frame **+ - 10 ns from the 150 ns coincidence pulse time.**

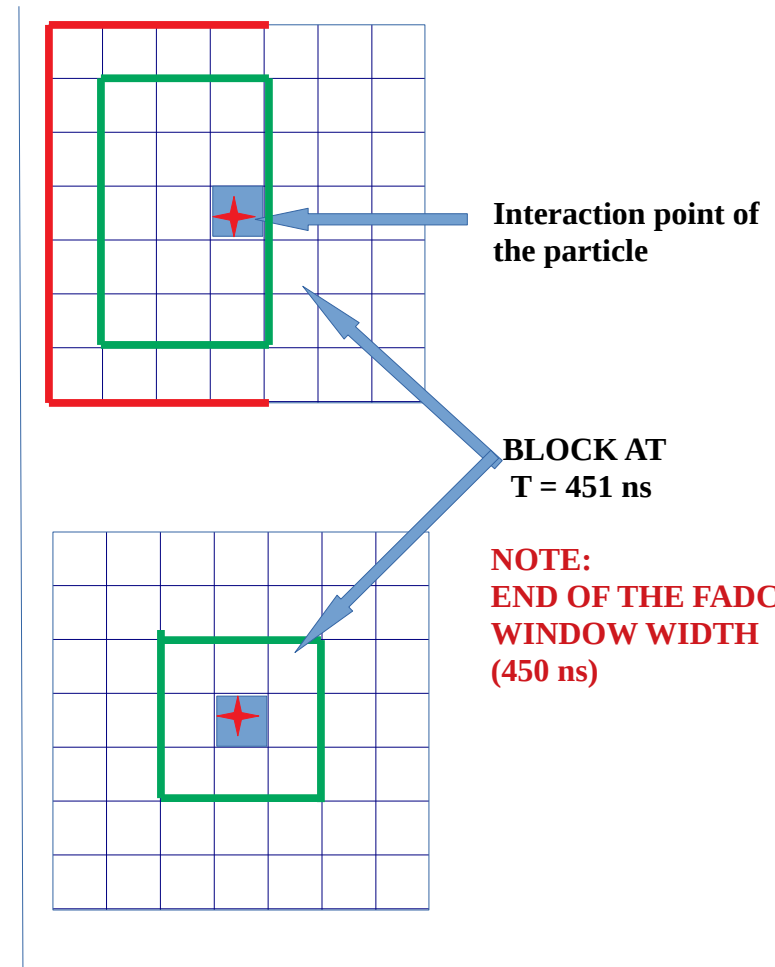
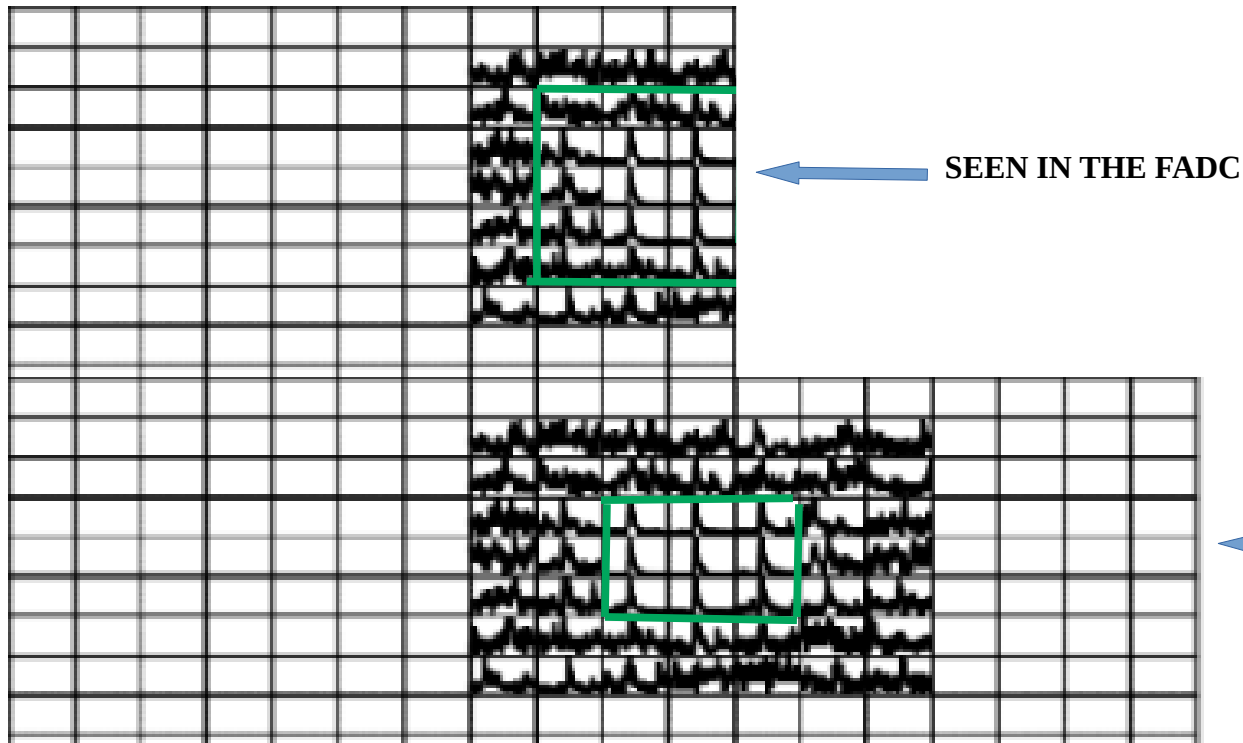
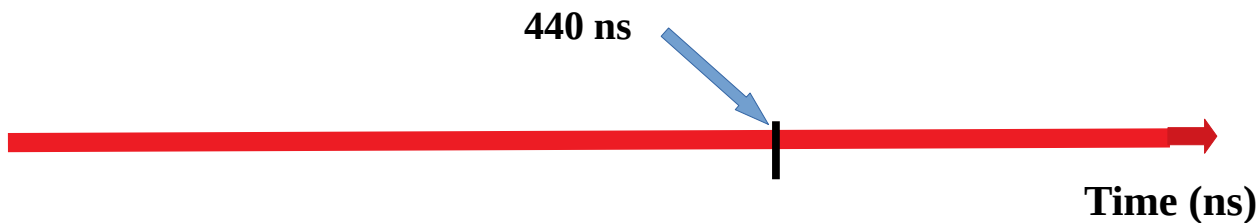
Discrepancy cases when comparing: (supposing the FADC offline analysis is the same as the VTP, which is not the case as far as I know, but should be modified)

1) E (FADC) > E (VTP) : (in some cases)

- A 7x7 clustering will collect the contribution of more channels than the 3x3 clustering
- A larger Cluster energy despite having the same seed block.

2) $E(\text{FADC}) < E(\text{VTP})$: (in some cases)

- Due to the limited W.W of the FADC some blocks are not accounted for in the clustering
- The blocks in the green contour are the blocks taken in account in the cluster
- The contribution of the blocks in the FADC is less than the ones in the VTP (exponential decay)



CONCLUSION:

- The comparison between the VTP and the FADC is meaningful only with certain **conditions, cuts** and overall attention to their separate **characteristics**
- Based on this analysis, **no difference** should be seen between **coin_sparse**, **coin_sparse_low** and **coin** for clusters above **1.4 GeV** since they all have the same parameters if we treat similar runs with the **exact same** conditions (not so easy to!).

