

# Data processing & evio-to-lcio status

Matt Graham  
HPS Software Meeting  
December 18, 2014

- Haven't started a full production of all runs yet
- I have been working on 3 representative runs
  - 3258 — single cluster, no blocking
  - 3288 — two cluster, no blocking
  - 3340 — two cluster, with blocking
- These files can be found in /volatile/hallb/hps/
  - tgt/ for evio files; licio/ for evioTolcio'ed files; recon/ for reconstructed files
  - The reconstruction only makes EcalHits and does the simple clusterer in org.ecal.recon.EcalClusterer
    - we should discuss which clusterers to include in the recon; should be (better be) possible to include >1

***Sorry if I bring up stuff that was discussed yesterday or are already figured out...***

# evioToLcio: some LCIO events only have trigger bank

Run: 3288

first Lcio event



```
Thu Dec 18 04:51:04 PST 2014 :: LCSimTestRunEventBuilder :: INFO :: Go event: time 1418642951 - Mon Dec 15 03:29:11
vent count so far 0
Ecal format tag: 0xe102
Thu Dec 18 04:51:04 PST 2014 :: EvioToLcio :: INFO :: first physics event time: -6 - Wed Dec 31 15:59:53 PST 1969
>> Event 0
Dec 18, 2014 4:51:04 AM org.hps.evio.LCSimEngRunEventBuilder makeLCSimEvent
SEVERE: Error making ECal hits
java.lang.IndexOutOfBoundsException
    at java.nio.Buffer.checkIndex(Buffer.java:538)
    at java.nio.HeapByteBuffer.getShort(HeapByteBuffer.java:308)
    at org.jlab.coda.jevio.CompositeData.process(CompositeData.java:2641)
    at org.jlab.coda.jevio.CompositeData.parse(CompositeData.java:400)
    at org.jlab.coda.jevio.BaseStructure.getCompositeData(BaseStructure.java:922)
    at org.hps.evio.EcalEvioReader.makeHits(EcalEvioReader.java:128)
    at org.hps.evio.LCSimEngRunEventBuilder.makeLCSimEvent(LCSimEngRunEventBuilder.java:47)
    at org.hps.evio.EvioToLcio.run(EvioToLcio.java:376)
    at org.hps.evio.EvioToLcio.main(EvioToLcio.java:99)
>> Event 1
>> Event 2
>> Event 3
```

first event had IOoB error...  
next event only has trigger bank...

the event# skip only seemed to  
happen after event #1

LCIO Event Header		
Run	3288	
Event	1	
Time Stamp	-6068354756	
Detector Name	HPS-ECalCommissioning	
Event Weight	1.0	
IDRUP	0	
SLIC Version		
Geant4 Version		

Collections		
Name	Type	Size
EcalReadoutExtraData	org.lcsim.event.GenericObject	13
EcalReadoutExtraDataRelations	org.lcsim.event.LCRelation	13
EcalReadoutHits	org.lcsim.event.RawCalorimeterHit	13
FADCGenericHits	org.lcsim.event.GenericObject	0
TriggerBank	org.lcsim.event.GenericObject	1

Next Lcio event

event # 12?



LCIO Event Header		
Run	3288	
Event	12	
Time Stamp	-6061507396	
Detector Name	HPS-ECalCommissioning	
Event Weight	1.0	
IDRUP	0	
SLIC Version		
Geant4 Version		

Collections		
Name	Type	Size
TriggerBank	org.lcsim.event.GenericObject	1

## 2 types of errors in EvioToLcio

```
SEVERE: Error making ECal hits
java.lang.IndexOutOfBoundsException
  at java.nio.Buffer.checkIndex(Buffer.java:538)
  at java.nio.HeapByteBuffer.getInt(HeapByteBuffer.java:359)
  at org.jlab.coda.jevio.CompositeData.process(CompositeData.java:2610)
  at org.jlab.coda.jevio.CompositeData.parse(CompositeData.java:400)
  at org.jlab.coda.jevio.BaseStructure.getCompositeData(BaseStructure.java:922)
  at org.hps.evio.ECalEvioReader.makeHits(ECalEvioReader.java:128)
  at org.hps.evio.LCSimEngRunEventBuilder.makeLCSimEvent(LCSimEngRunEventBuilder.java:47)
  at org.hps.evio.EvioToLcio.run(EvioToLcio.java:376)
  at org.hps.evio.EvioToLcio.main(EvioToLcio.java:99)
```

Sometimes this is getShort that gives the error...

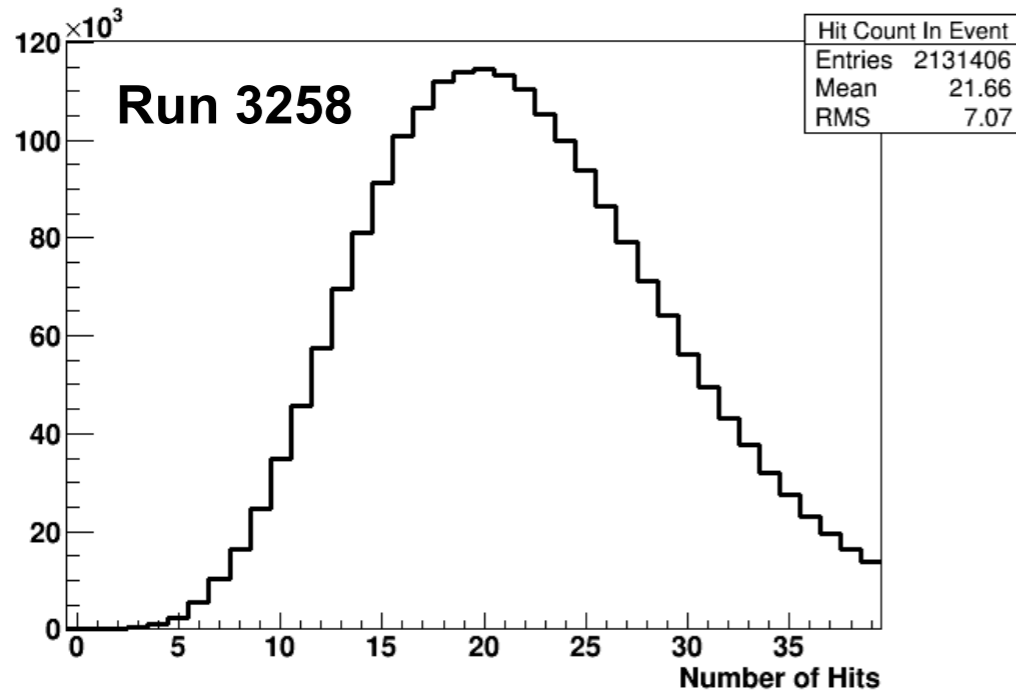
```
>> Event 21
Dec 18, 2014 5:06:44 AM org.hps.evio.LCSimEngRunEventBuilder makeLCSimEvent
SEVERE: Error making ECal hits
java.lang.NullPointerException
  at org.hps.evio.ECalEvioReader.makeIntegralHitsMode7(ECalEvioReader.java:361)
  at org.hps.evio.ECalEvioReader.makeHits(ECalEvioReader.java:152)
  at org.hps.evio.LCSimEngRunEventBuilder.makeLCSimEvent(LCSimEngRunEventBuilder.java:47)
  at org.hps.evio.EvioToLcio.run(EvioToLcio.java:376)
  at org.hps.evio.EvioToLcio.main(EvioToLcio.java:99)
```

We see more errors/event in 3288 than in 3340 (~x5-10)...maybe due to fixes in data format or (my pick) a rate effect; the current for 3288 was 145nA vs 50 nA for 3340.

***WE DON'T SEE ANY OF THESE ERRORS FOR RUN 3258;*** single cluster trigger, 185 nA (more than 3288); other difference: readout window of fADC is 400 ns vs 200 ns for 3288 & 3340...?

# Some simple plots: # of ECal Hits

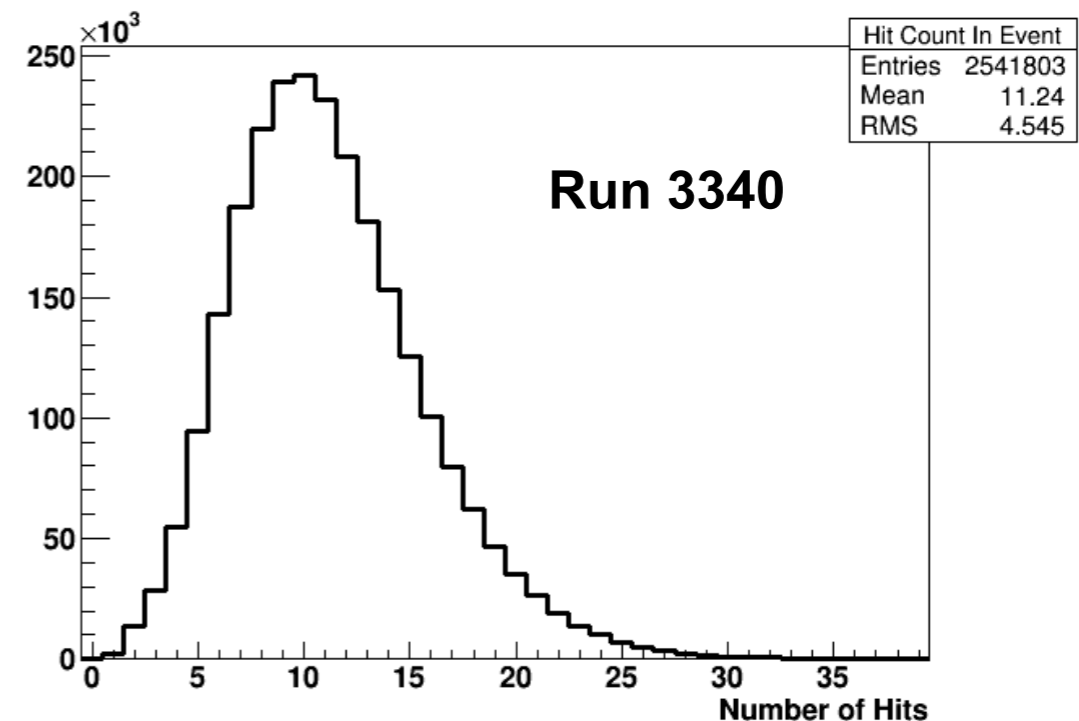
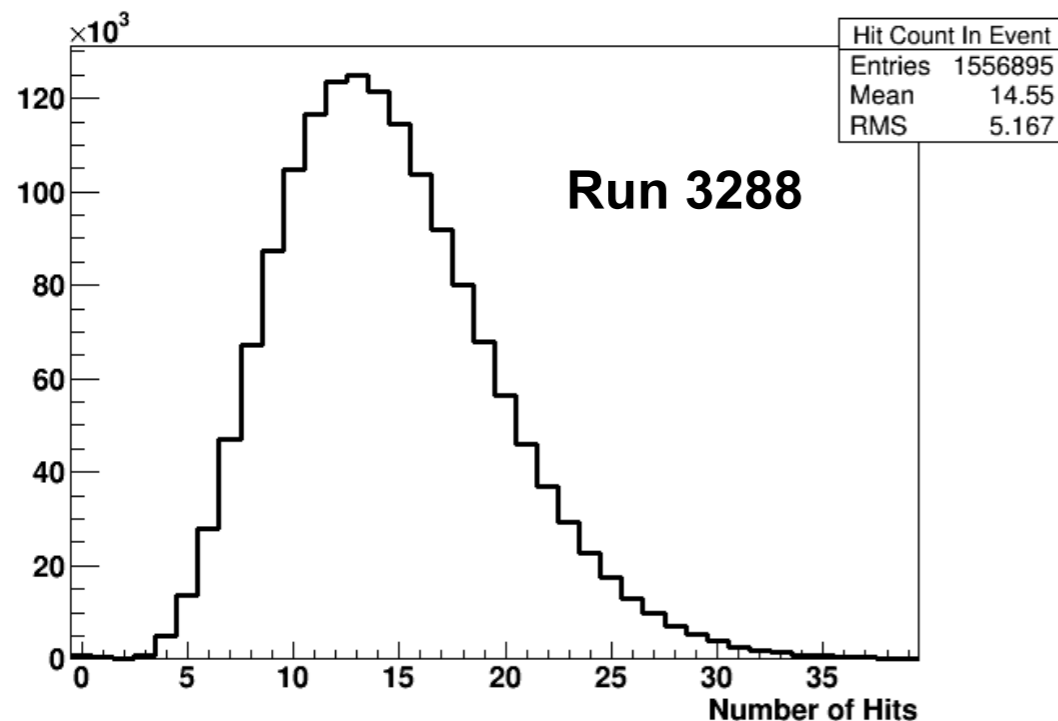
*Note: All plots are from `org.hps.analysis.dataquality.EcalMonitoring.java`*



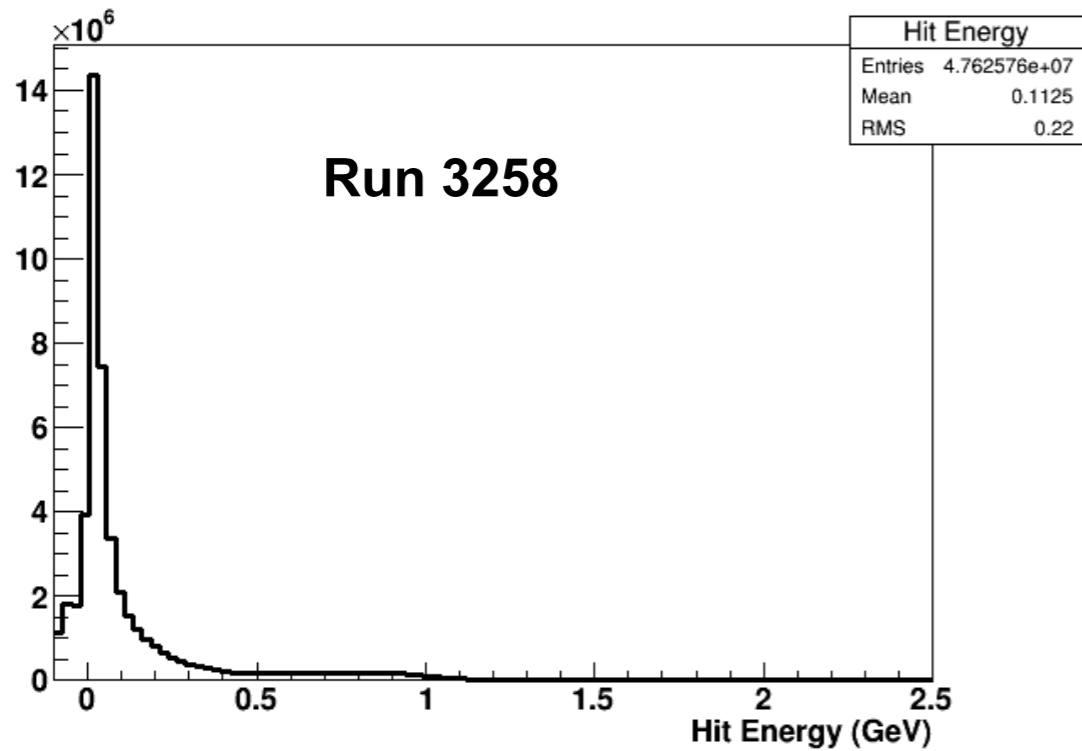
Run 3258: single cluster, 185 nA,  
400 ns window, unblocked

Run 3288: two cluster, 145 nA,  
200 ns window, unblocked

Run 3340: two cluster, 50 nA,  
200 ns window, blocked



# Some simple plots: Energy of ECal Hits

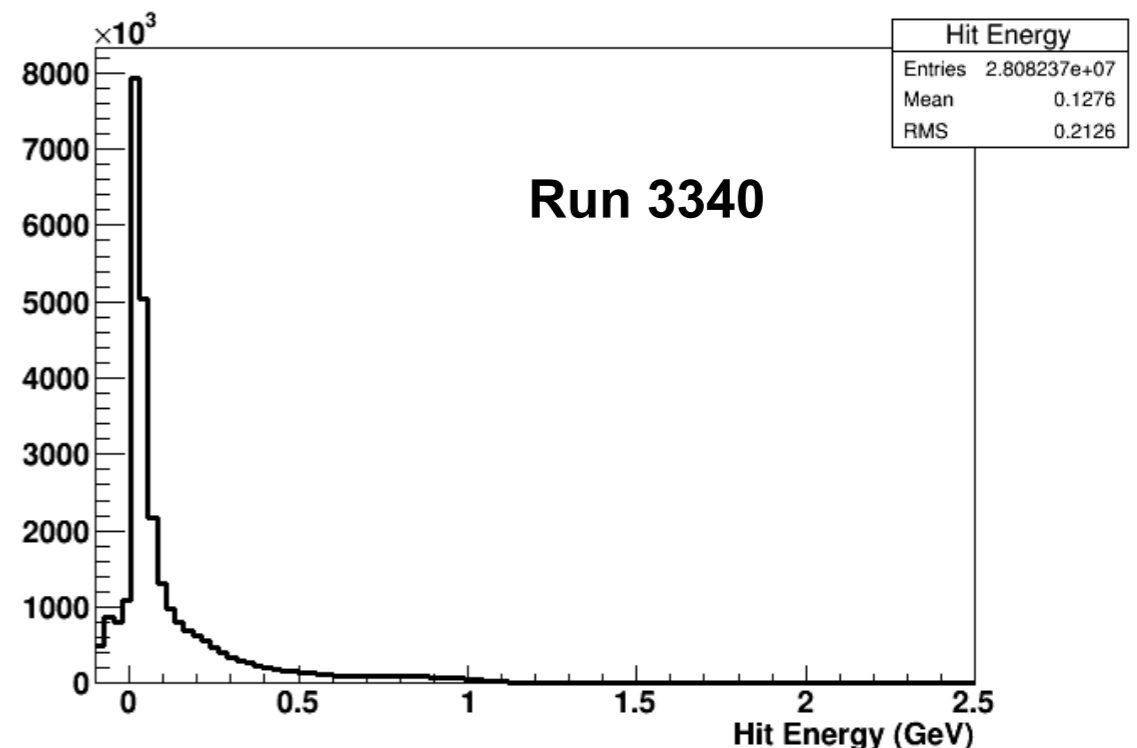
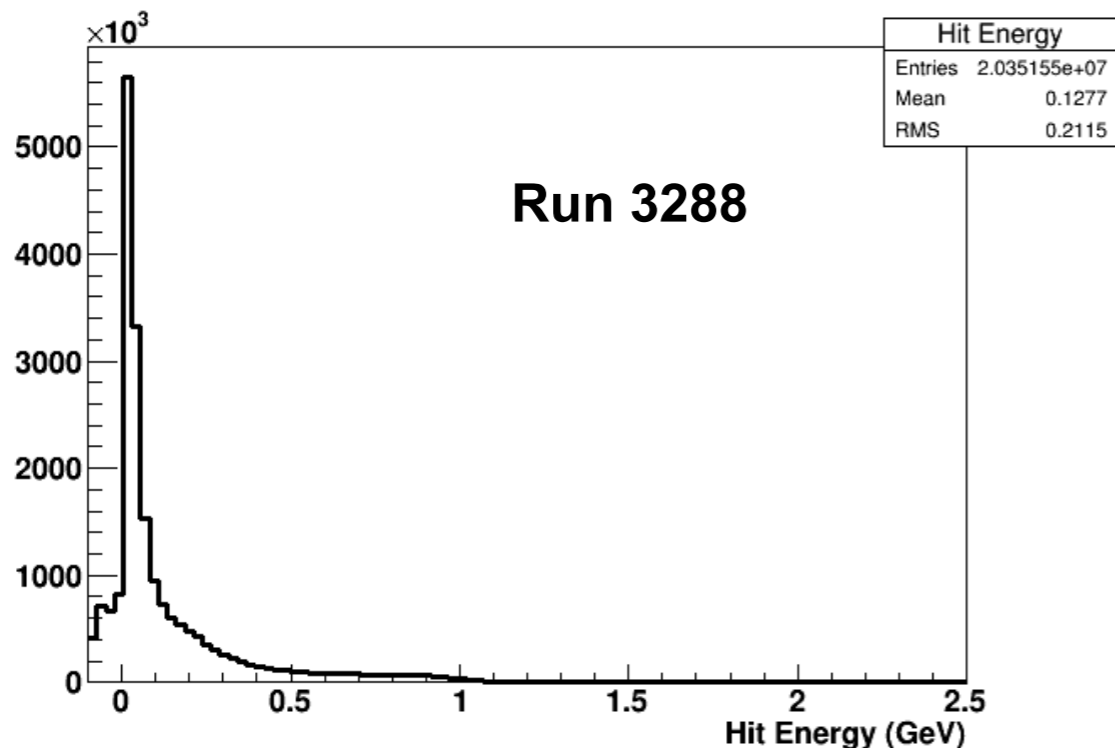


Run 3258: single cluster, 185 nA,  
400 ns window, unblocked

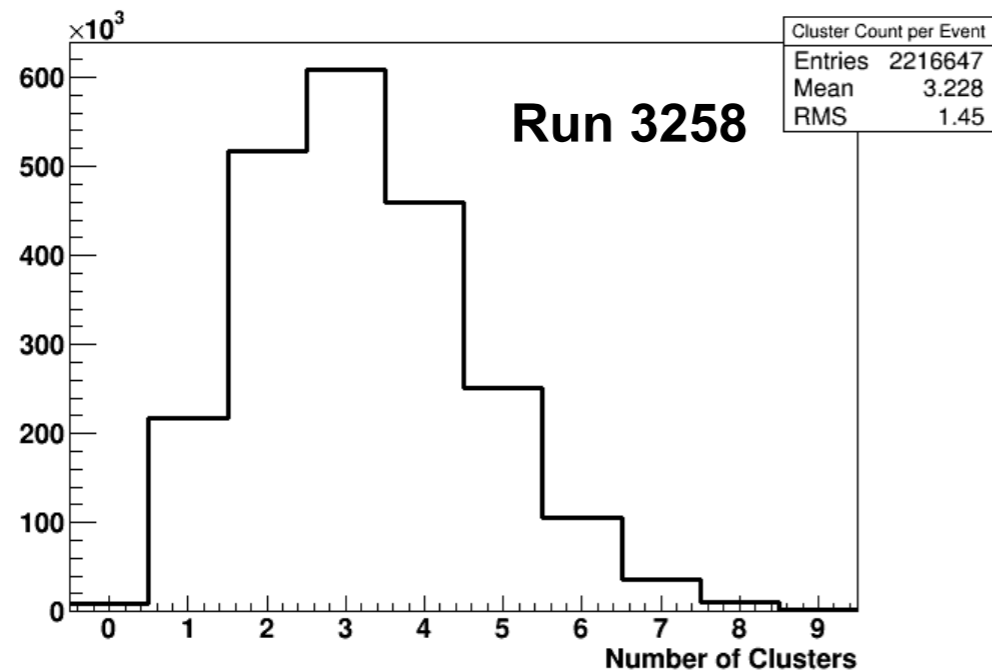
Run 3288: two cluster, 145 nA,  
200 ns window, unblocked

Run 3340: two cluster, 50 nA,  
200 ns window, blocked

**Negative energy comes from  
out-of-time hits!!!**



# Some simple plots: # of ECal Clusters

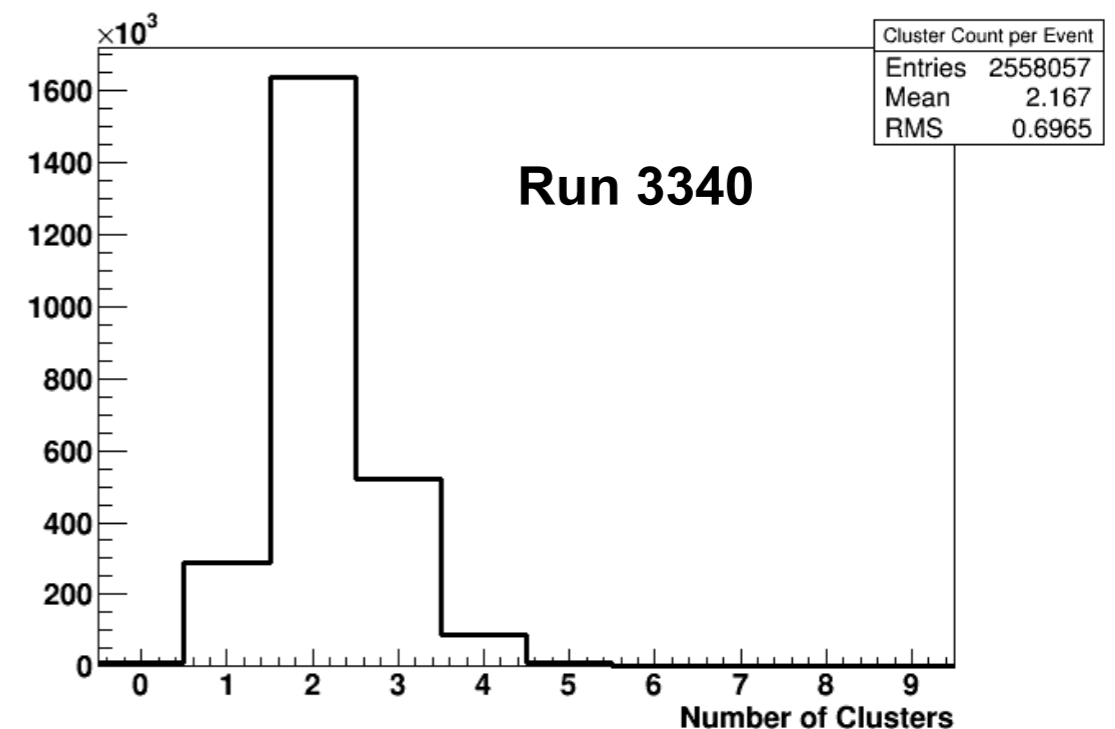
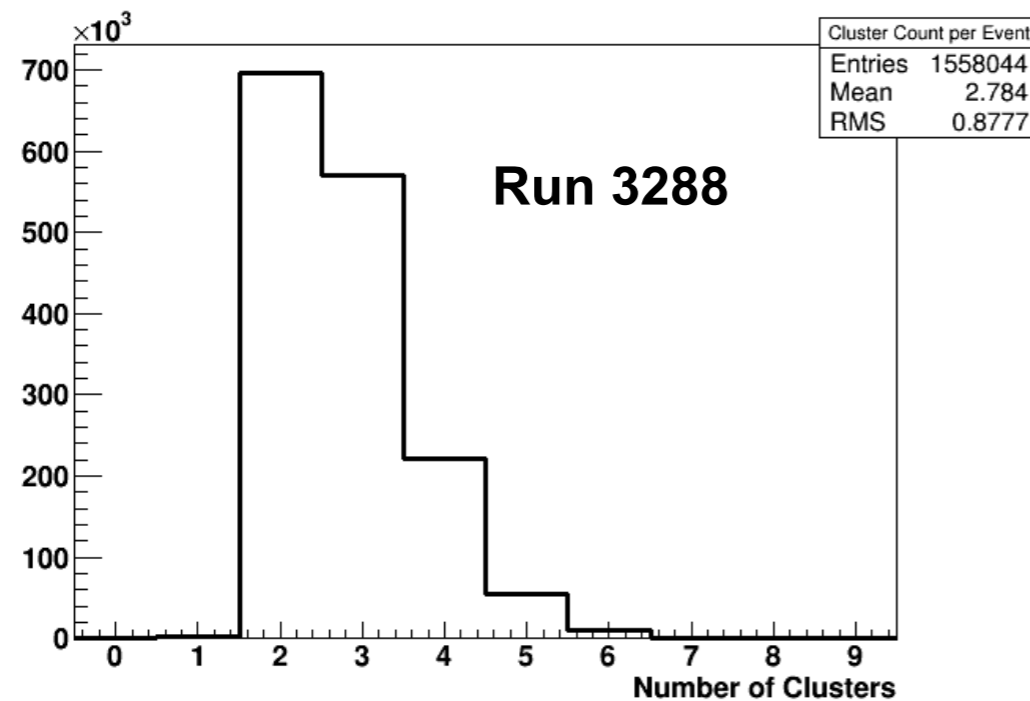


Run 3258: single cluster, 185 nA,  
400 ns window, unblocked

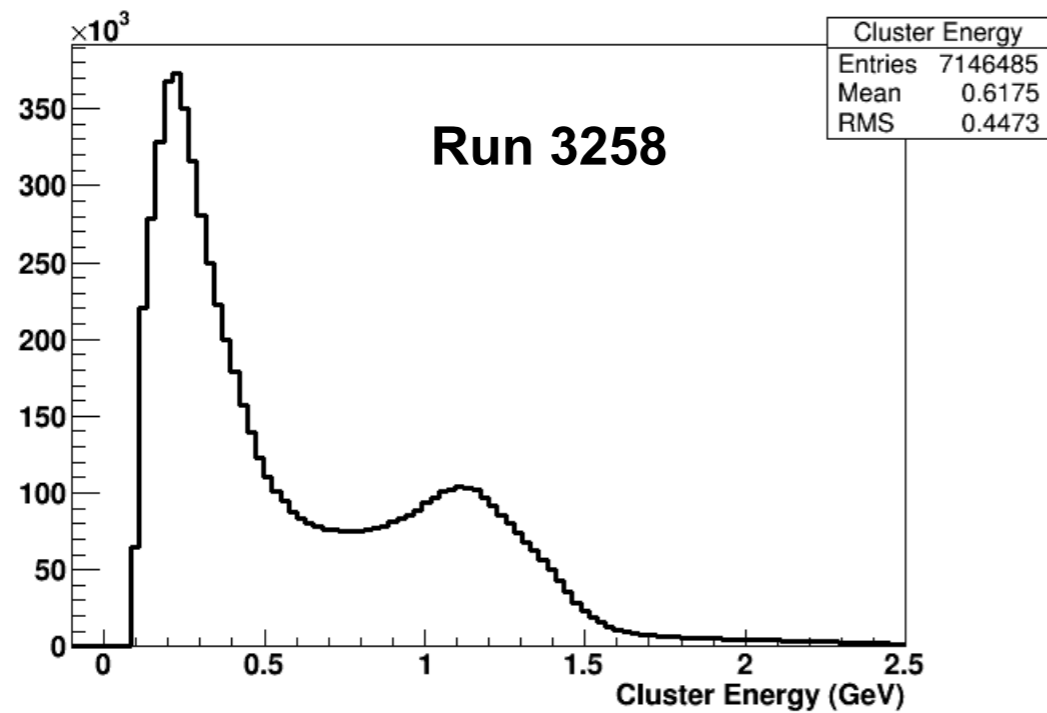
Run 3288: two cluster, 145 nA,  
200 ns window, unblocked

Run 3340: two cluster, 50 nA,  
200 ns window, blocked

***No time cut on hits in cluster***



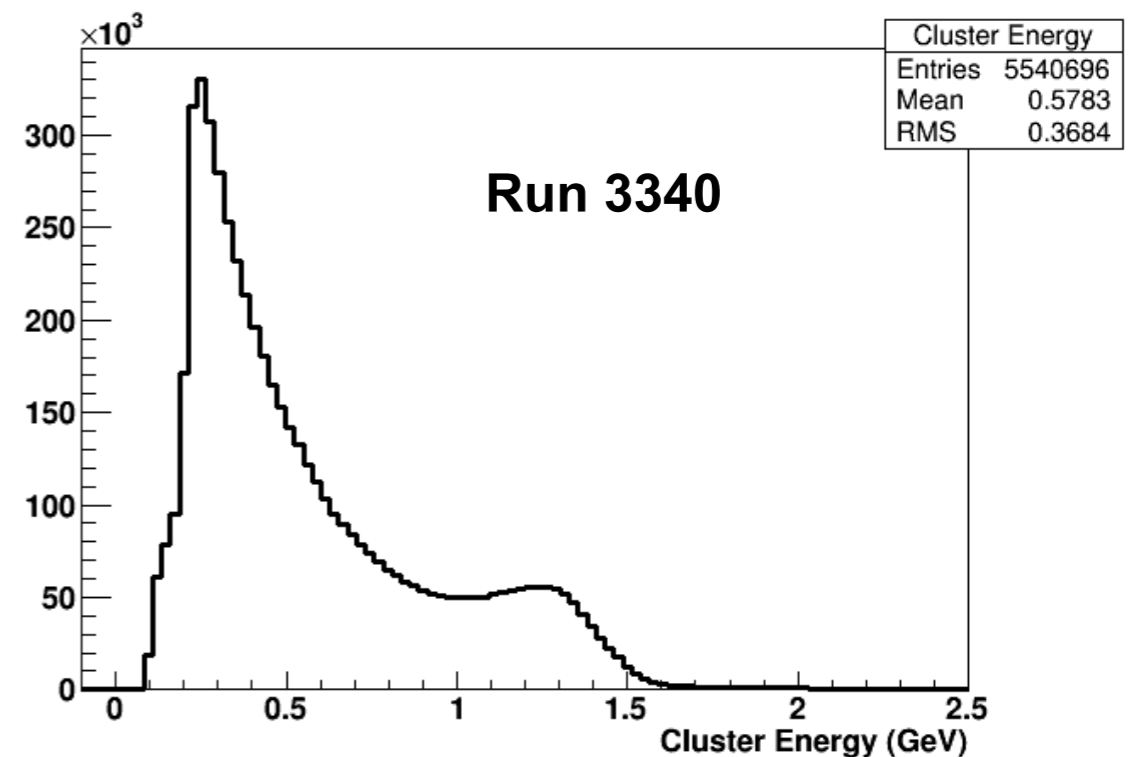
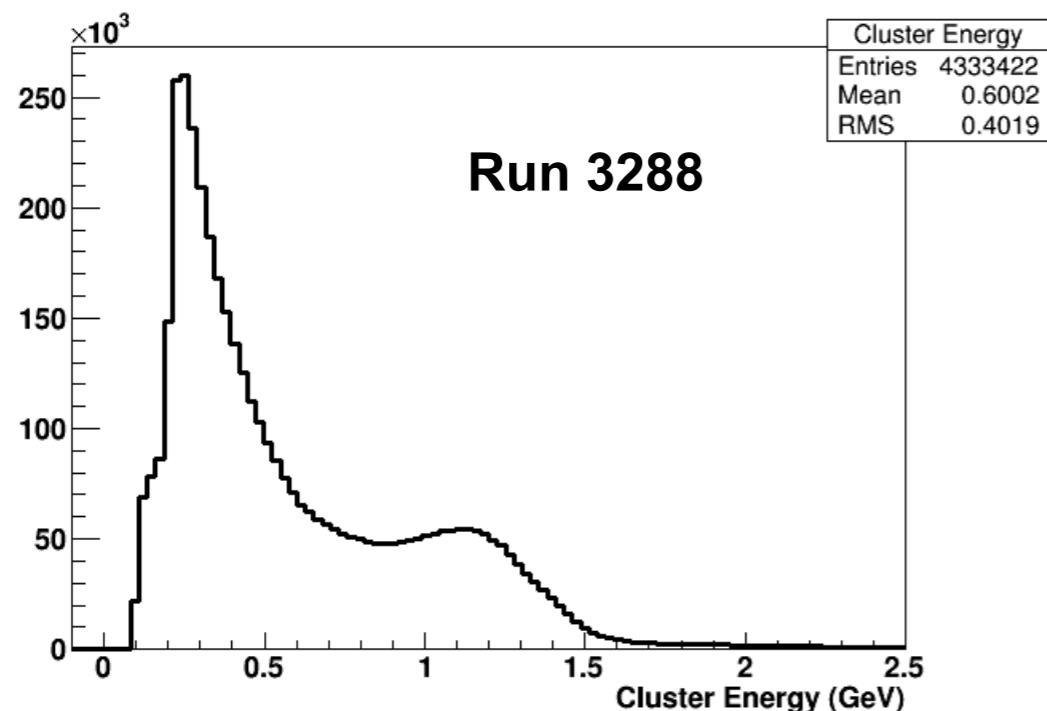
# Some simple plots: ECal Cluster Energy



Run 3258: single cluster, 185 nA,  
400 ns window, unblocked

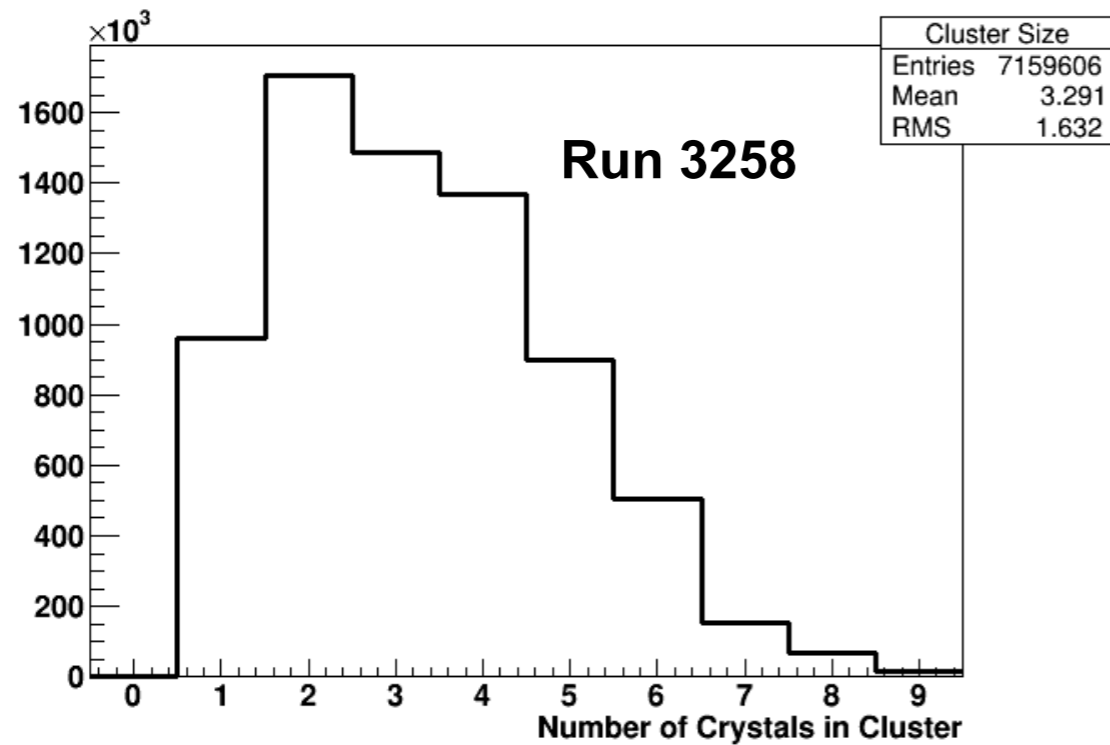
Run 3288: two cluster, 145 nA,  
200 ns window, unblocked

Run 3340: two cluster, 50 nA,  
200 ns window, blocked





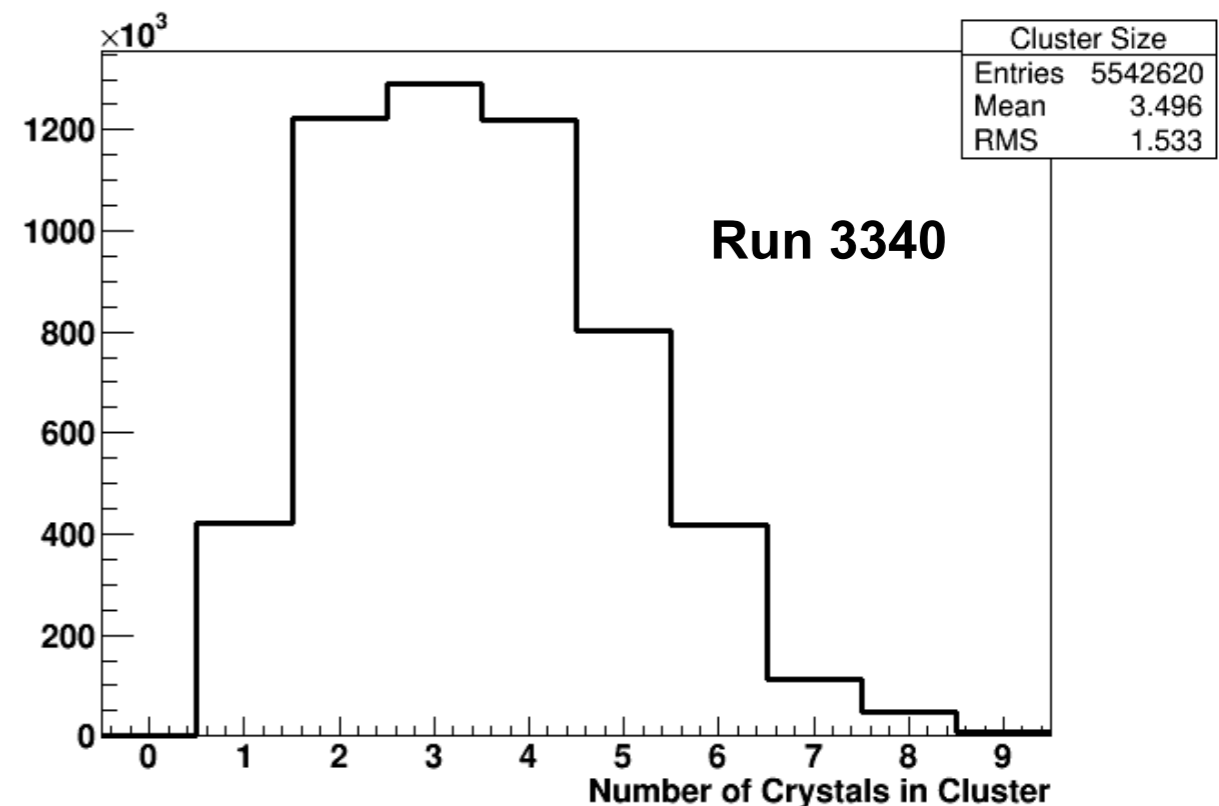
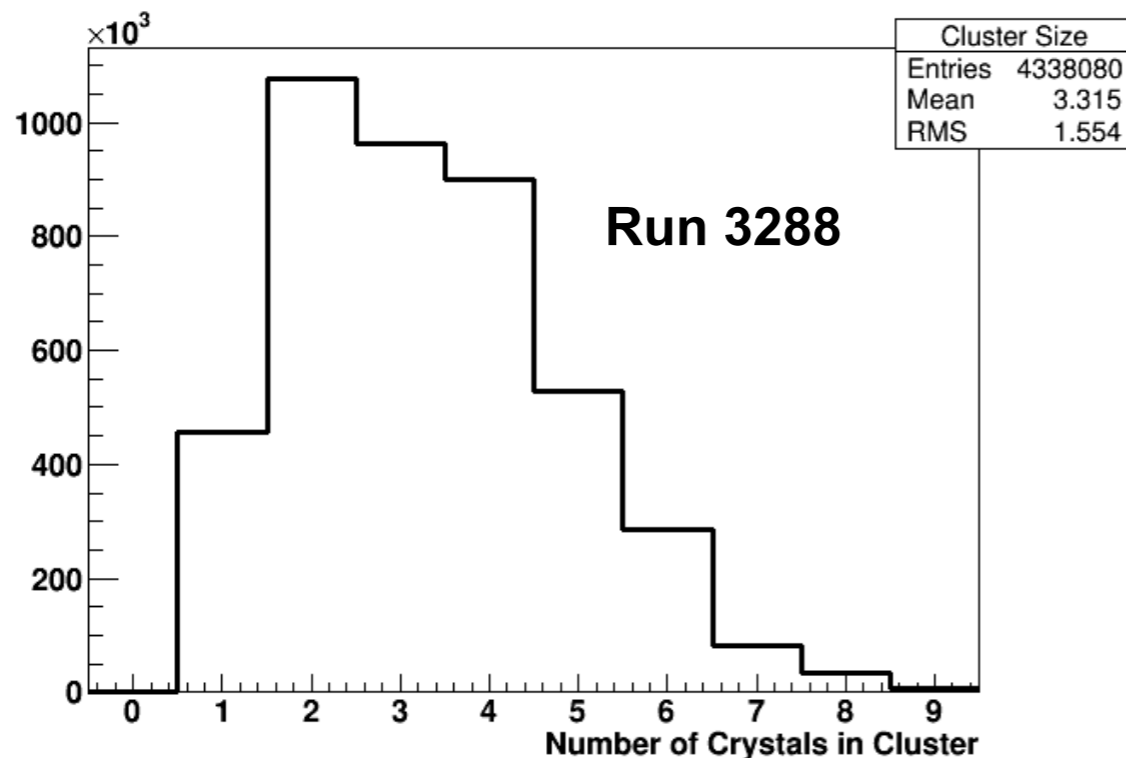
# Some simple plots: Number of ECal Crystals in Cluster



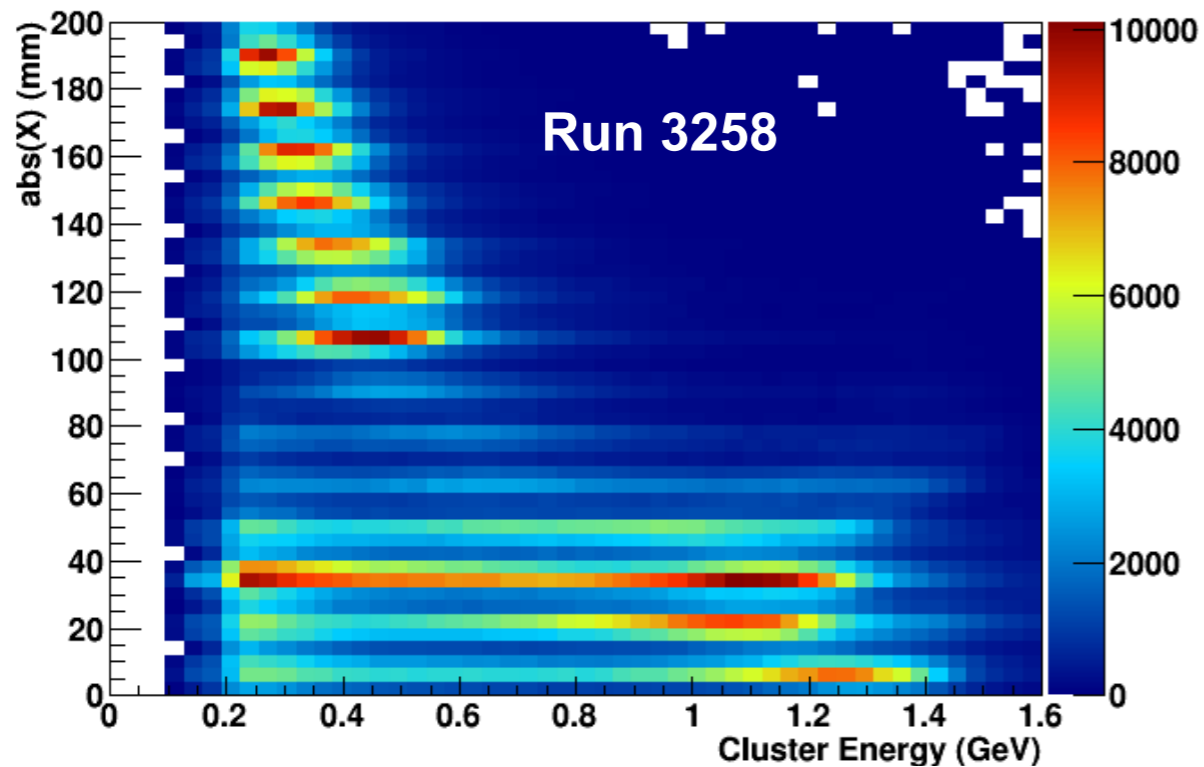
Run 3258: single cluster, 185 nA,  
400 ns window, unblocked

Run 3288: two cluster, 145 nA,  
200 ns window, unblocked

Run 3340: two cluster, 50 nA,  
200 ns window, blocked



# Some simple plots: Cluster energy vs $|X|$

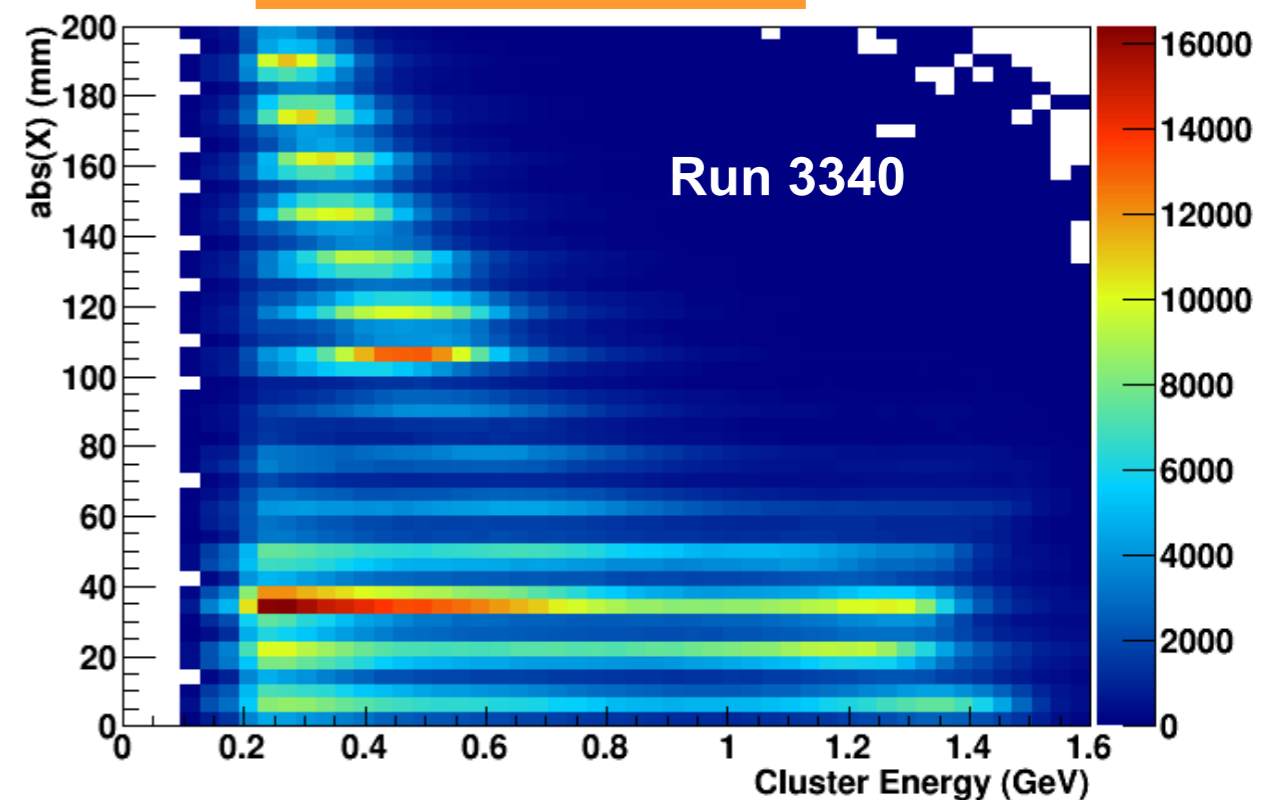
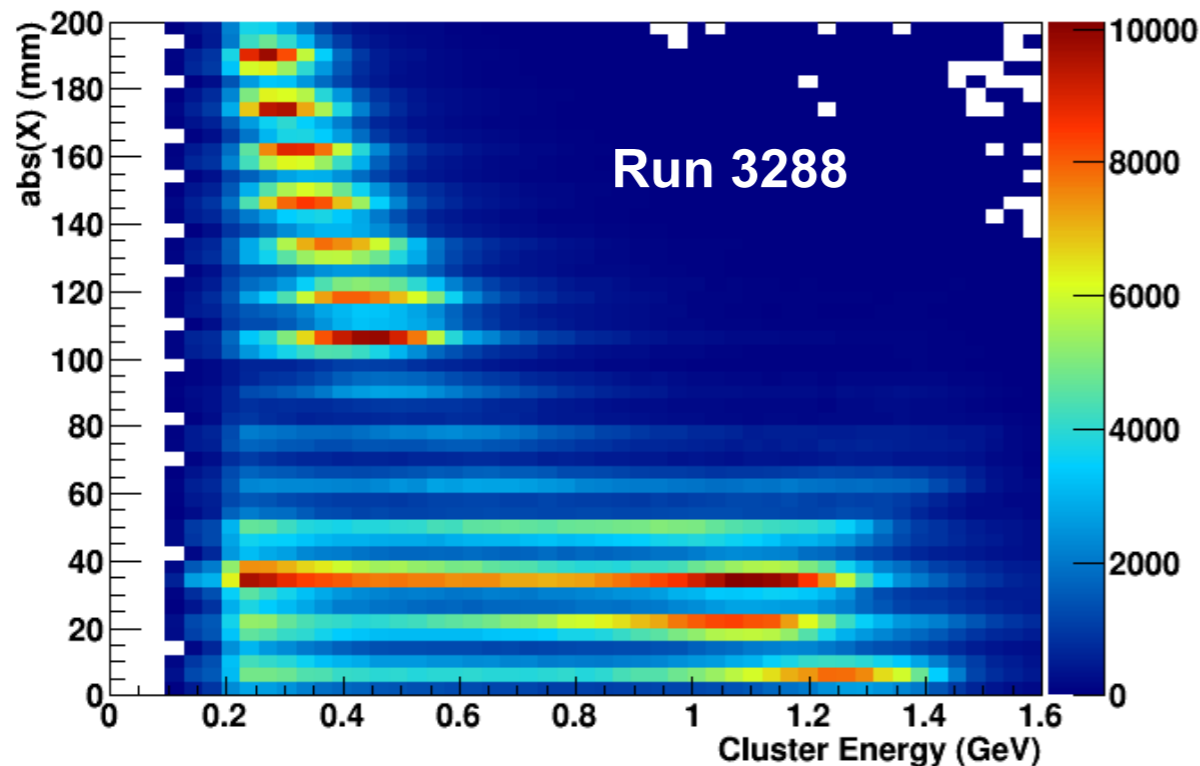


Run 3258: single cluster, 185 nA,  
400 ns window, unblocked

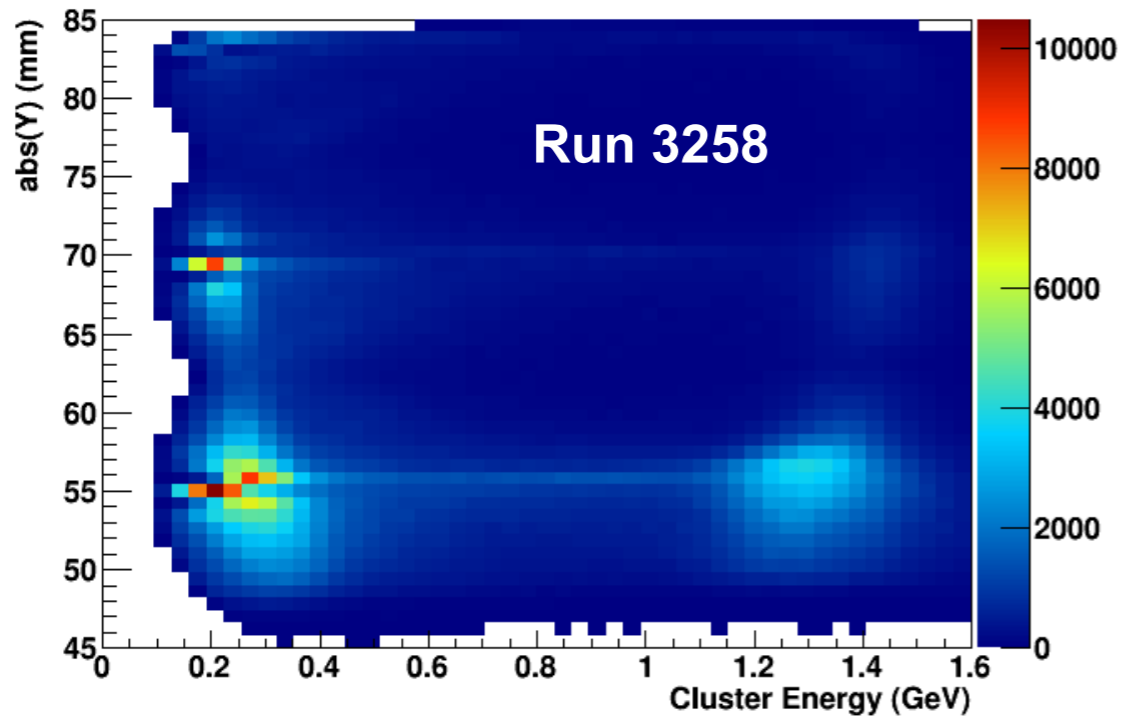
Run 3288: two cluster, 145 nA,  
200 ns window, unblocked

Run 3340: two cluster, 50 nA,  
200 ns window, blocked

**Cluster size > 1 !!!**



# Some simple plots: Cluster energy vs $|Y|$

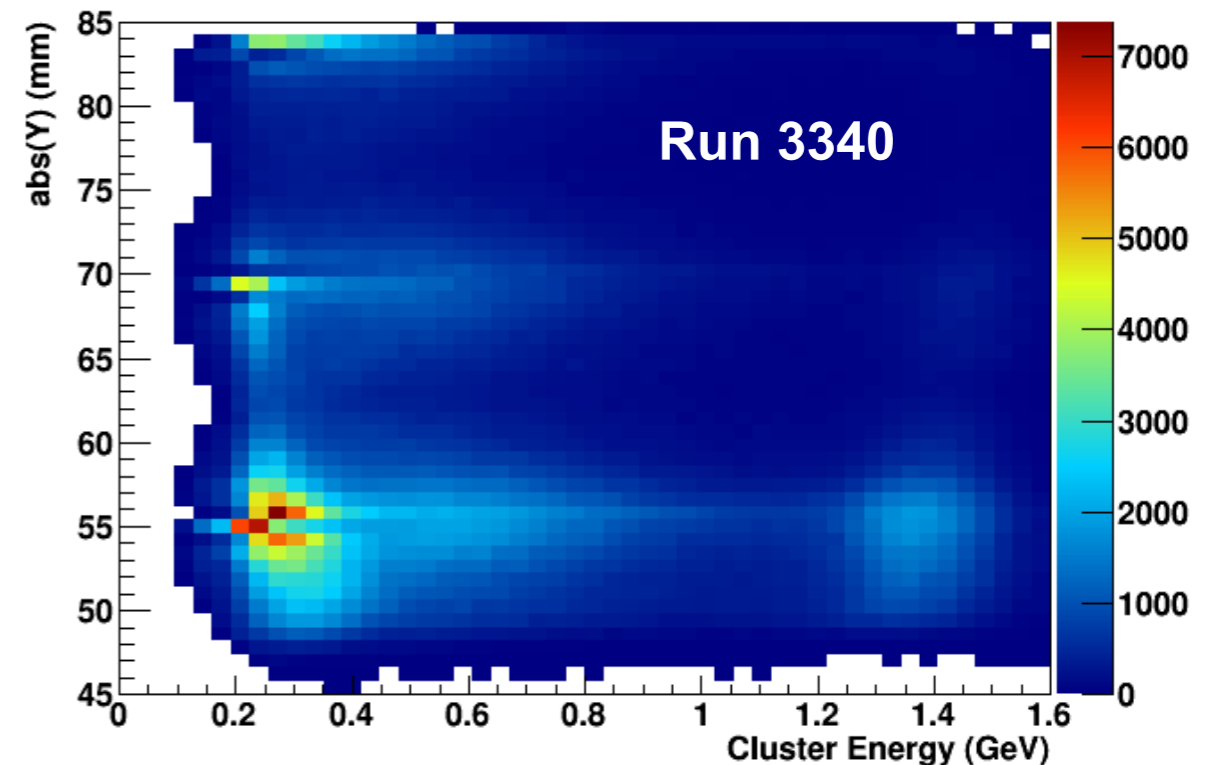
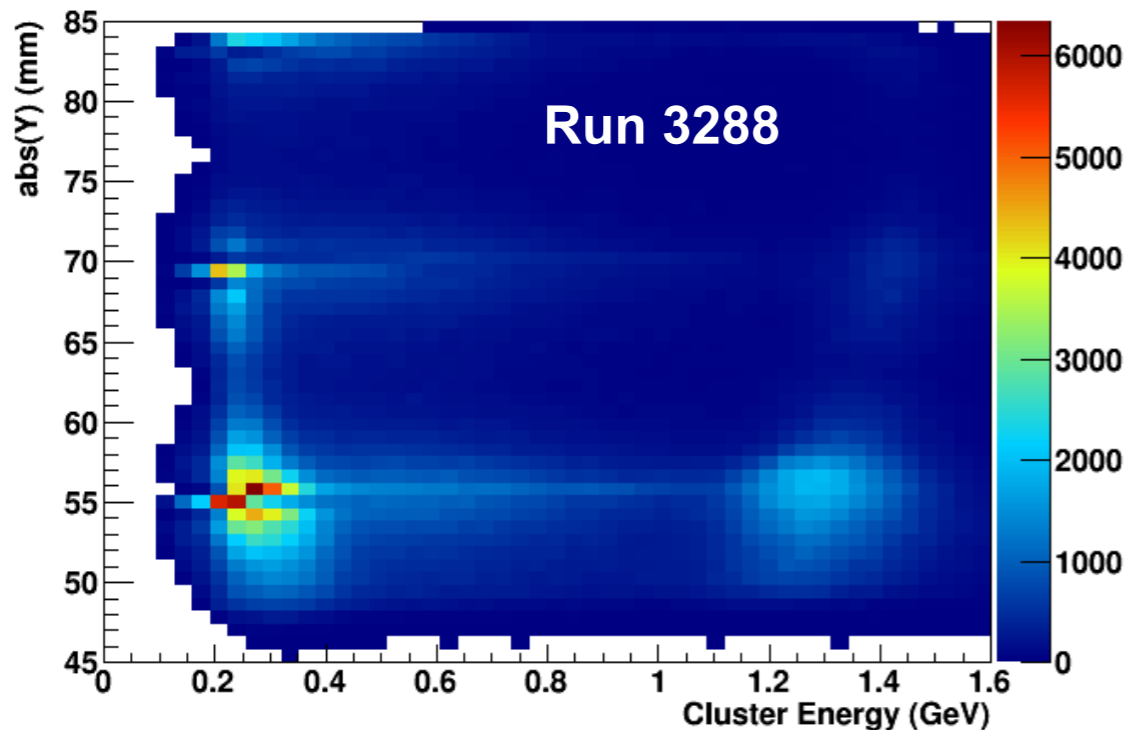


Run 3258: single cluster, 185 nA,  
400 ns window, unblocked

Run 3288: two cluster, 145 nA,  
200 ns window, unblocked

Run 3340: two cluster, 50 nA,  
200 ns window, blocked

**Cluster size > 1 &  $|row| > 2$  !!!**



# Summary

- Some issues with evio format and/or EvioToLcio
  - We should figure these out ASAP
- Despite these issues, we get ~reasonable looking ECal data, to 0th order
- Let's decide what collections to include in the recon soon (today!)