

# Second-pass clustering evaluation in SBND

Ewerton Belchior

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# Data samples

## Bee displays:

- MC: <https://www.phy.bnl.gov/twister/bee/set/a415dde0-2d2d-47e2-a971-a1302203ba11/event/list/>
- Data (run 14766): <https://www.phy.bnl.gov/twister/bee/set/30a0b3af-1db8-49a7-b66b-fa06a185bd43/event/list/>
- Data (run 18005): <https://www.phy.bnl.gov/twister/bee/set/3ddaa979-a07d-49f3-836c-339e48c45bf8/event/list/>

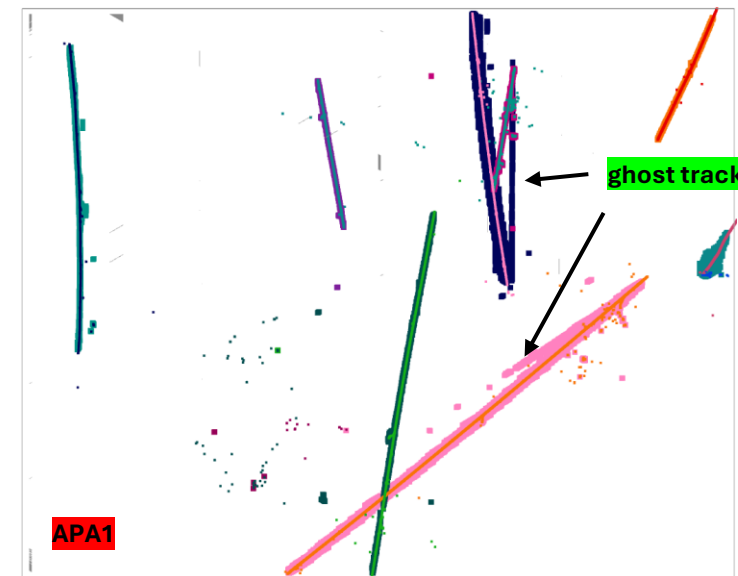
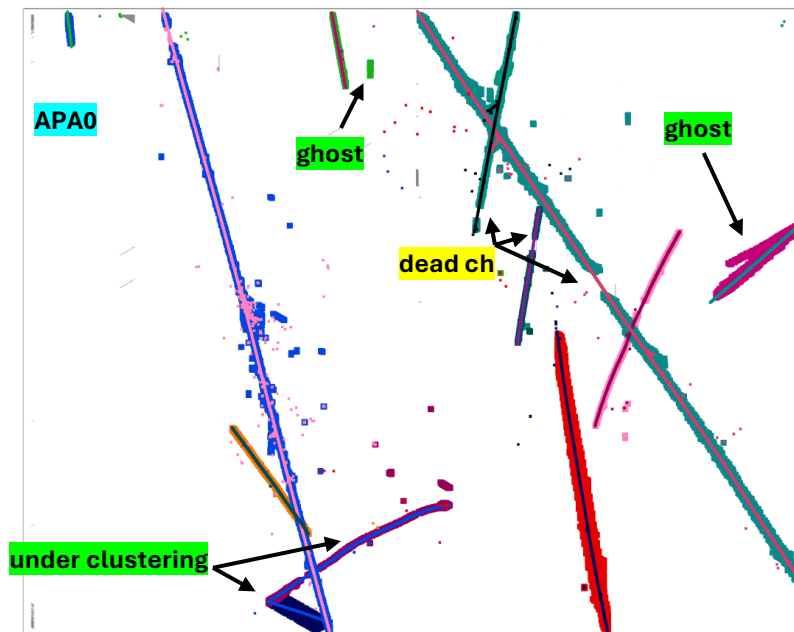
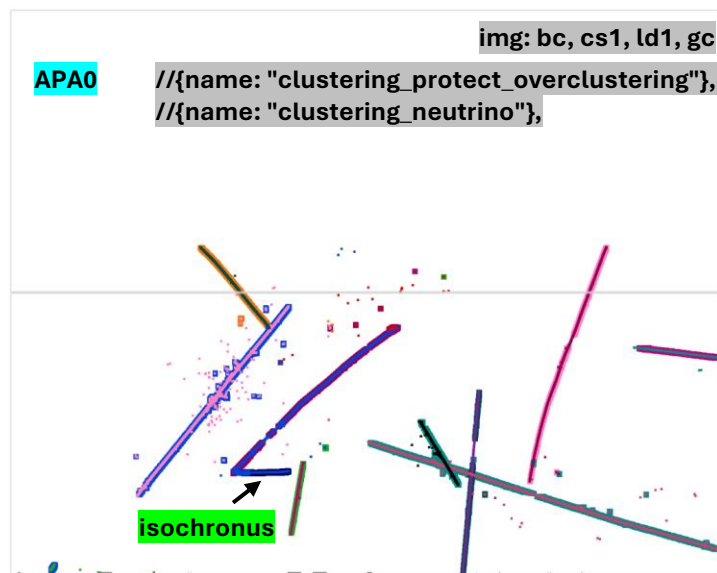
## Data samples:

- MC: [/exp/sbnd/data/users/ebatista/wirecell-clustering/eval/bnb\\_nu\\_cosmic\\_additional/sigproc.root](#)
- Data (run 14766): [/exp/sbnd/data/users/ebatista/wirecell-clustering/eval/run14766/sigproc.root](#)
- Data (run 18005): [/exp/sbnd/data/users/ebatista/wirecell-clustering/eval/run18005/sigproc.root](#)
- **sbndcode version for clustering with wct v0\_30\_2:**
- MC: v10\_04\_07 (first-pass was v09\_91\_02, with wct v0\_27\_1)
- Data (run 14766): v10\_04\_07 (first-pass was v10\_04\_03, with wct v0\_29\_5)
- Data (run 18005): v10\_04\_07 (first-pass was v10\_04\_03, with wct v0\_29\_5)

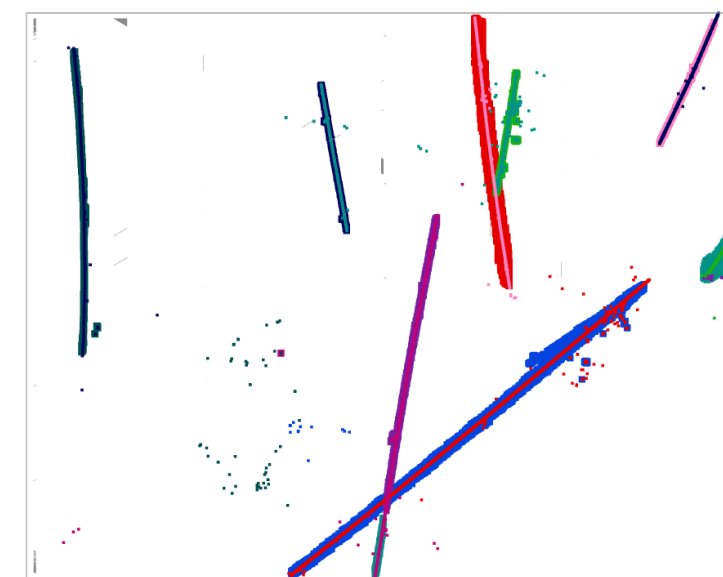
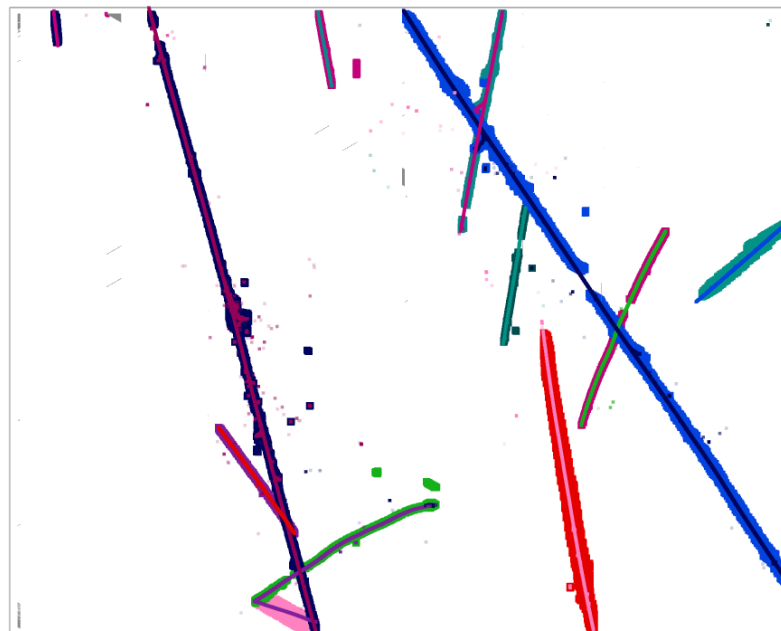
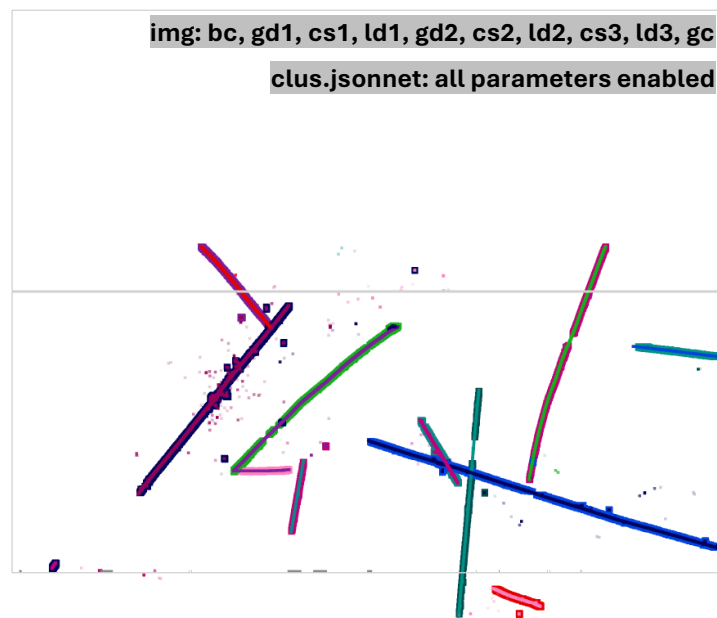
# Handscan (MC)

2<sup>nd</sup> pass: run 1, event 10

1<sup>st</sup> pass evaluation

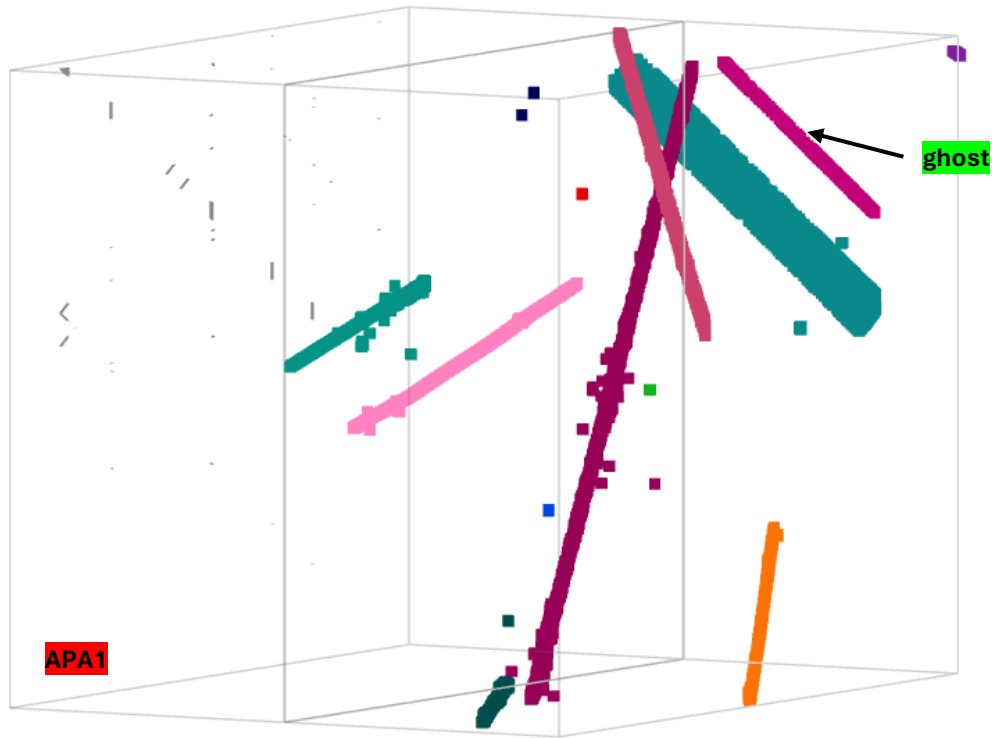


2<sup>nd</sup> pass evaluation

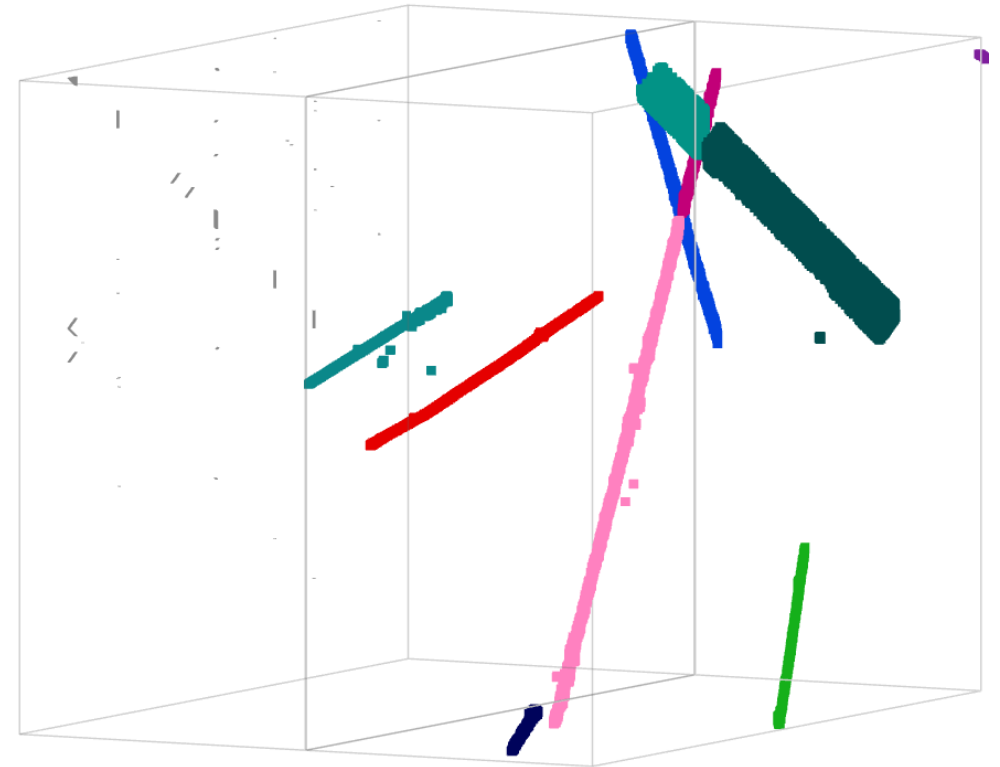


# Handscan (data: run 18005)

2<sup>nd</sup> pass: run 18005, event 36453



← 1<sup>st</sup> pass evaluation

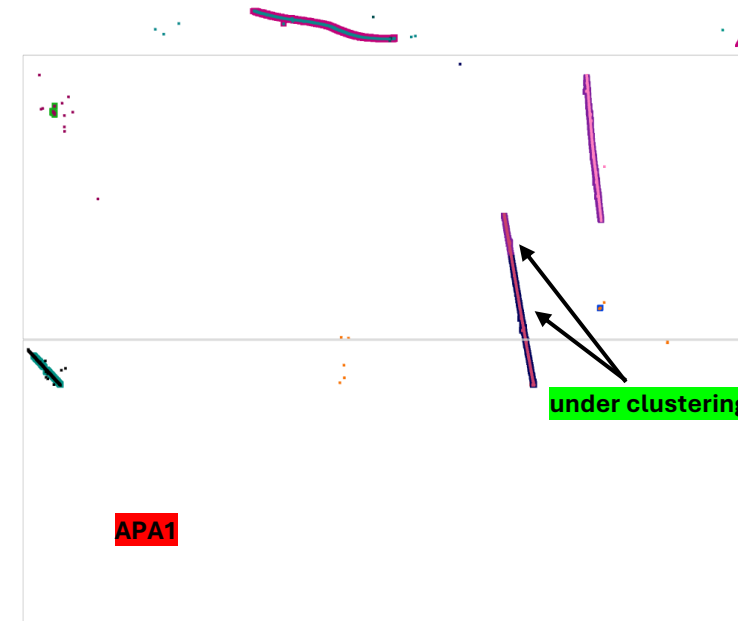
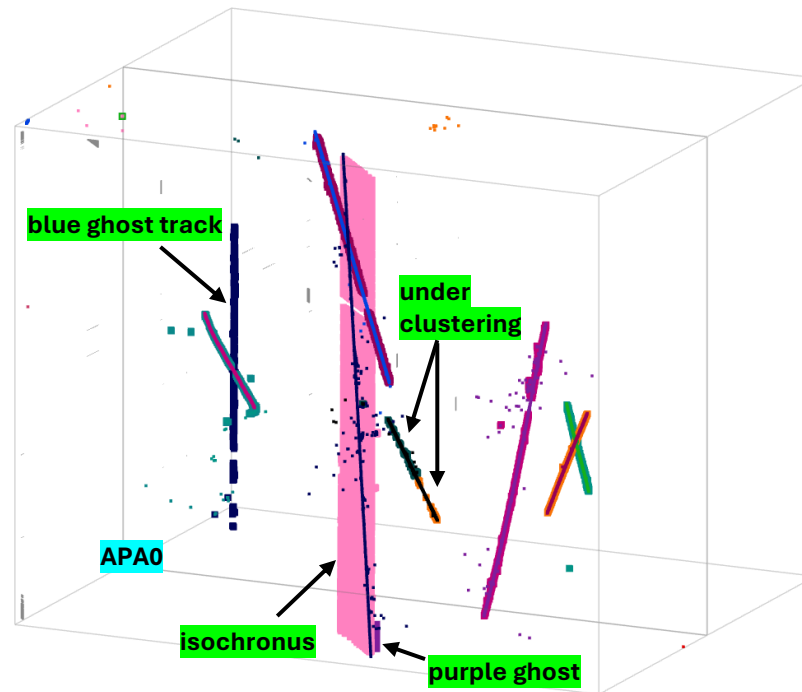
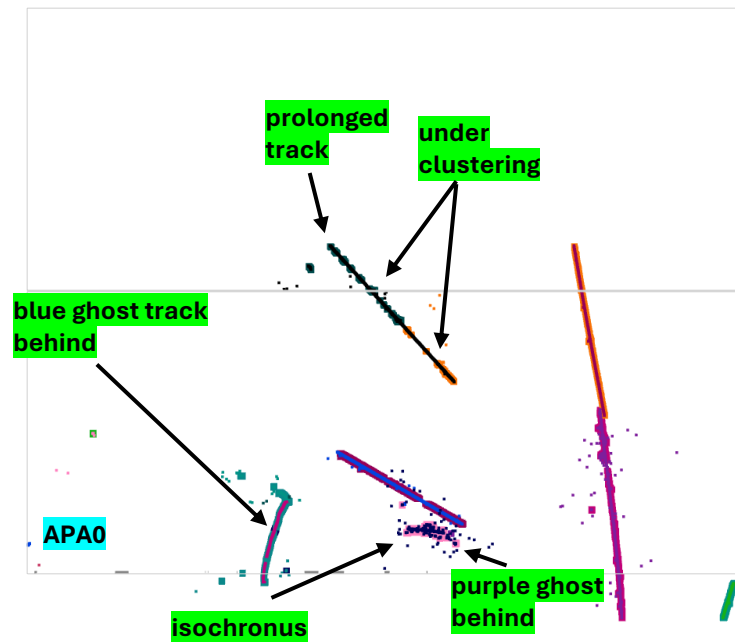


→ 2<sup>nd</sup> pass evaluation

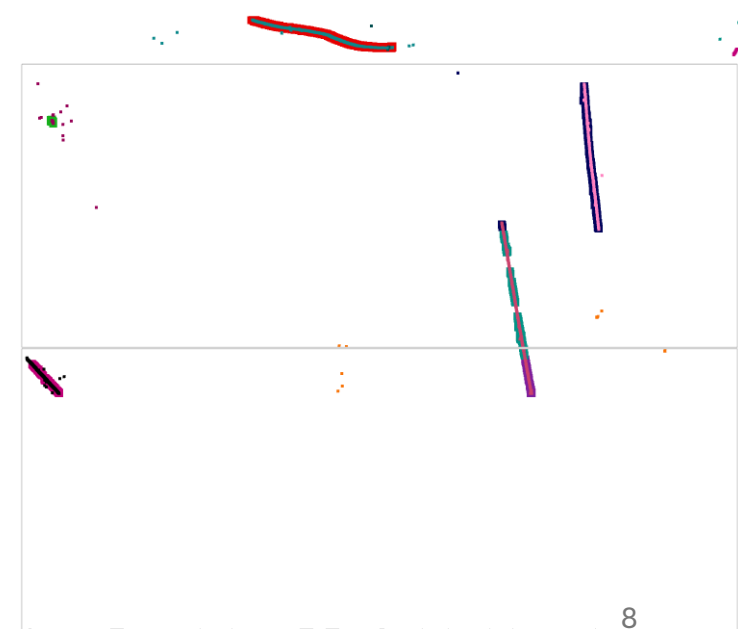
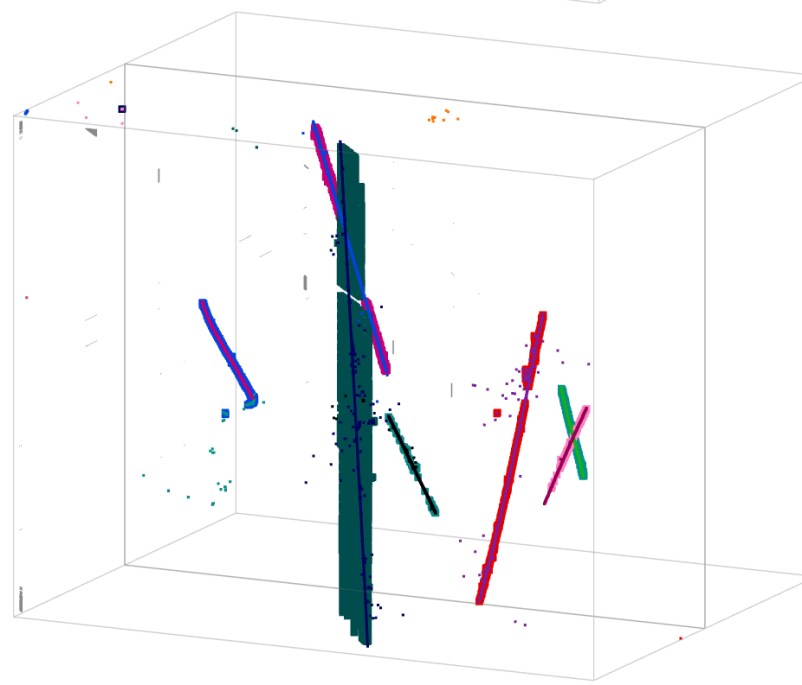
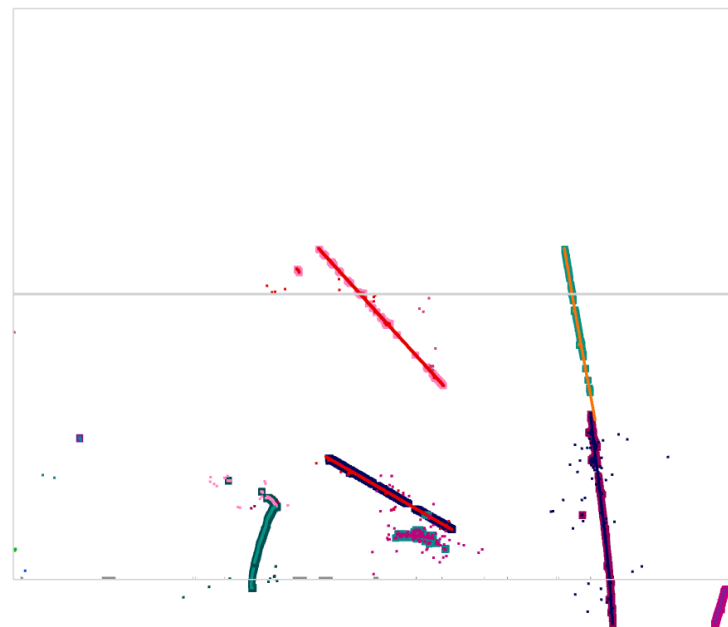
# Handscan (MC)

2<sup>nd</sup> pass: run 1, event 14

1<sup>st</sup> pass evaluation



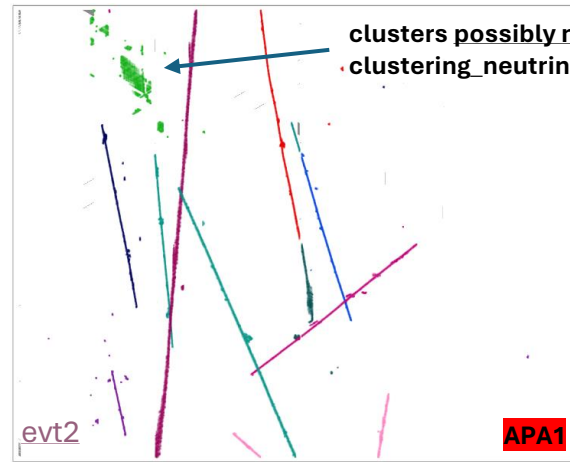
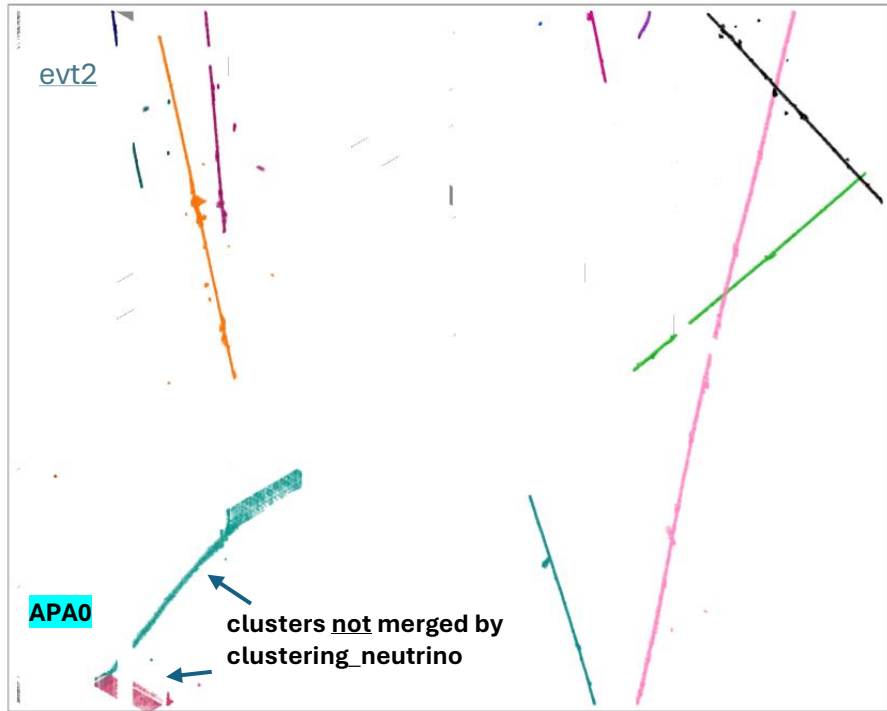
2<sup>nd</sup> pass evaluation



- Picking up more neutrino events -> checking neutrino clustering
- Clustering: timming issues?
  - Run14766 (nskip 3): time > 399 seconds
  - bnb\_nu\_cosmic (nskip 27): time > 863 seconds
  - bnb\_nu\_cosmic\_additional (nskip 8): time > 504 seconds

**Some findings related to  
function clustering\_neutrino**

- Looks like **clustering\_neutrino** is not merging clusters in APA0 in the few events investigated (next slides)
- No such behavior is seen in APA1
- Ask for some direction on how to solve or debug this!
- Now trying to understand the reason



empty vectors!  
(there should be candidates here  
to merge?)

**APA0**

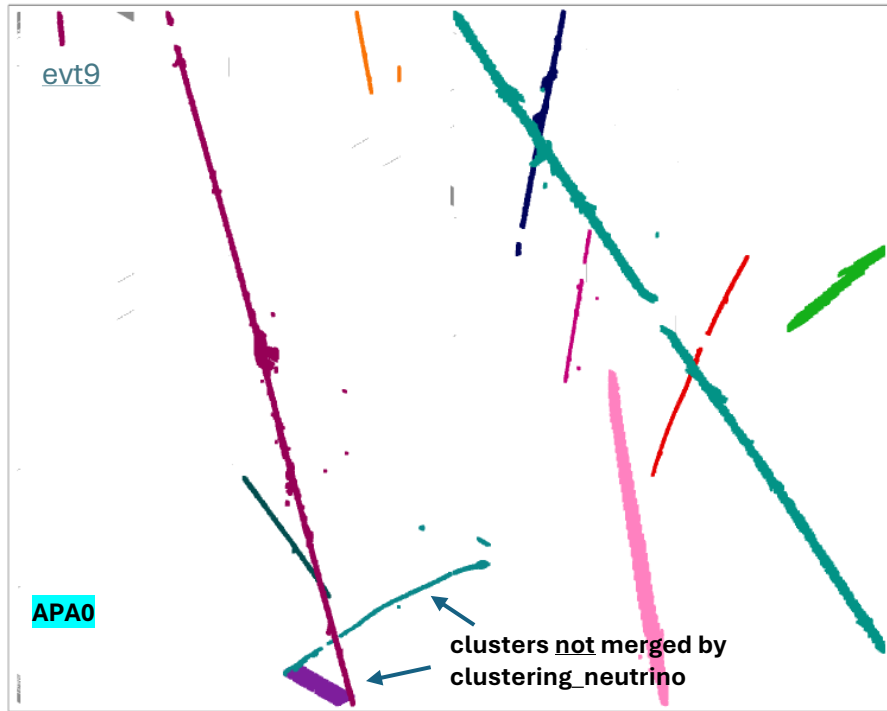
```
clustering_neutrino.cxx [ew]: candidate_clusters.size()=0
clustering_neutrino.cxx [ew]: contained_clusters.size()=0
```

**APA1**

```
clustering_neutrino.cxx [ew]: candidate_clusters.size()=19
clustering_neutrino.cxx [ew]: contained_clusters.size()=38
```

### merged clusters in APA1

```
cluster1->get_length()=419.361, cluster2->get_length()=71.192
cluster1->get_length()=419.361, cluster2->get_length()=126.545
cluster1->get_length()=419.361, cluster2->get_length()=79.3436
cluster1->get_length()=126.545, cluster2->get_length()=78.8822
cluster1->get_length()=108.576, cluster2->get_length()=85.1987
cluster1->get_length()=108.576, cluster2->get_length()=419.361
```



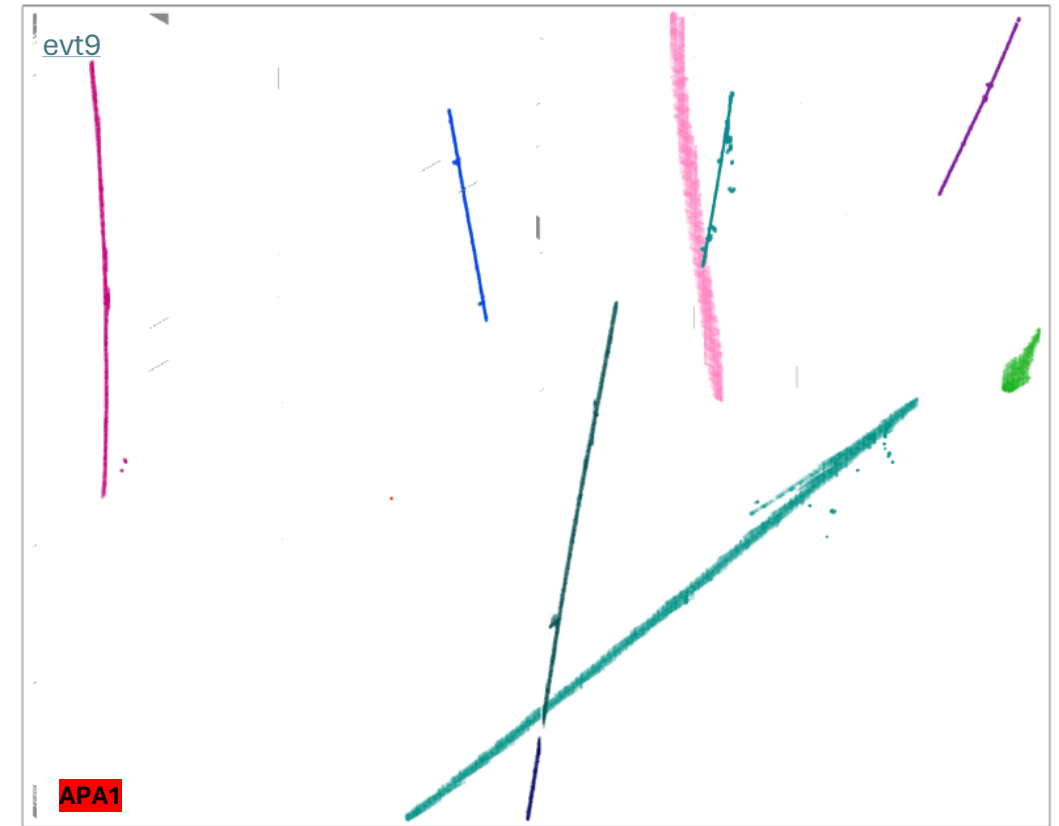
empty vectors!  
(there should be candidates here  
to merge?)

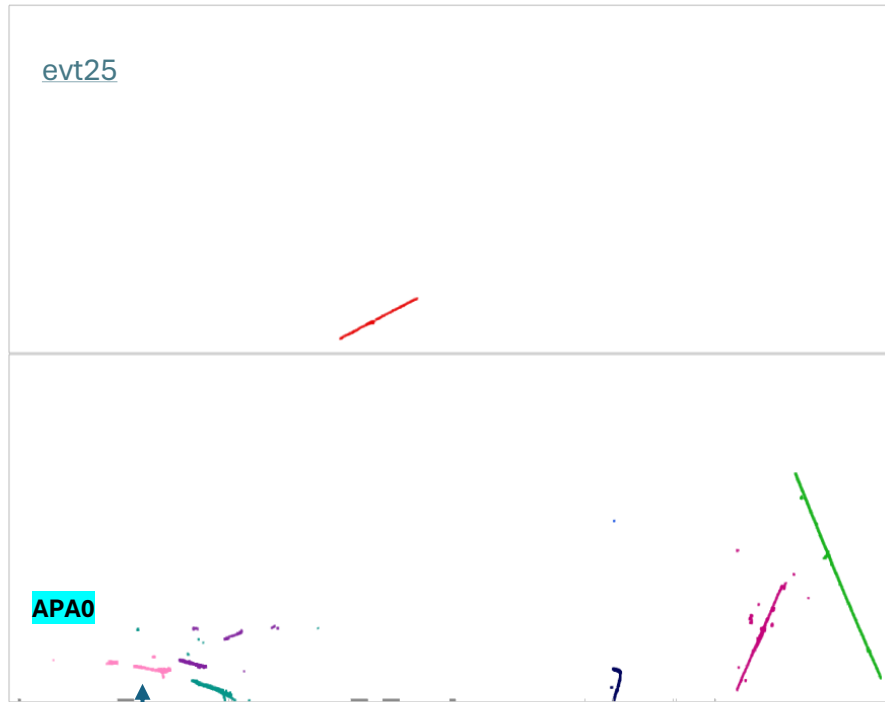
**APA0**

```
clustering_neutrino.cxx [ew]: candidate_clusters.size()=0
clustering_neutrino.cxx [ew]: contained_clusters.size()=0
```

**APA1**

```
clustering_neutrino.cxx [ew]: candidate_clusters.size()=11
clustering_neutrino.cxx [ew]: contained_clusters.size()=22
```





APA0

clusters not merged by  
clustering\_neutrino.cxx

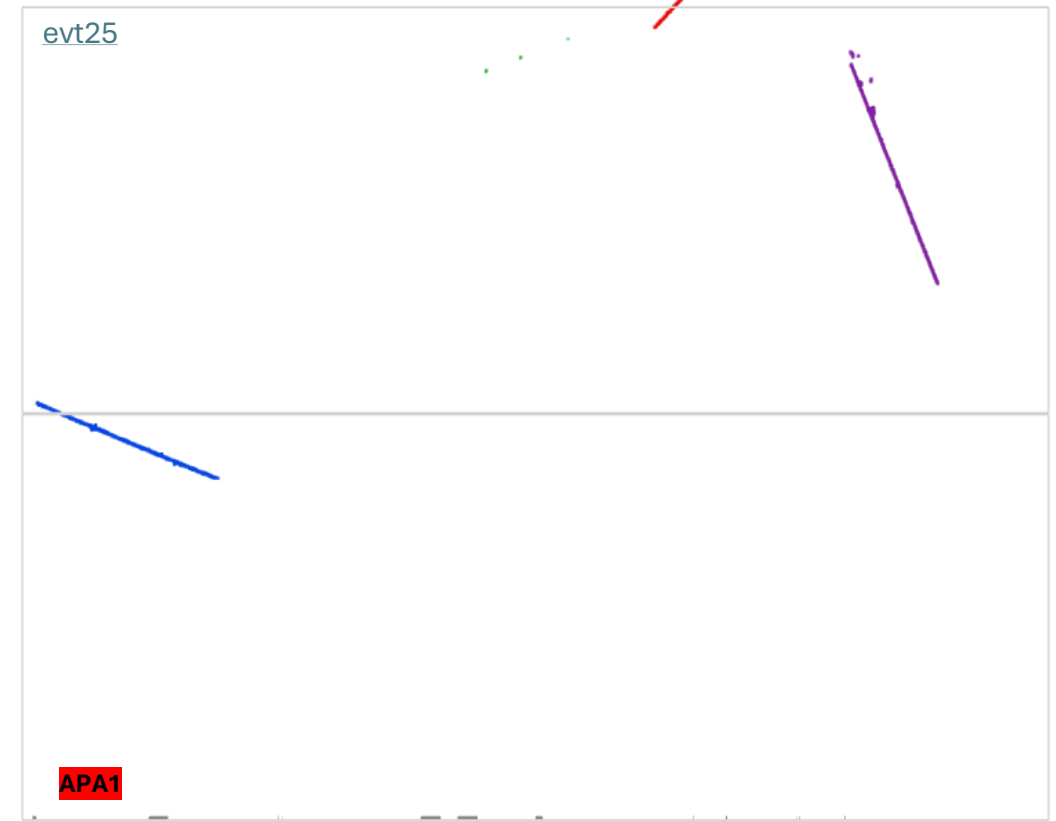
non-empty vectors!  
(did not pass merging requirements  
though, not merged)

APA0

```
clustering_neutrino.cxx [ew]: candidate_clusters.size()=1
clustering_neutrino.cxx [ew]: contained_clusters.size()=2
```

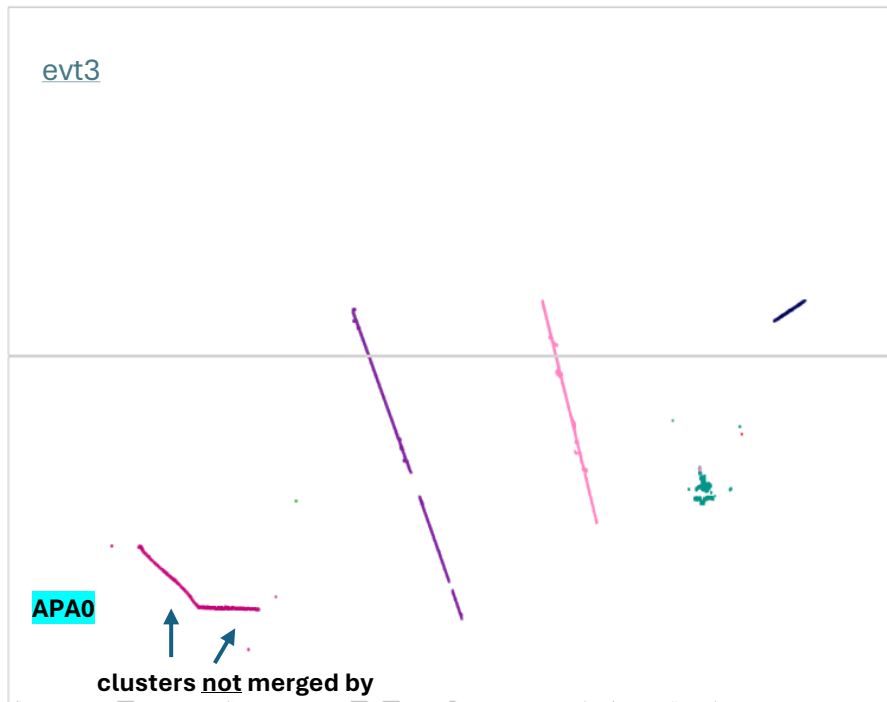
APA1

```
clustering_neutrino.cxx [ew]: candidate_clusters.size()=2
clustering_neutrino.cxx [ew]: contained_clusters.size()=4
```



evt25

APA1



clusters not merged by  
clustering\_neutrino -> (clustered by other  
functions like clustering\_regular,  
clustering\_close, etc?)

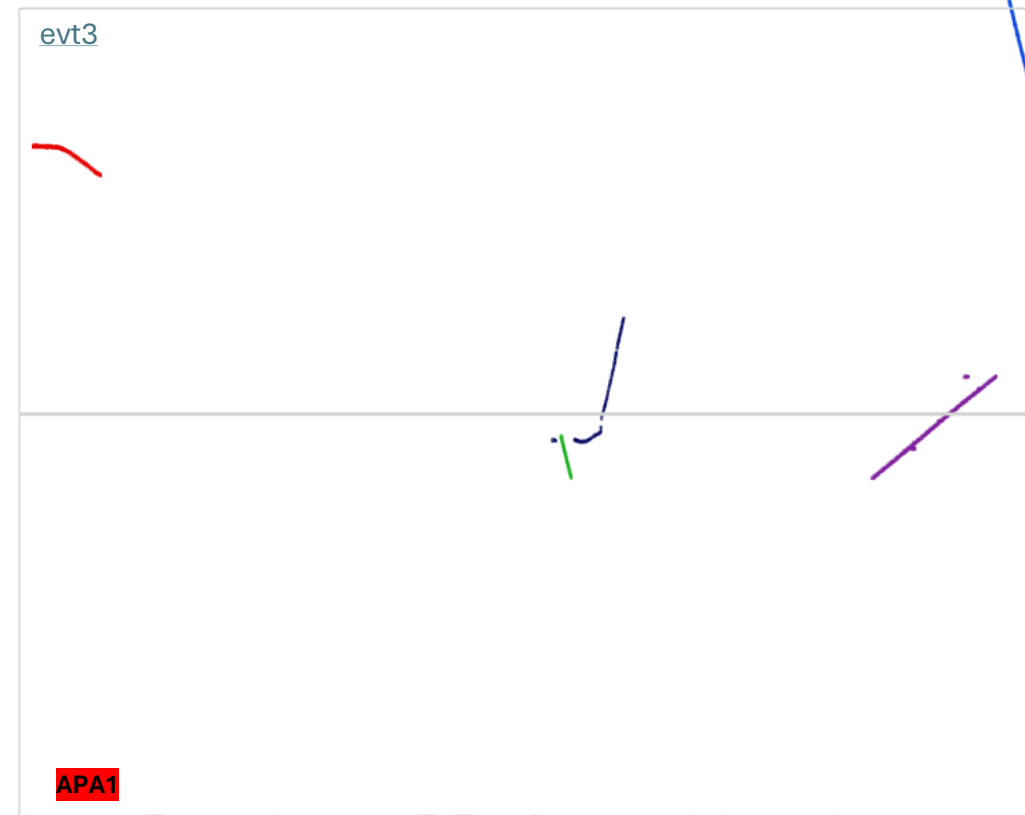
non-empty vectors!  
(did not pass merging requirements  
though, not merged. Look ok)

**APA0**

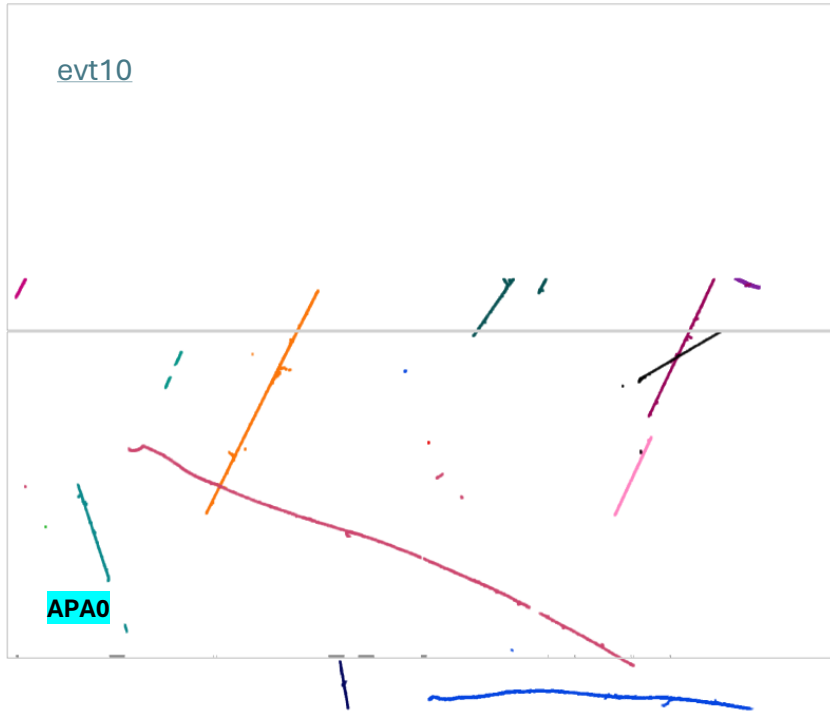
```
clustering_neutrino.cxx [ew]: candidate_clusters.size()=1
clustering_neutrino.cxx [ew]: contained_clusters.size()=2
```

**APA1**

```
clustering_neutrino.cxx [ew]: candidate_clusters.size()=1
clustering_neutrino.cxx [ew]: contained_clusters.size()=3
```



**APA1**



**APA0**

```
clustering_neutrino.cxx [ew]: candidate_clusters.size()=3
clustering_neutrino.cxx [ew]: contained_clusters.size()=6
```

**APA1**

```
clustering_neutrino.cxx [ew]: candidate_clusters.size()=13
clustering_neutrino.cxx [ew]: contained_clusters.size()=27
```

non-empty vectors!  
(did not pass merging requirements  
though, not merged. Look ok)



clusters already merged in  
imaging step (maybe additional merge by  
clustering\_neutrino, need further check)



### merged clusters in APA1

```
cluster1->get_length()=222.609, cluster2->get_length()=203.421
cluster1->get_length()=228.357, cluster2->get_length()=1968.8
cluster1->get_length()=228.357, cluster2->get_length()=64.7943
cluster1->get_length()=60.7272, cluster2->get_length()=1622.17
cluster1->get_length()=203.421, cluster2->get_length()=82.8529
```



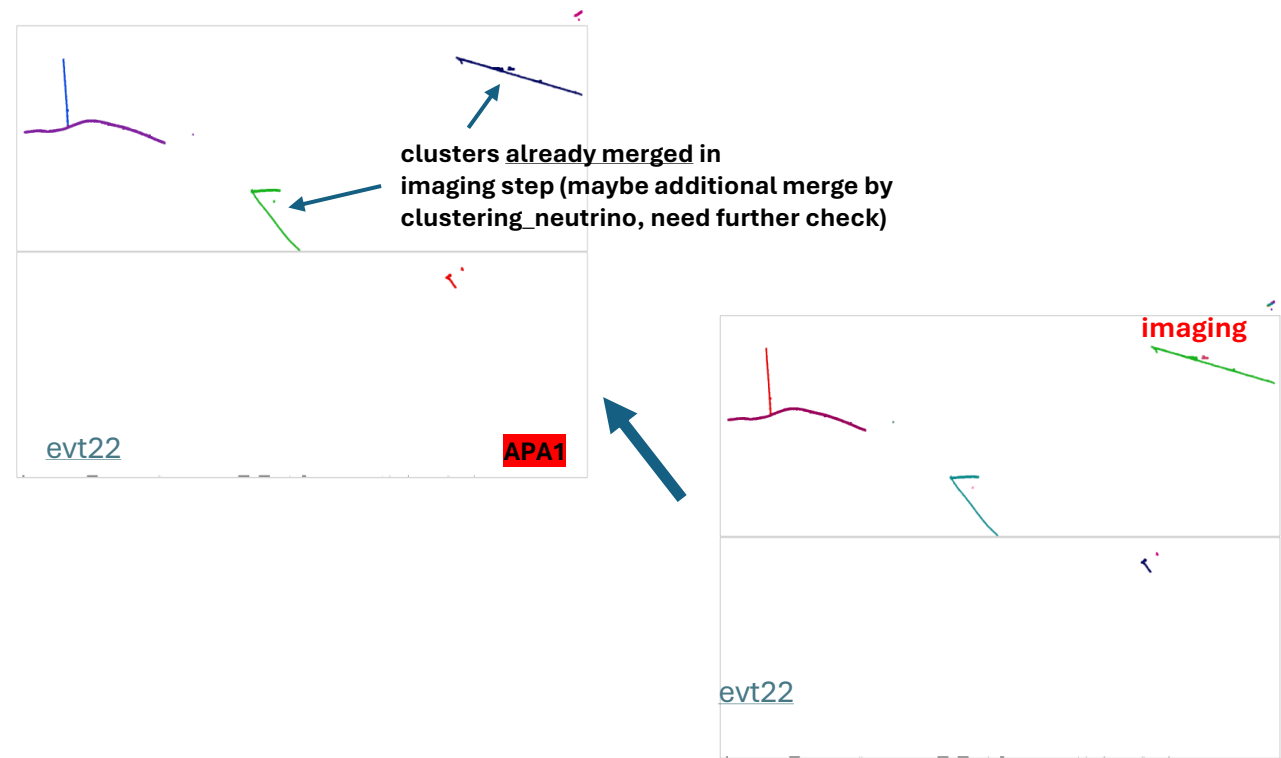
**APA0**

```
clustering_neutrino.cxx [ew]: candidate_clusters.size()=0
clustering_neutrino.cxx [ew]: contained_clusters.size()=0
```

**APA1**

```
clustering_neutrino.cxx [ew]: candidate_clusters.size()=4
clustering_neutrino.cxx [ew]: contained_clusters.size()=10
```

empty vectors!  
(look ok)



merged clusters in APA1

```
cluster1->get length()=70.6932, cluster2->get length()=1303.8
```