

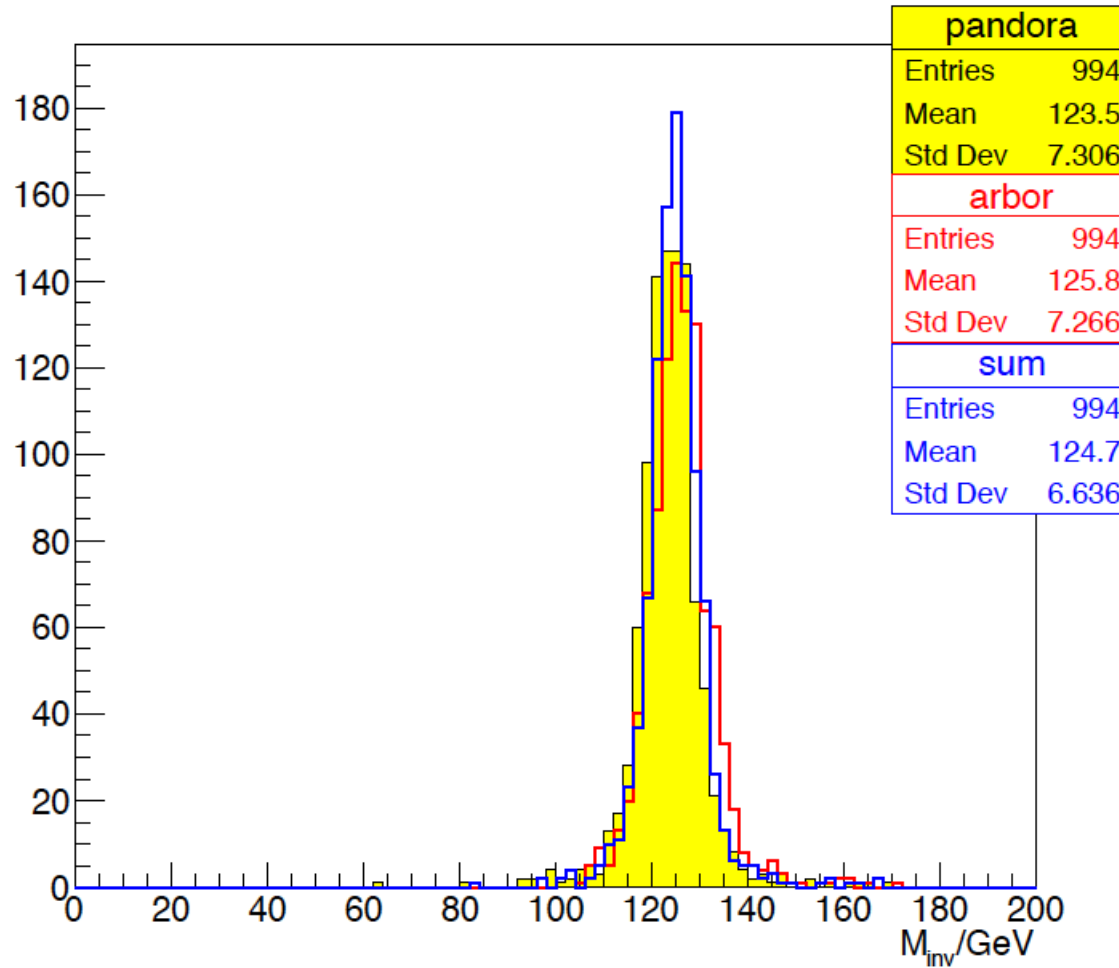


Arbor JER Diag



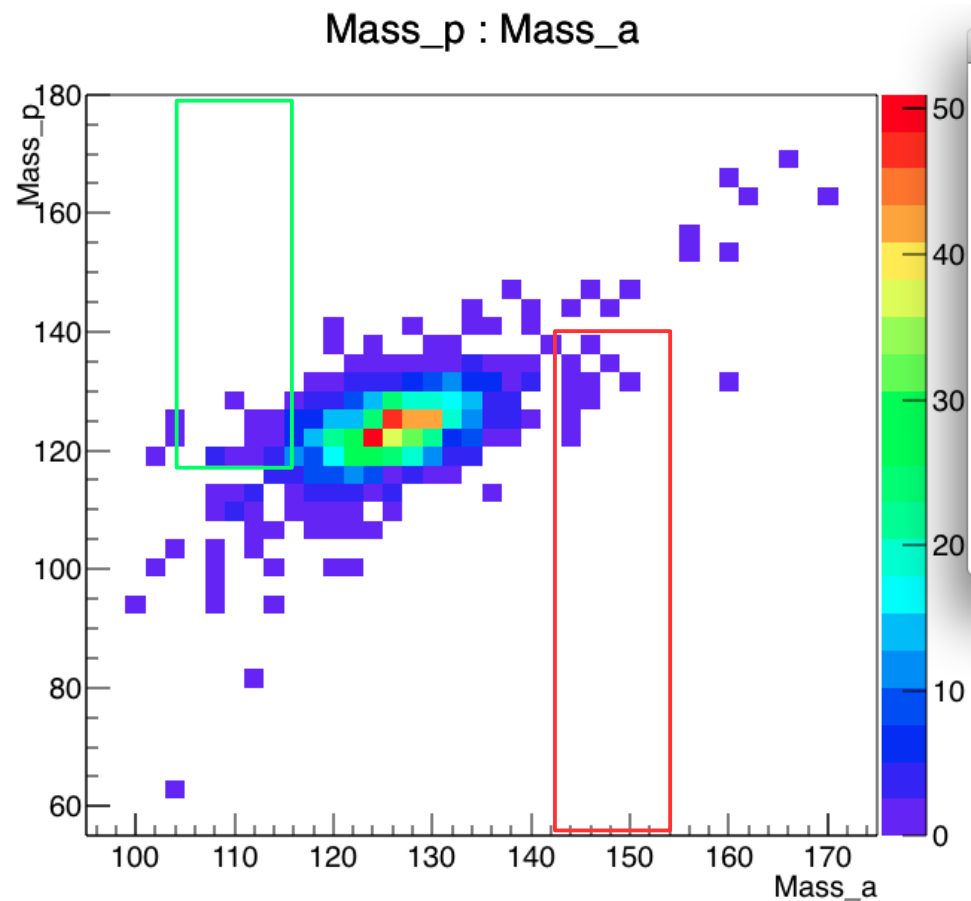
Manqi

Inv Mass of $\nu\nu H$, $H \rightarrow gg$ events



1k $\nu\nu H$. Sample at `~manqi/ArborDiag/727/*.slcio`

Private version, not syn. To Binsong's Git release



```

root [5] MPart->Scan("EventNr : Mass_a : Mass_p", "Mass_a > 144 && Mass_p < 140")
*****
* Row * EventNr * Mass_a * Mass_p *
*****
*      87 *      87 * 149.56849 * 130.64961 *
*      116 *     116 * 145.90663 * 128.10687 *
*      129 *     129 * 159.49743 * 130.38552 *
*      373 *     373 * 147.73657 * 134.87707 *
*      492 *     492 * 145.08674 * 136.37544 *
*      520 *     520 * 146.90110 * 130.14126 *
*      526 *     526 * 144.21597 * 124.33514 *
*      862 *     862 * 144.25770 * 132.99382 *
*****
==> 8 selected entries
(Long64_t) 8
root [6] █

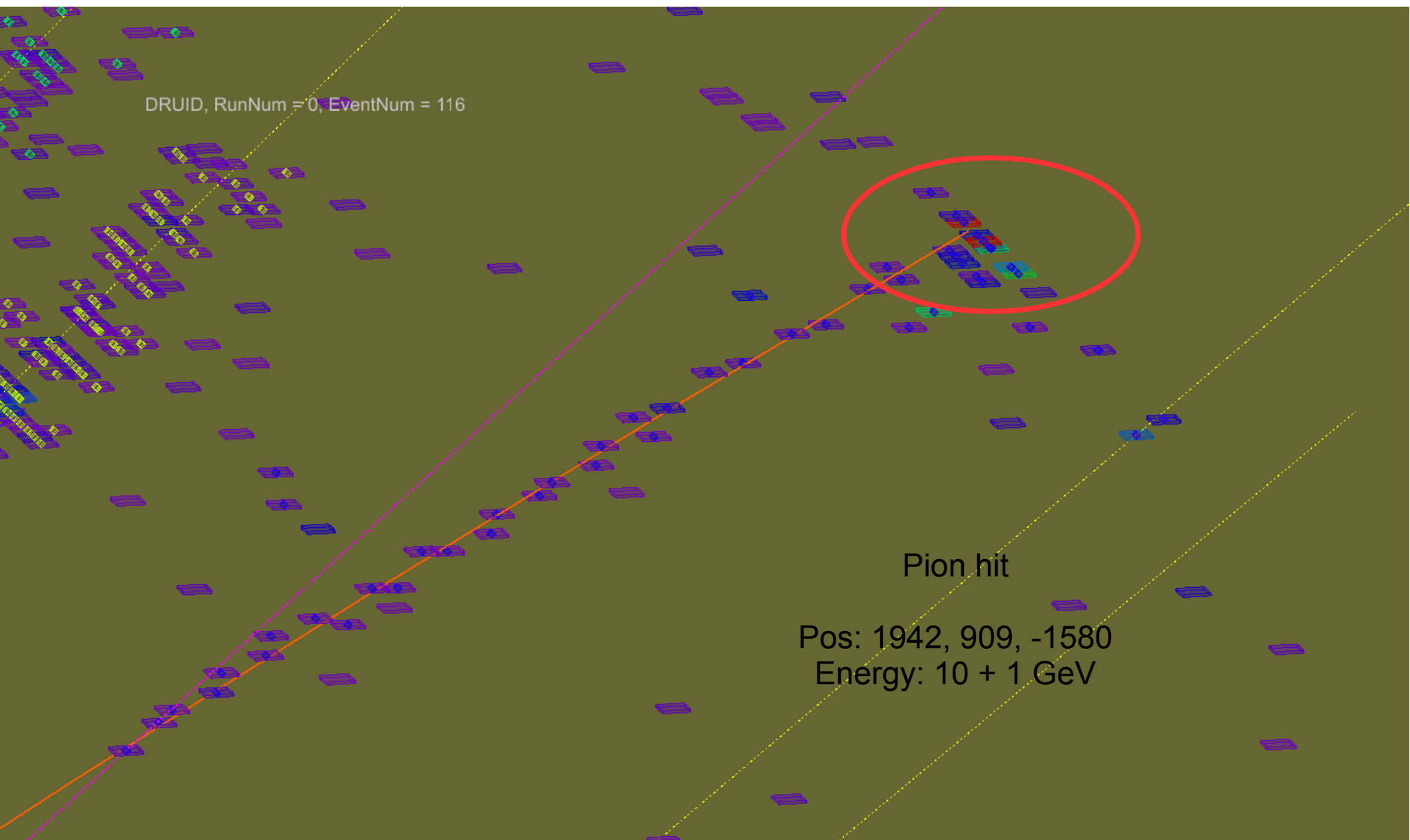
```

```

root [6] MPart->Scan("EventNr : Mass_a : Mass_p", "Mass_a < 115 && Mass_p > 120")
*****
* Row * EventNr * Mass_a * Mass_p *
*****
*      109 *     109 * 109.73754 * 127.12881 *
*      172 *     172 * 114.54180 * 126.41745 *
*      519 *     519 * 104.90619 * 121.88773 *
*      690 *     690 * 114.27851 * 121.24404 *
*      796 *     796 * 111.81652 * 123.90554 *
*      969 *     969 * 112.90985 * 121.38199 *
*      974 *     974 * 103.55856 * 126.18665 *
*****
==> 7 selected entries
(Long64_t) 7
root [7] █

```

High E Side



DRUID, RunNum = 0, EventNum = 862



Neutron hit

Pos: -1338, -1451, 1230
Energy: 1.8 + 3.6 GeV

Ultra hot hit

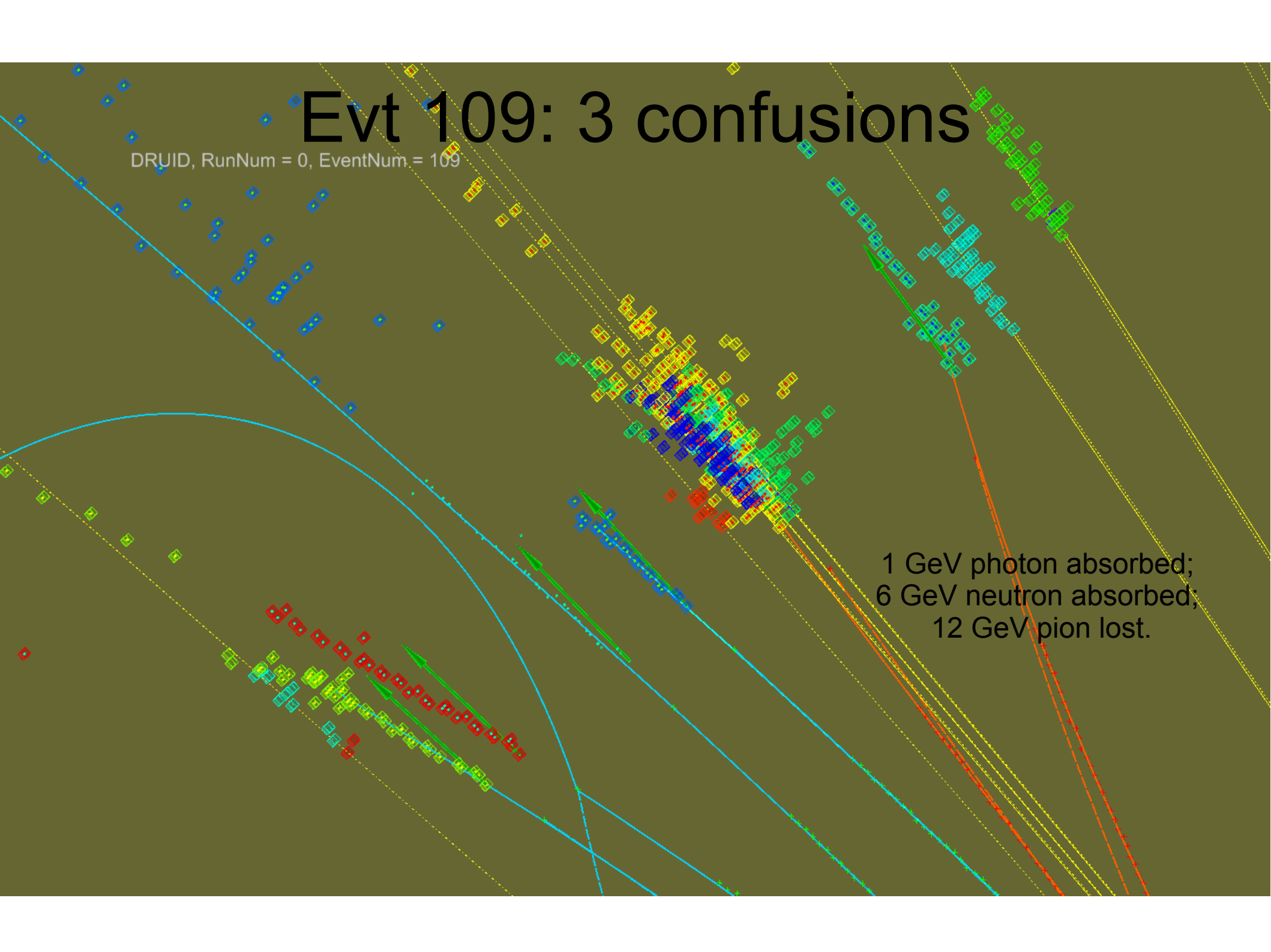
- EM Core: should preserve
- As Nuclear interaction: should veto
- Algorithm:
 - For each ECAL Cluster, check if exist ultra hot hit ($E > 1 \text{ GeV}$...)
 - Check if EM Cluster.
 - Check if in the core of EM Cluster, and if the cluster energy matches the hit energy
 - Side study: check the hottest cell energy in EM shower
- Algorithm need to be **very dedicate**, such that only actives at the problem need to be treated.
 - Once one algorithm added: always check **IFF** the target events are affected

Low E Side

Evt 109: 3 confusions

DRUID, RunNum = 0, EventNum = 109

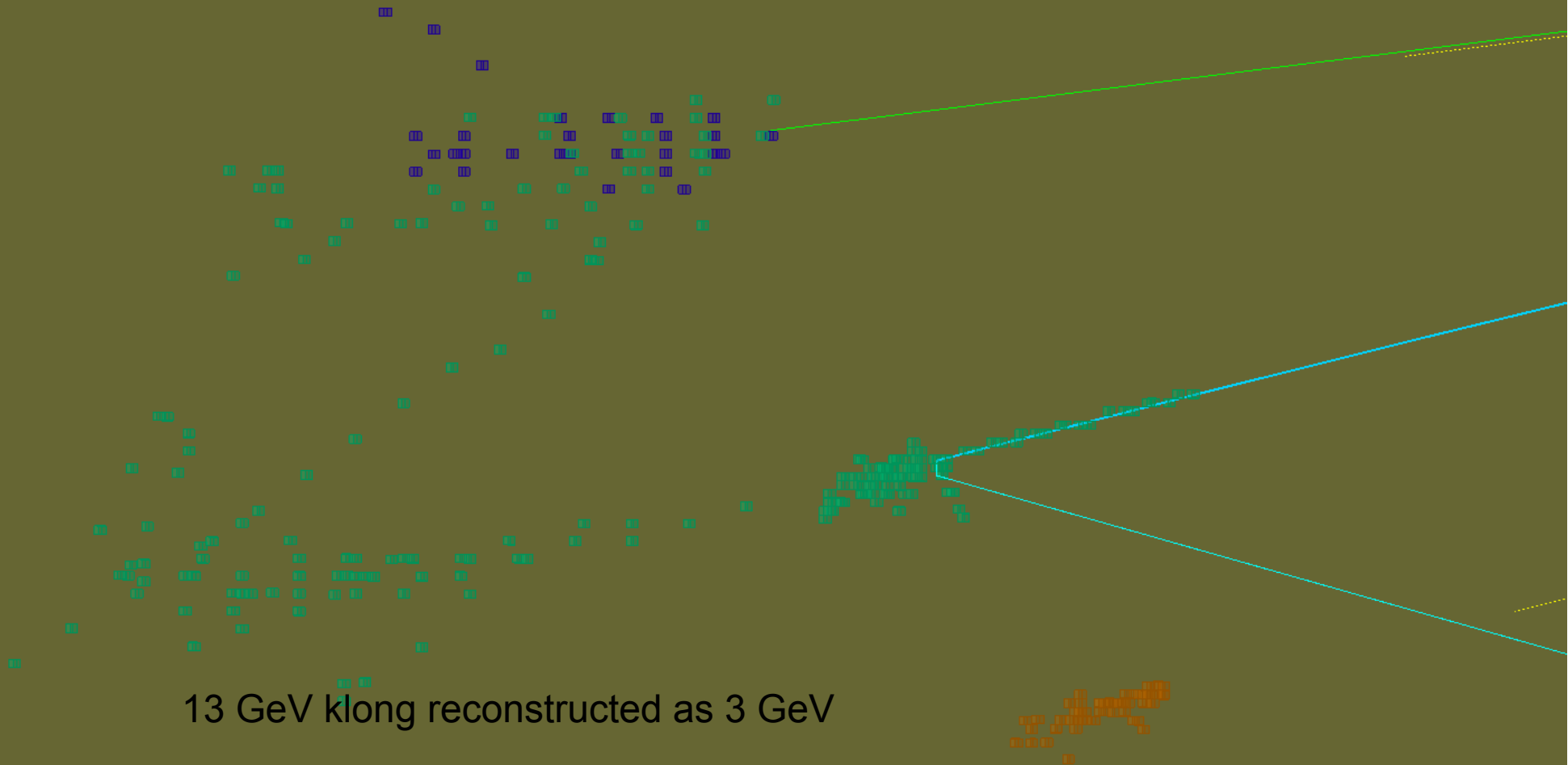
1 GeV photon absorbed;
6 GeV neutron absorbed;
12 GeV pion lost.



DRUID, RunNum = 0, EventNum = 969

12 GeV Pion, lost initial Cluster (seed)
And merged to nearby pion shower,
Similar to evt 109

DRUID, RunNum = 0, EventNum = 172

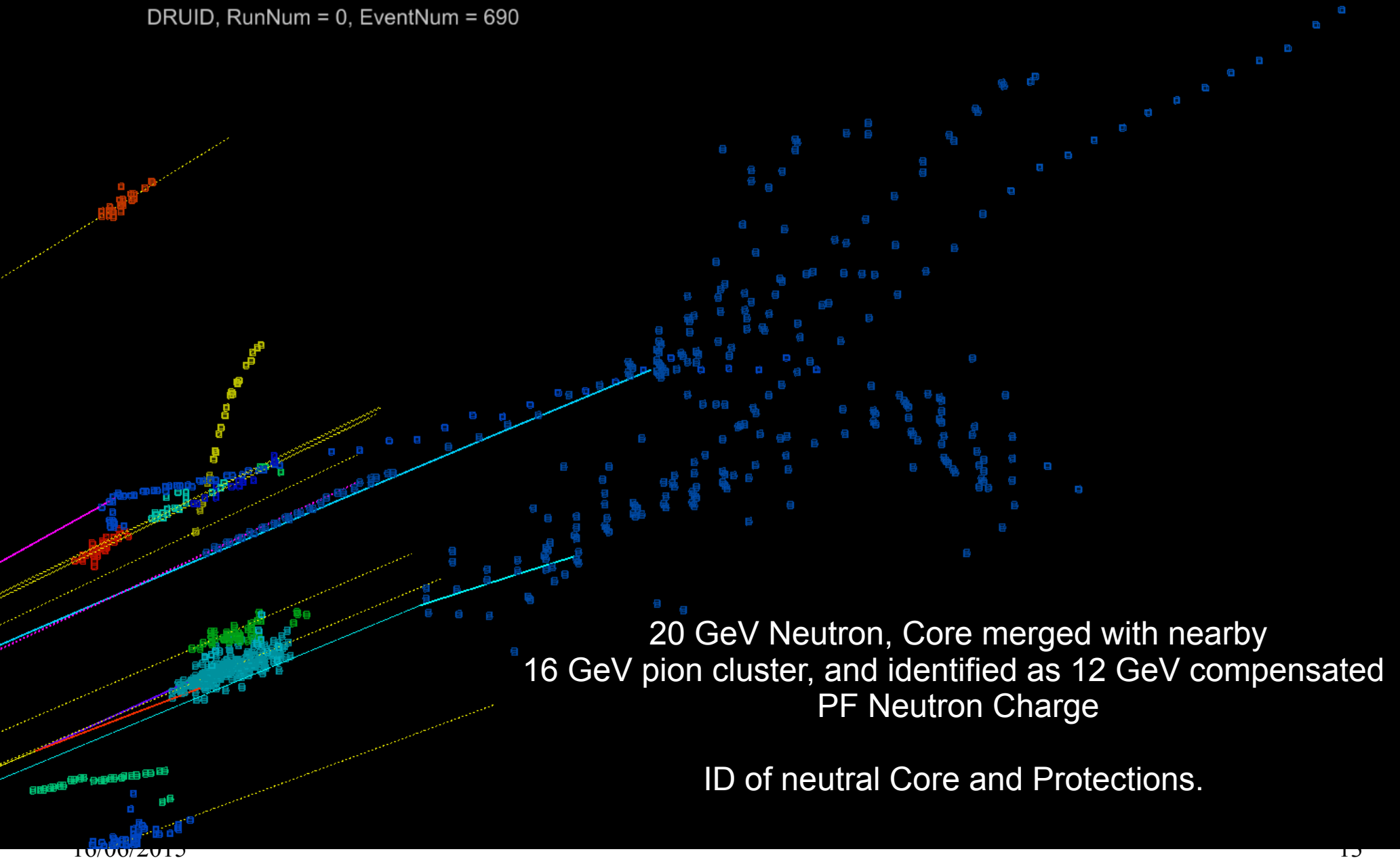


Receipt: treat ChargedCore and Neutral Core at same footing,
Let them compete for the intermiddle hit/clusters
Hadronic shower energy resolution need to be improved

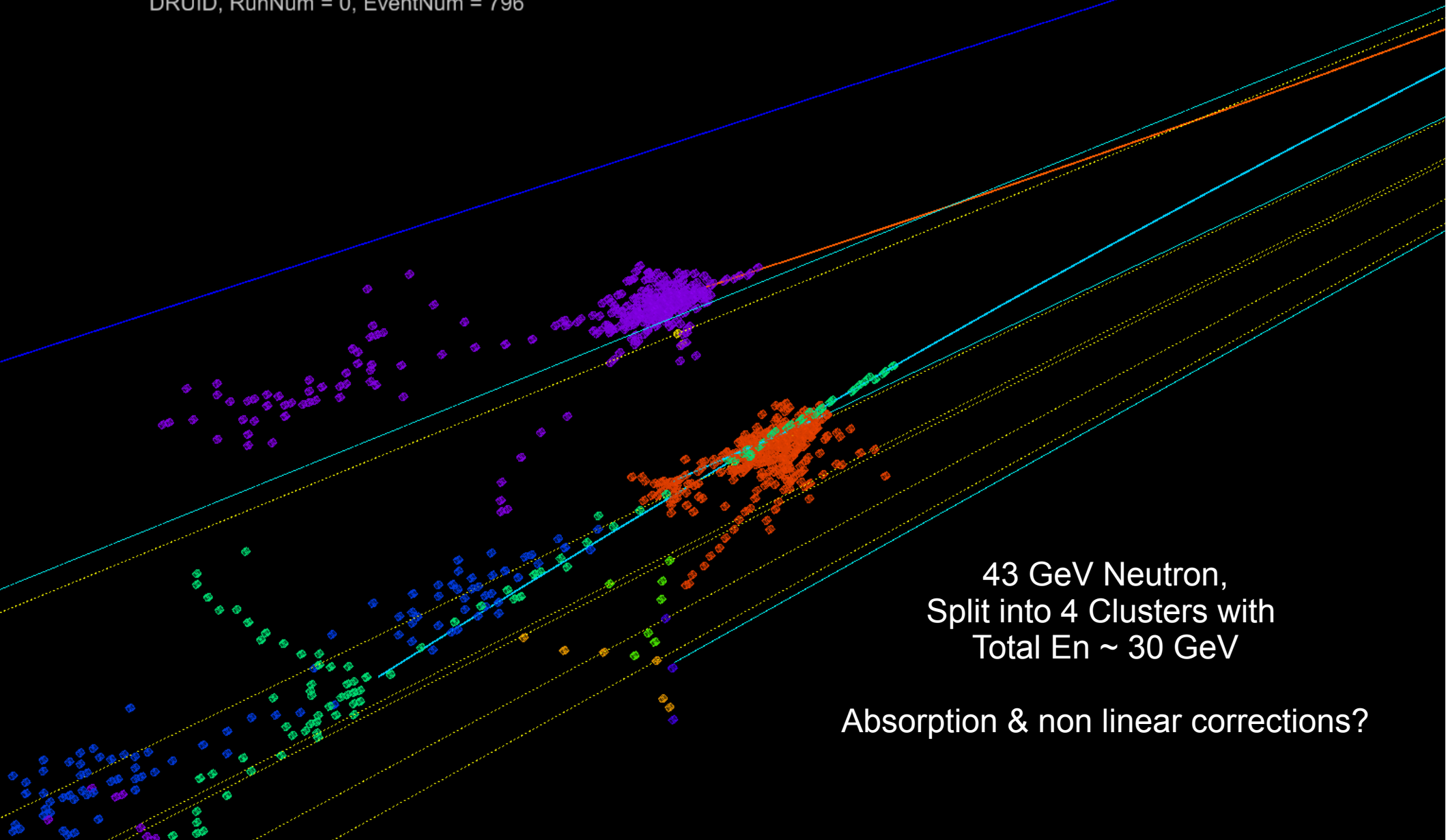
DRUID, RunNum = 0, EventNum = 519

Main Cluster of 13 GeV Klong
Absorbed by 38 GeV pion

DRUID, RunNum = 0, EventNum = 690



DRUID, RunNum = 0, EventNum = 796



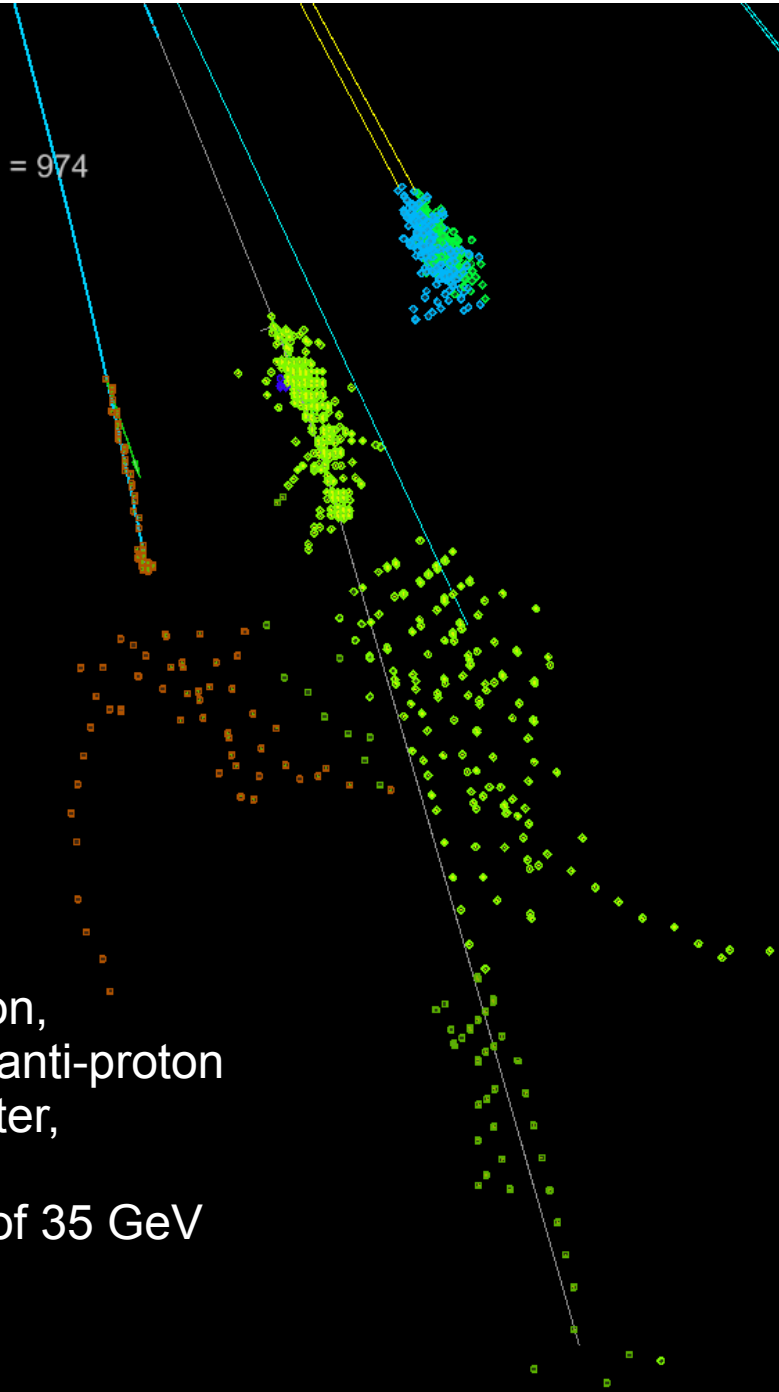
43 GeV Neutron,
Split into 4 Clusters with
Total En \sim 30 GeV

Absorption & non linear corrections?

DRUID, RunNum = 0, EventNum = 974

12 GeV Neutron,
Absorbed into nearby anti-proton
(31 GeV) Cluster,

Making a big cluster of 35 GeV

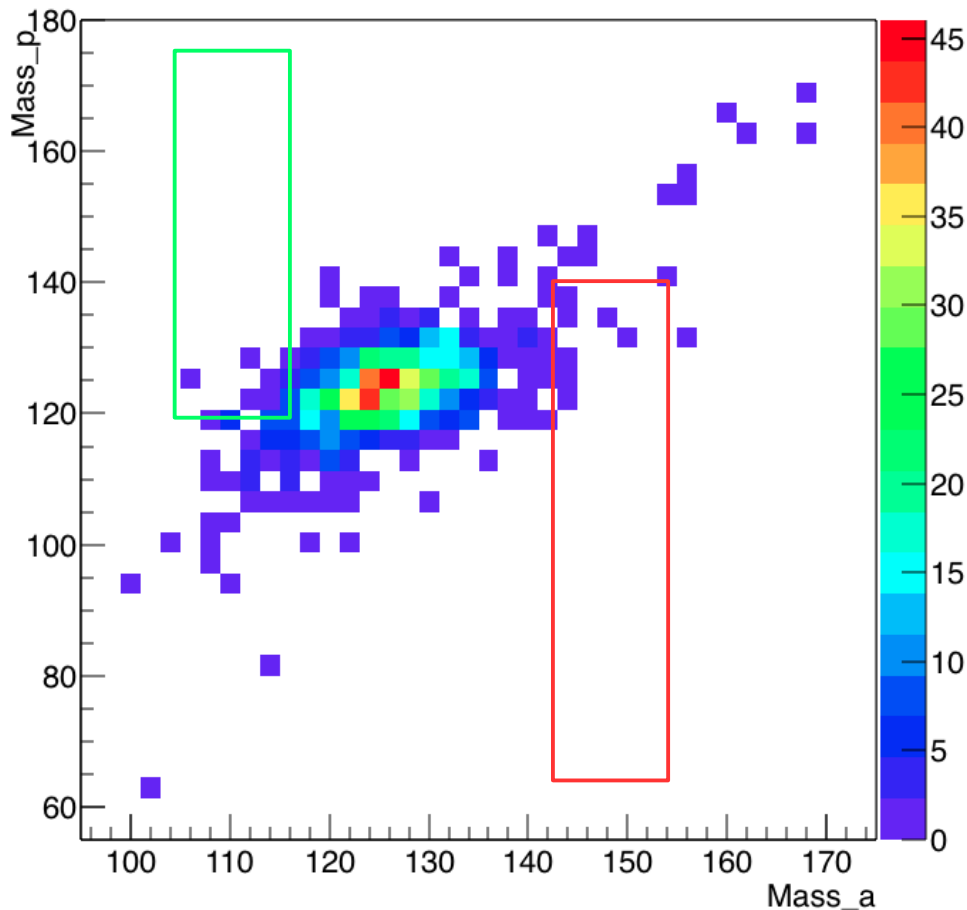


Lower energies

- Core Cluster Tail lost (109, 969)
 - Obvious bug on Charged Core selection ($!(E_{clu} < 1 \ \&\& \ P_{trk} > 10)$)
 - Fixed: add one algorithm to check if there is nearby big charged track/cluster, Implemented to `~manqi/ArborDiag/723_2/`
- Neutral Cluster:
 - Need to study the energy response for hadrons at Arbor cluster level
 - Dan & Feng, could you take care of that?
 - Neutral Cluster be absorbed by nearby Charged ones
 - Neutral Core finding algorithm: find neutral core and protect them. Starting from ECAL/HCAL Bushes.
 - Neutral Cluster energy under estimation
 - New energy estimation & Hit absorption algorithm is needed

Remarks: with Binsong's Git Version

Mass_p : Mass_a



```
root [2]
root [2] MPart->Scan("EventNr : Mass_a : Mass_p", "Mass_a > 144 && Mass_p < 140")
*****
* Row * EventNr * Mass_a * Mass_p *
*****
* 87 * 87 * 150.24848 * 130.64961 *
* 129 * 129 * 155.38562 * 130.38552 *
* 373 * 373 * 148.34712 * 134.87707 *
* 520 * 520 * 155.38699 * 130.14126 *
* 525 * 525 * 144.14448 * 134.94737 *
* 526 * 526 * 144.30166 * 124.33514 *
* 573 * 573 * 144.45561 * 121.49779 *
* 577 * 577 * 144.08126 * 137.42065 *
* 617 * 617 * 144.39535 * 135.22814 *
* 758 * 758 * 144.96560 * 124.78681 *
* 791 * 791 * 153.88346 * 139.87503 *
*****
```

==> 11 selected entries

(Long64_t) 11

root [3]

```
root [3] MPart->Scan("EventNr : Mass_a : Mass_p", "Mass_a < 115 && Mass_p > 120")
*****
* Row * EventNr * Mass_a * Mass_p *
*****
* 396 * 396 * 114.14253 * 124.02552 *
* 428 * 428 * 112.57387 * 129.47769 *
* 690 * 690 * 112.66635 * 121.24404 *
* 699 * 699 * 114.74244 * 120.39888 *
* 712 * 712 * 113.33187 * 121.51834 *
* 796 * 796 * 106.01308 * 123.90554 *
* 974 * 974 * 114.54489 * 126.18665 *
*****
```

==> 7 selected entries

(Long64_t) 7

Tasks

- Please check if the mentioned problems still exist in Git version (I believe so), at per event level
- Please integrate the photon energy phi-eta dependence & hot hit veto into current version. I tried but the result is divergence (RMS ~ 7.8)
- Try to minimize the RMS at 1k events, and then test on 100 k events.
- Next release should synergy these two versions
 - Modified code at `~manqi/ArborDiag/723_2/`
 - Git version