

PDVD img debug

Xuyang Ning

imaging crushing issue

```
[21:32:11.342] D [ img ] <GridTiling:tiling-anode5-face0> anode=5 face=0 slice=1621, time=3.242 ms no activity
[21:32:11.342] D [ img ] <BlobClustering:blobclustering-anode5> MEM [operator()-entry call=1621] VmSize=2818264 kB, VmRSS=1358096 kB, VmHWM=1620520 kB
[21:32:11.342] D [ img ] <GridTiling:tiling-anode5-face1> anode=5 face=1 slice=1622, time=3.244 ms no activity
[21:32:11.342] D [ img ] <GridTiling:tiling-anode5-face0> anode=5 face=0 slice=1622, time=3.244 ms no activity
[21:32:11.342] D [ img ] <BlobClustering:blobclustering-anode5> MEM [operator()-entry call=1622] VmSize=2818264 kB, VmRSS=1358096 kB, VmHWM=1620520 kB
[21:32:11.342] D [ img ] <GridTiling:tiling-anode5-face1> anode=5 face=1 slice=1623, time=3.246 ms no activity
[21:32:11.342] D [ img ] <GridTiling:tiling-anode5-face0> anode=5 face=0 slice=1623, time=3.246 ms no activity
[21:32:11.343] D [ img ] <BlobClustering:blobclustering-anode5> MEM [operator()-entry call=1623] VmSize=2818264 kB, VmRSS=1358096 kB, VmHWM=1620520 kB
[21:32:11.343] D [ img ] <GridTiling:tiling-anode5-face1> anode=5 face=1 slice=1624, time=3.248 ms no activity
[21:32:11.343] D [ img ] <GridTiling:tiling-anode5-face0> anode=5 face=0 slice=1624, time=3.248 ms no activity
[21:32:11.343] D [ img ] <BlobClustering:blobclustering-anode5> MEM [operator()-entry call=1624] VmSize=2818264 kB, VmRSS=1358096 kB, VmHWM=1620520 kB
[21:32:11.343] D [ glue ] <FrameFanout:sn_mag_fout_0_0> see EOS
[21:32:11.343] D [ glue ] <FrameFanout:sn_mag_fout_1_0> call=1: see EOS
[21:32:11.343] D [ glue ] <ChannelSelector:chsel5> see EOS at call=0
[21:32:11.343] D [ sigproc ] <OmnibusNoiseFilter:nf5> EOS at call=1
[21:32:11.343] D [ sigproc ] <OmnibusSigProc:anode5sigproc5> EOS at call=1 anode=5
[21:32:11.343] D [ img ] <CMMModifier:cmm-mod-anode5> see EOS at call=1
[21:32:11.343] D [ img ] <FrameMasking:frame-masking-anode5> see EOS
[21:32:11.343] D [ img ] <ChargeErrorFrameEstimator:cefe-anode5> see EOS
[21:32:11.343] D [ img ] <MaskSlice:slicing-anode5> EOS
[21:32:11.343] D [ glue ] <SliceFanout:slicefanout-anode5> sending out 2 EOSes
no slice
[21:32:11.343] D [ img ] <GridTiling:tiling-anode5-face1> EOS
no slice
[21:32:11.343] D [ img ] <GridTiling:tiling-anode5-face0> EOS
[21:32:11.343] D [ glue ] <BlobSetSync:blobsetsync-anode5> EOS
[21:32:11.343] D [ img ] <BlobClustering:blobclustering-anode5> MEM [operator()-entry call=1625] VmSize=2818264 kB, VmRSS=1358100 kB, VmHWM=1620520 kB
[21:32:11.343] D [ img ] <BlobClustering:blobclustering-anode5> MEM [flush-begin call=1625] VmSize=2818264 kB, VmRSS=1358100 kB, VmHWM=1620520 kB
[21:32:11.346] D [ img ] <BlobClustering:blobclustering-anode5> MEM [flush-loop bscount=50/1625 nblobs=2 V=428 E=1162] VmSize=2818264 kB, VmRSS=1358156 kB, VmHWM=1620520 kB
[21:32:11.348] D [ img ] <BlobClustering:blobclustering-anode5> MEM [flush-loop bscount=100/1625 nblobs=2 V=806 E=2209] VmSize=2818264 kB, VmRSS=1358156 kB, VmHWM=1620520 kB
[21:32:11.350] D [ img ] <BlobClustering:blobclustering-anode5> MEM [flush-loop bscount=150/1625 nblobs=1 V=1166 E=3191] VmSize=2818264 kB, VmRSS=1358156 kB, VmHWM=1620520 kB
[21:32:11.351] D [ img ] <BlobClustering:blobclustering-anode5> MEM [flush-loop bscount=200/1625 nblobs=1 V=1438 E=3791] VmSize=2818264 kB, VmRSS=1358156 kB, VmHWM=1620520 kB
./processdata_loop_img_2.sh: line 54: 3714 Killed                  lar -n 1 --skip 1 -c standard_reco_pdvdimg_offline.fcl $filename
xning@dunebuild02:/exp/dune/data/users/xning/proto-dune-vd/test2$ free -m
              total        used        free      shared  buff/cache   available
Mem:           31564            522        30308            3         733        30603
Swap:           4095             333         3762

xning@dunebuild02:/exp/dune/data/users/xning/proto-dune-vd/test2$ ulimit -a
core file size          (blocks, -c) unlimited
data seg size           (kbytes, -d) unlimited
scheduling priority     (-e) 0
file size               (blocks, -f) unlimited
pending signals         (-i) 125997
max locked memory       (kbytes, -l) 8192
max memory size         (kbytes, -m) unlimited
open files              (-n) 1024
pipe size               (512 bytes, -p) 8
POSIX message queues    (bytes, -q) 819200
real-time priority      (-r) 0
stack size              (kbytes, -s) 8192
cpu time                (seconds, -t) unlimited
max user processes      (-u) 125997
virtual memory          (kbytes, -v) unlimited
file locks              (-x) unlimited
xning@dunebuild02:/exp/dune/data/users/xning/proto-dune-vd/test2$ cat /proc/self/cgroup 2>/dev/null || echo "no cgroup"
0::user.slice/user-12918.slice/session-4373.scope
xning@dunebuild02:/exp/dune/data/users/xning/proto-dune-vd/test2$ cat /proc/self/oom_score_adj
0
xning@dunebuild02:/exp/dune/data/users/xning/proto-dune-vd/test2$ systemctl --user status 2>/dev/null | head -5
xning@dunebuild02:/exp/dune/data/users/xning/proto-dune-vd/test2$ cat /sys/fs/cgroup/user.slice/user-$(id -u).s
lice/memory.limit_in_bytes 2>/dev/null || echo "no cgroup memory limit found"
max
xning@dunebuild02:/exp/dune/data/users/xning/proto-dune-vd/test2$ dmesg | grep -i "killed process" | tail -10
[2007776.383408] Out of memory: Killed process 30975 (python) total-vm:13570536kB, anon-rss:9664864kB, file-rss:0kB, shmem-rss:0kB, UID:57766 pgtables:23276kB oom_score_adj:0
[2379910.060269] Out of memory: Killed process 1473411 (lar) total-vm:44167192kB, anon-rss:31480352kB, file-rss:512kB, shmem-rss:0kB, UID:12918 pgtables:71832kB oom_score_adj:0
xning@dunebuild02:/exp/dune/data/users/xning/proto-dune-vd/test2$
```

```
RC overlap: recursing to layer=3 newproj.size=203 nblobs=1
RC overlap: layer=3 strip=[446641312,0) tol=1 lbound=446641311 hbound=1 proj.size=203
RC overlap: layer=3 selected 0 blobs
RC associate: overlap returned 0 matches
[23:17:47.509] D [geom_clustering] geom_clustering EXIT associate pair=2 edges_this=1
[23:17:47.509] D [geom_clustering] MEM geom_clustering done pairs=2 edges_total=2 VmRSS=1356576 kB
[23:17:47.509] D [ img ] <BlobClustering:blobclustering-anode5> MEM [after-geom_clust bscount=228/1625 nblobs=1 V=1597 E=
[23:17:47.509] D [ img ] <BlobClustering:blobclustering-anode5> MEM [after-add_blobs bscount=229/1625 nblobs=1 V=1600 E=4
[23:17:47.509] D [geom_clustering] geom_clustering ENTER associate pair=1 rel_diff=1 nblobs1=2 nblobs2=1 tol=2
RC associate: one[0]: L0=[0,1) L1=[0,1) L2=[13,16) L3=[201,203) L4=[40,42)
RC associate: one[1]: L0=[266,267)
RC associate: two[0]: L0=[0,1) L1=[0,1) L2=[14,16) L3=[201,203) L4=[40,42)
RC associate: proj.size()=42
RC associate: calling overlap for blob 0/2
RC overlap: layer=4 strip=[40,42) tol=2 lbound=38 hbound=42 proj.size=42
RC overlap: layer=4 selected 1 blobs
RC overlap: recursing to layer=3 newproj.size=203 nblobs=1
RC overlap: layer=3 strip=[201,203) tol=2 lbound=199 hbound=203 proj.size=203
RC overlap: layer=3 selected 1 blobs
RC overlap: recursing to layer=2 newproj.size=16 nblobs=1
RC overlap: layer=2 strip=[13,16) tol=2 lbound=11 hbound=16 proj.size=16
RC overlap: layer=2 selected 1 blobs
RC associate: overlap returned 1 matches
RC associate: calling overlap for blob 1/2
RC overlap: layer=4 strip=[0,743) tol=2 lbound=0 hbound=42 proj.size=42
RC overlap: layer=4 selected 1 blobs
RC overlap: recursing to layer=3 newproj.size=203 nblobs=1
RC overlap: layer=3 strip=[421585216,0) tol=2 lbound=421585214 hbound=2 proj.size=203
RC overlap: layer=3 selected 0 blobs
RC associate: overlap returned 0 matches
[23:17:47.509] D [geom_clustering] geom_clustering EXIT associate pair=1 edges_this=1
[23:17:47.509] D [geom_clustering] geom_clustering ENTER associate pair=2 rel_diff=2 nblobs1=1 nblobs2=1 tol=1
RC associate: one[0]: L0=[0,1) L1=[0,1) L2=[13,15) L3=[201,203) L4=[40,42)
RC associate: two[0]: L0=[0,1) L1=[0,1) L2=[14,16) L3=[201,203) L4=[40,42)
RC associate: proj.size()=42
RC associate: calling overlap for blob 0/1
RC overlap: layer=4 strip=[40,42) tol=1 lbound=39 hbound=42 proj.size=42
RC overlap: layer=4 selected 1 blobs
RC overlap: recursing to layer=3 newproj.size=203 nblobs=1
RC overlap: layer=3 strip=[201,203) tol=1 lbound=200 hbound=203 proj.size=203
RC overlap: layer=3 selected 1 blobs
RC overlap: recursing to layer=2 newproj.size=16 nblobs=1
RC overlap: layer=2 strip=[13,15) tol=1 lbound=12 hbound=16 proj.size=16
RC overlap: layer=2 selected 1 blobs
RC associate: overlap returned 1 matches
[23:17:47.509] D [geom_clustering] geom_clustering EXIT associate pair=2 edges_this=1
[23:17:47.509] D [geom_clustering] MEM geom_clustering done pairs=2 edges_total=2 VmRSS=1356576 kB
[23:17:47.509] D [ img ] <BlobClustering:blobclustering-anode5> MEM [after-geom_clust bscount=229/1625 nblobs=1 V=1601 E=
[23:17:47.509] D [ img ] <BlobClustering:blobclustering-anode5> MEM [after-add_blobs bscount=230/1625 nblobs=2 V=1606 E=4
[23:17:47.509] D [geom_clustering] geom_clustering ENTER associate pair=1 rel_diff=1 nblobs1=1 nblobs2=2 tol=2
RC associate: one[0]: L0=[0,1) L1=[0,1) L2=[13,15) L3=[201,203) L4=[40,42)
RC associate: two[0]: L0=[0,1) L1=[0,1) L2=[13,16) L3=[201,203) L4=[40,42)
RC associate: two[1]: L0=[266,267)
RC associate: proj.size()=919
RC associate: calling overlap for blob 0/1
RC overlap: layer=4 strip=[40,42) tol=2 lbound=38 hbound=44 proj.size=919
RC overlap: layer=4 selected 2 blobs
^Z^Z
[2]+ Stopped ./processdata_loop_img_2.sh
xning@dunebuild02:/exp/dune/data/users/xning/proto-dune-vd/test2$ Timeout, server dunebuild02.fnal.gov not responding.
```

The bug accidentally work

Then same issue cause crush

```

93
94 void WireCell::RayGrid::associate(const blobs_t& one, const blobs_t& two, associator_t func, overlap_t ol)
95 {
96     if (one.empty() or two.empty()) {
97         return;
98     }
99     const size_t nlayers = two[0].strips().size();
100    const size_t ilayer = nlayers - 1;
101    const auto proj = projection(references(two), ilayer);
102    for (blobref_t blob = one.begin(); blob != one.end(); ++blob) {
103        auto assoc = ol(blob, proj, ilayer); // recursive call
104        for (blobref_t other : assoc) {
105            func(blob, other);
106        }
107    }
108 }
109

```

RayClustering.cxx

<https://github.com/WireCell/wire-cell-toolkit/blob/master/util/src/RayClustering.cxx#L103>

RayTiling.cxx

```

---
117 class Blob {
118     public:
119         // Add a strip to this blob, updating corners.
120         // A nudge will effectively enlarge strips for the purpose of the inclusion
121         // tests by this fraction of the pitch.
122         void add(const Coordinates& coords, const Strip& strip,
123                double nudge = 0);
124
125         const strips_t& strips() const { return m_strips; }
126         strips_t& strips() { return m_strips; }
127
128         // Blob corners are pair-wise ray crossing points which
129         // are contained by all strips.
130         const crossings_t& corners() const;
131
132     bool valid() const
133     {
134         size_t nstrips = m_strips.size();
135         if (nstrips == 0) {
136             return false;
137         } // empty
138         for (const auto& strip : m_strips) {
139             if (strip.bounds.second == strip.bounds.first) {
140                 return false; // strip has no width
141             }
142         }
143         if (nstrips == 1) {
144             return true;
145         } // no corners expected with 1 strip
146         // A blob must have some area
147         return corners().size() >= 3;
148     }
149

```

```

446 blobs_t WireCell::RayGrid::make_blobs(const Coordinates& coords,
447                                     const activities_t& activities,
448                                     double nudge)
449 {
450     Tiling rc(coords, nudge);
451     blobs_t blobs;
452
453     for (const auto& activity : activities) {
454         if (blobs.empty()) {
455             blobs = rc(activity);
456         }
457         else {
458             blobs = rc(blobs, activity);
459             if (blobs.empty()) {
460                 spdlog::trace("RayGrid::make_blobs: lost blobs with {}", activity);
461                 return blobs_t{};
462             }
463         }
464         drop_invalid(blobs);
465     }
466     prune(coords, blobs, nudge);
467     drop_invalid(blobs);
468     return blobs;
469 }

```

if add some debug info here:

```

[02:25:19.705] D [ img ] <BlobClustering:blobclustering-anode5> MEM [operator()
[02:25:19.705] D [ img ] <GridTiling:tiling-anode5-face1> nactivities = 9
[02:25:19.705] D [ img ] <GridTiling:tiling-anode5-face0> nactivities = 9
[02:25:19.706] D [ img ] <BlobClustering:blobclustering-anode5> MEM [operator()
[02:25:19.706] D [ img ] <GridTiling:tiling-anode5-face1> nactivities = 7
[02:25:19.706] D [ img ] <GridTiling:tiling-anode5-face0> nactivities = 7
[02:25:19.706] D [ img ] <BlobClustering:blobclustering-anode5> MEM [operator()
[02:25:19.706] D [ img ] <GridTiling:tiling-anode5-face1> nactivities = 8
make_blobs: MALFORMED blob[0] nstrips=1 expected=5 L4=[266,267)
[02:25:19.706] W [ img ] <GridTiling:tiling-anode5-face1> anode=5 face=1 slice=
[02:25:19.706] D [ img ] <GridTiling:tiling-anode5-face0> nactivities = 8
[02:25:19.706] D [ img ] <BlobClustering:blobclustering-anode5> MEM [operator()
[02:25:19.706] D [ img ] <GridTiling:tiling-anode5-face1> nactivities = 8
[02:25:19.706] D [ img ] <GridTiling:tiling-anode5-face0> nactivities = 8
[02:25:19.706] D [ img ] <BlobClustering:blobclustering-anode5> MEM [operator()
[02:25:19.706] D [ img ] <GridTiling:tiling-anode5-face1> nactivities = 10
[02:25:19.706] D [ img ] <GridTiling:tiling-anode5-face0> nactivities = 10

```

How single strip blob is created

```
446 blobs_t WireCell::RayGrid::make_blobs(const Coordinates& coords,  
447                                     const activities_t& activities,  
448                                     double nudge)  
449 {  
450     Tiling rc(coords, nudge);  
451     blobs_t blobs;  
452  
453     for (const auto& activity : activities) {  
454         if (blobs.empty()) {  
455             blobs = rc(activity);    if blob has no layers, start a new layer  
456         }  
457         else {  
458             blobs = rc(blobs, activity);  
459             if (blobs.empty()) {  
460                 spdlog::trace("RayGrid::make_blobs: lost blobs with {}", activity);    Add one layers  
461                 return blobs_t{};  
462             }  
463         }  
464         drop_invalid(blobs);    Check if current blob is validated (process check each time after a new layer is added)  
465     }  
466     prune(coords, blobs, nudge);  
467     drop_invalid(blobs);  
468  
469     return blobs;  
470 }
```

```
[22:55:18.386] D [ img ] <GridTiling:tiling-anode5-face1> nactivities = 8  
GridTiling make_blobs: anode=5 face=1 slice=229 nactivities=5  
slice charges (chan: value +/- error):  
chan=8898 plane=2 wire=266 q=2480 +/- 169.613  
chan=7845 plane=1 wire=12 q=12453 +/- 1384  
chan=7846 plane=1 wire=11 q=9253 +/- 1492.9  
chan=6825 plane=0 wire=205 q=897 +/- 523.121  
chan=6824 plane=0 wire=204 q=14053 +/- 906.958  
chan=6823 plane=0 wire=203 q=1215 +/- 442.085  
layer=0 offset=0 nstrips=1 [0,1) charges: [0]=1  
layer=1 offset=0 nstrips=1 [0,1) charges: [0]=1  
layer=2 offset=203 nstrips=1 [203,206) charges: [203]=1 [204]=1 [205]=1  
layer=3 offset=11 nstrips=1 [11,13) charges: [11]=1 [12]=1  
layer=4 offset=266 nstrips=1 [266,267) charges: [266]=1  
after drop_invalid: make_blobs: MALFORMED blob[0] nstrips=1 expected=5 L0=[0,1)  
before drop_invalid: make_blobs: MALFORMED blob[0] nstrips=2 expected=5 L0=[0,1) L1=[0,1)  
after drop_invalid: make_blobs: MALFORMED blob[0] nstrips=2 expected=5 L0=[0,1) L1=[0,1)  
before drop_invalid: make_blobs: MALFORMED blob[0] nstrips=3 expected=5 L0=[0,1) L1=[0,1) L2=[203,206)  
after drop_invalid: make_blobs: MALFORMED blob[0] nstrips=3 expected=5 L0=[0,1) L1=[0,1) L2=[203,206)  
before drop_invalid: make_blobs: MALFORMED blob[0] nstrips=4 expected=5 L0=[0,1) L1=[0,1) L2=[203,206) L3=[12,13)  
after drop_invalid: make_blobs: MALFORMED blob[0] nstrips=1 expected=5 L4=[266,267)  
before prune: make_blobs: MALFORMED blob[0] nstrips=1 expected=5 L4=[266,267)  
[22:55:18.386] W [ img ] <GridTiling:tiling-anode5-face1> anode=5 face=1 slice=229 SKIPPING malformed blob 0/1: nstrips=1 expected=5
```

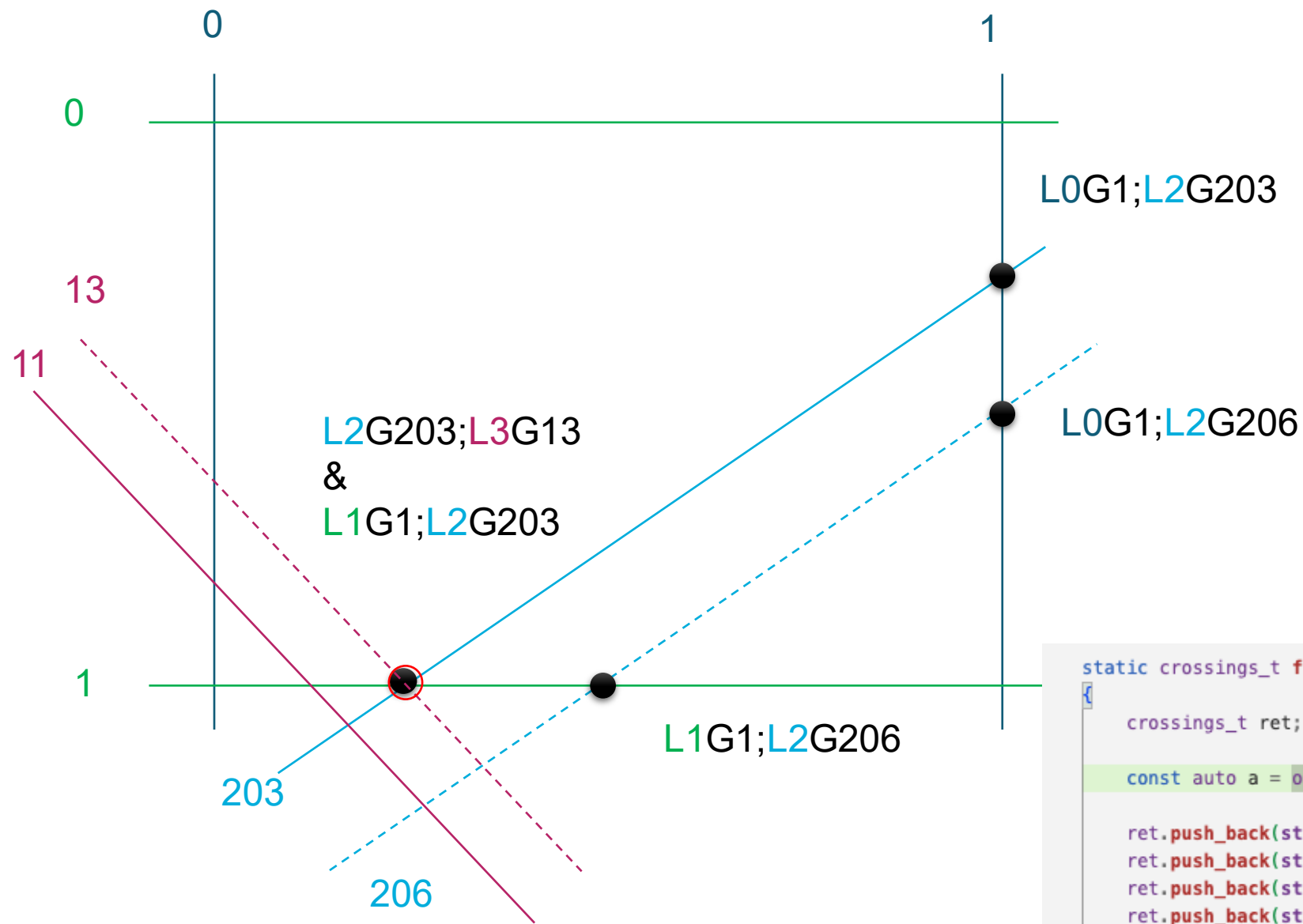
The blob is dropped after 4 layers overlay, then the 5th layer creates a new blob itself, and single strip blob will survive all check.

Why 4 layers blob being dropped

```
[23:59:36.326] D [ img ] <GridTiling:tiling-anode5-face1> nactivities = 8
GridTiling make_blobs: anode=5 face=1 slice=229 nactivities=5
  slice charges (chan: value +/- error):
    chan=8898 plane=2 wire=266 q=2480 +/- 169.613
    chan=7845 plane=1 wire=12 q=12453 +/- 1384
    chan=7846 plane=1 wire=11 q=9253 +/- 1492.9
    chan=6825 plane=0 wire=205 q=897 +/- 523.121
    chan=6824 plane=0 wire=204 q=14053 +/- 906.958
    chan=6823 plane=0 wire=203 q=1215 +/- 442.085
  layer=0 offset=0 nstrips=1 [0,1) charges: [0]=1
  layer=1 offset=0 nstrips=1 [0,1) charges: [0]=1
  layer=2 offset=203 nstrips=1 [203,206) charges: [203]=1 [204]=1 [205]=1
  layer=3 offset=11 nstrips=1 [11,13) charges: [11]=1 [12]=1
  layer=4 offset=266 nstrips=1 [266,267) charges: [266]=1
after drop_invalid: make_blobs: blob[0] nstrips=1 expected=5 L0=[0,1)
Tiling::operator() blob[0] nstrips=1 ncorners=0 adding layer=1 proj_empty=0 proj_nstrips=1 [0,1)
  after add strip L1=[0,1) ncorners=4 C0[L0G0xL1G0] C1[L0G0xL1G1] C2[L0G1xL1G0] C3[L0G1xL1G1]
before drop_invalid: make_blobs: blob[0] nstrips=2 expected=5 L0=[0,1) L1=[0,1)
after drop_invalid: make_blobs: blob[0] nstrips=2 expected=5 L0=[0,1) L1=[0,1)
Tiling::operator() blob[0] nstrips=2 ncorners=4 adding layer=2 proj_empty=0 proj_nstrips=1 [203,206)
  corner[0]: L0G0 x L1G0
  corner[1]: L0G0 x L1G1
  corner[2]: L0G1 x L1G0
  corner[3]: L0G1 x L1G1
  after add strip L2=[203,206) ncorners=4 C0[L0G1xL2G203] C1[L0G1xL2G206] C2[L1G1xL2G203] C3[L1G1xL2G206]
before drop_invalid: make_blobs: blob[0] nstrips=3 expected=5 L0=[0,1) L1=[0,1) L2=[203,206)
after drop_invalid: make_blobs: blob[0] nstrips=3 expected=5 L0=[0,1) L1=[0,1) L2=[203,206)
Tiling::operator() blob[0] nstrips=3 ncorners=4 adding layer=3 proj_empty=0 proj_nstrips=1 [12,13)
  corner[0]: L0G1 x L2G203
  corner[1]: L0G1 x L2G206
  corner[2]: L1G1 x L2G203
  corner[3]: L1G1 x L2G206
  after add strip L3=[12,13) ncorners=1 C0[L2G203xL3G13]
before drop_invalid: make_blobs: blob[0] nstrips=4 expected=5 L0=[0,1) L1=[0,1) L2=[203,206) L3=[12,13)
after drop_invalid: make_blobs: blob[0] nstrips=1 expected=5 L4=[266,267)
before prune: make_blobs: MALFORMED blob[0] nstrips=1 expected=5 L4=[266,267)
```

After adding 4 layers,
only one point is left

How one point blob is created

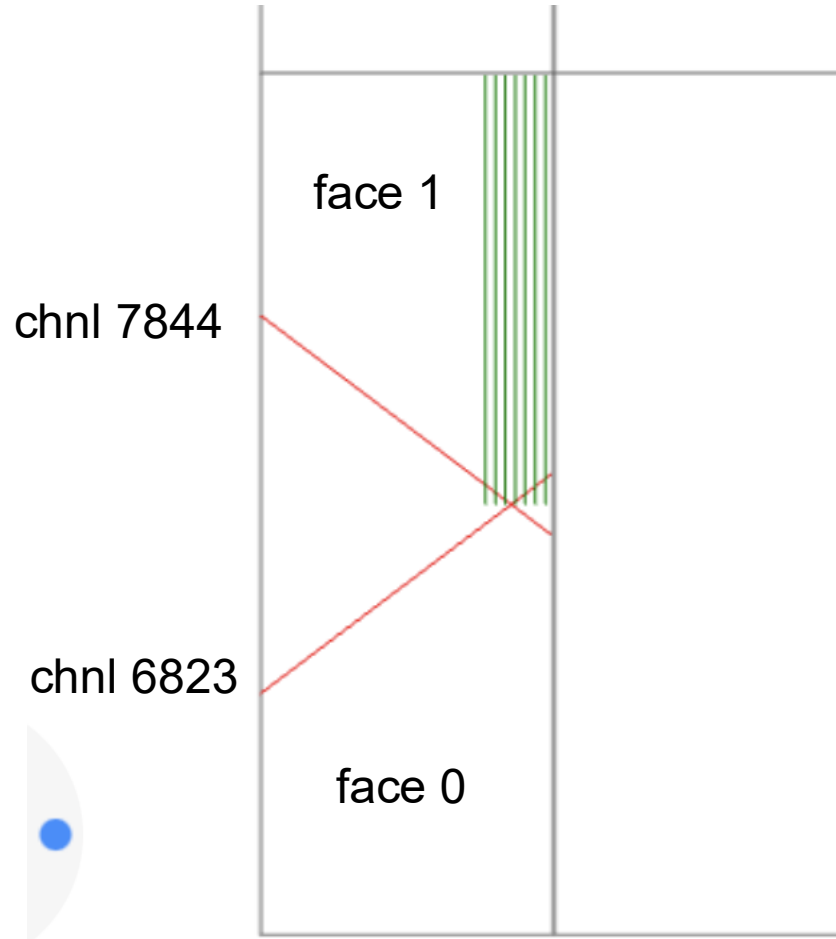


```
static crossings_t find_corners(const Strip& one, const Strip& two)
{
    crossings_t ret;

    const auto a = one.addresses(), b = two.addresses();

    ret.push_back(std::make_pair(a.first, b.first));
    ret.push_back(std::make_pair(a.first, b.second));
    ret.push_back(std::make_pair(a.second, b.first));
    ret.push_back(std::make_pair(a.second, b.second));
    return ret;
}
```

Check the vd geometry

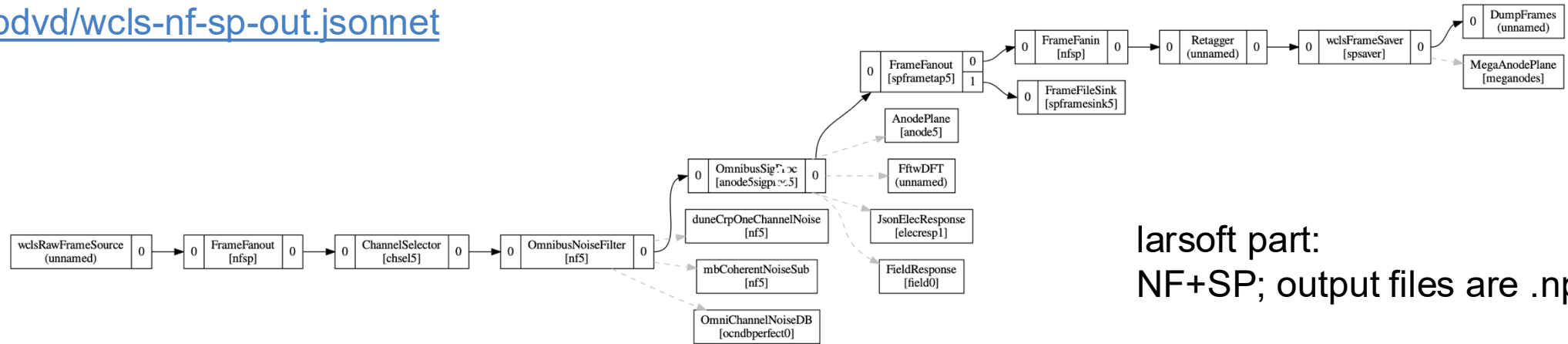


happens at the point where u and v
and boundary intersect.
Not happened in hd geometry

Separate img from wcls

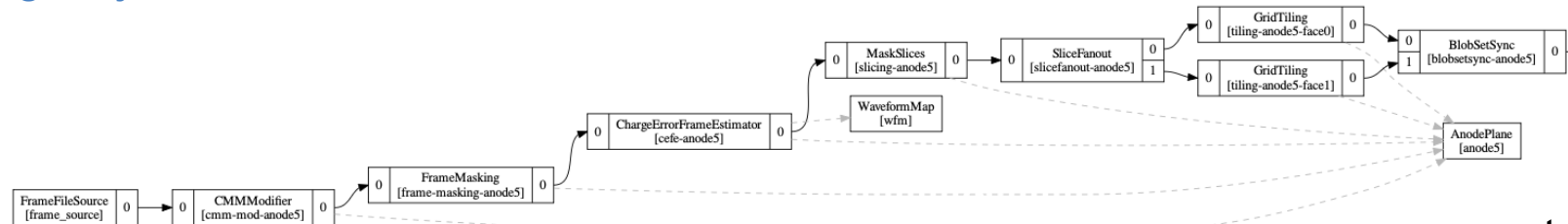
https://github.com/HaiwangYu/wcp-porting-img/tree/xn_vd_debug/pdvd

[pdvd/wcls-nf-sp-out.jsonnet](#)



larsoft part:
NF+SP; output files are .npz

[wct-img-all.jsonnet](#)

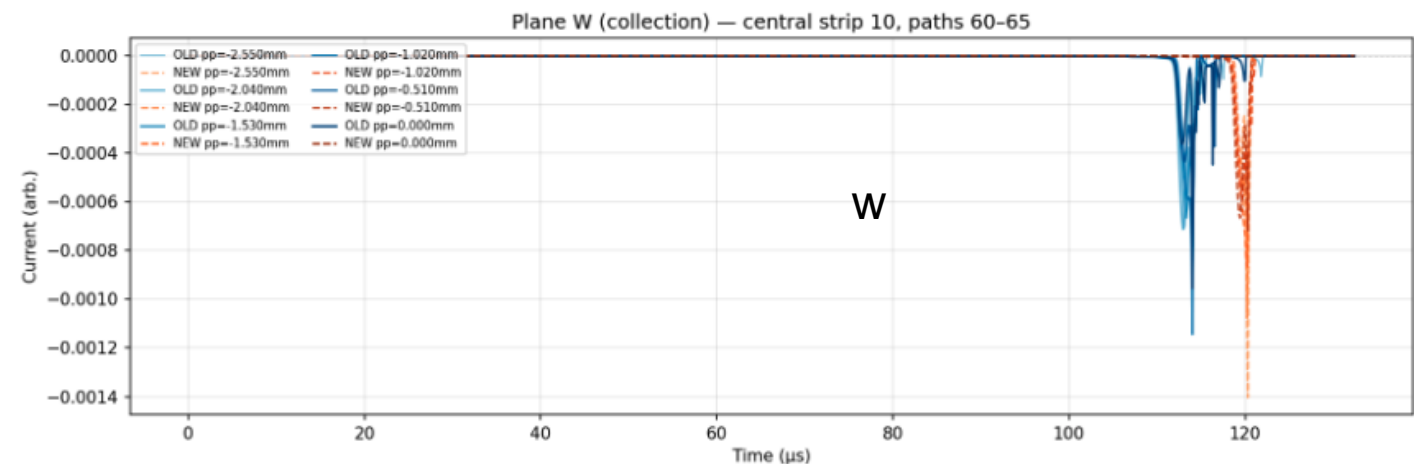
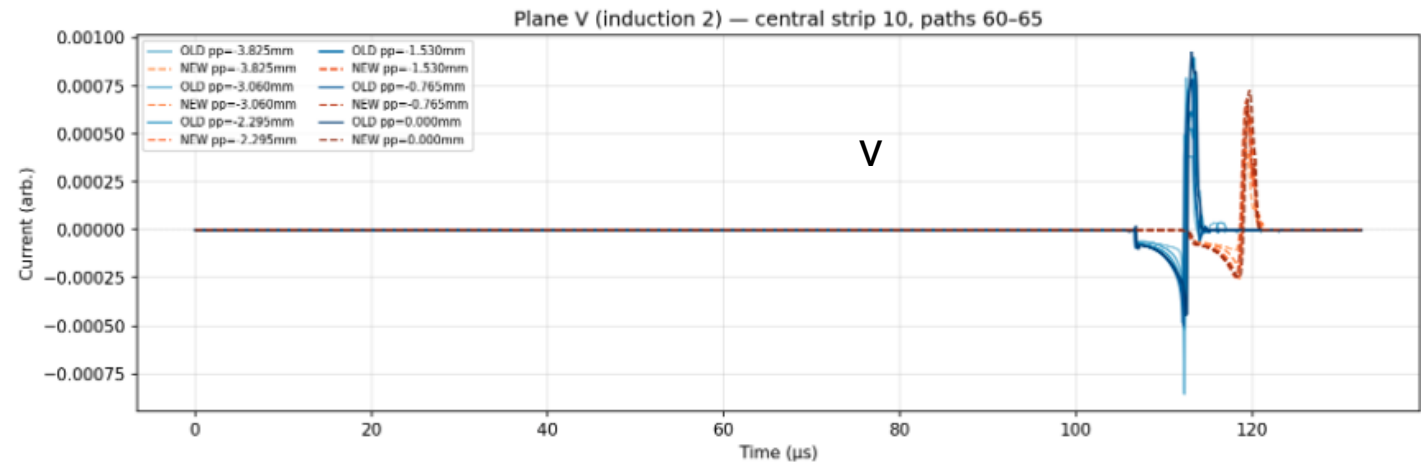
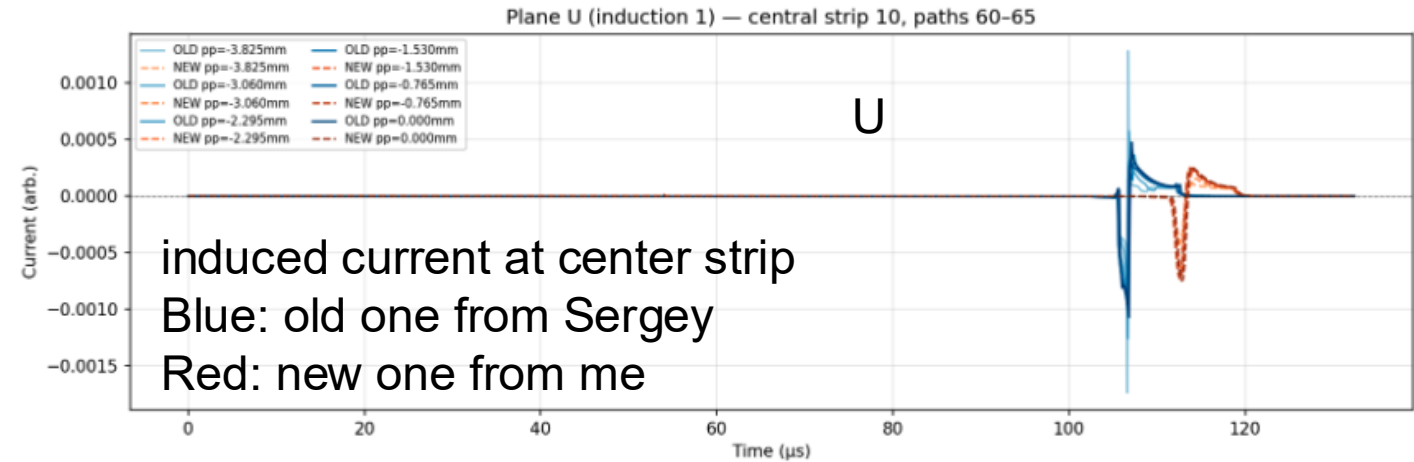


separate img part;
easy to debug on wclc server

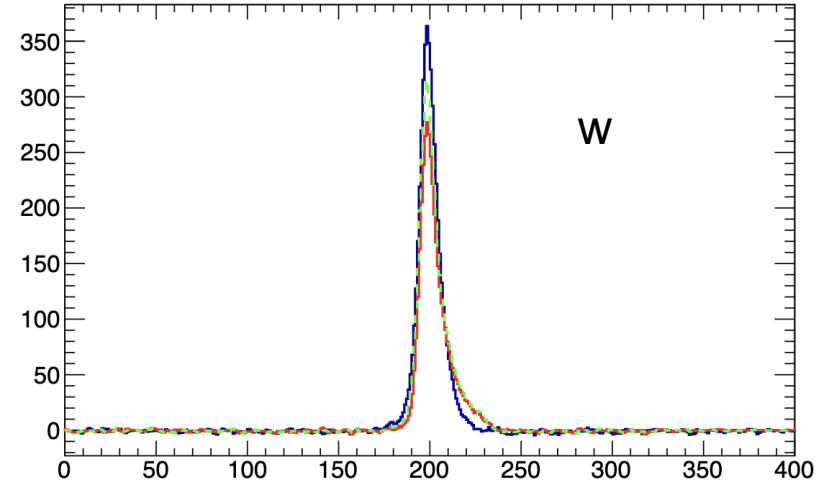
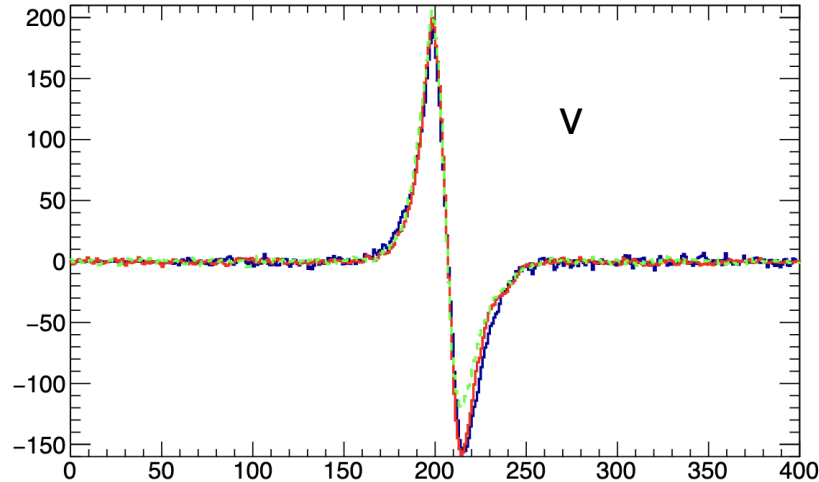
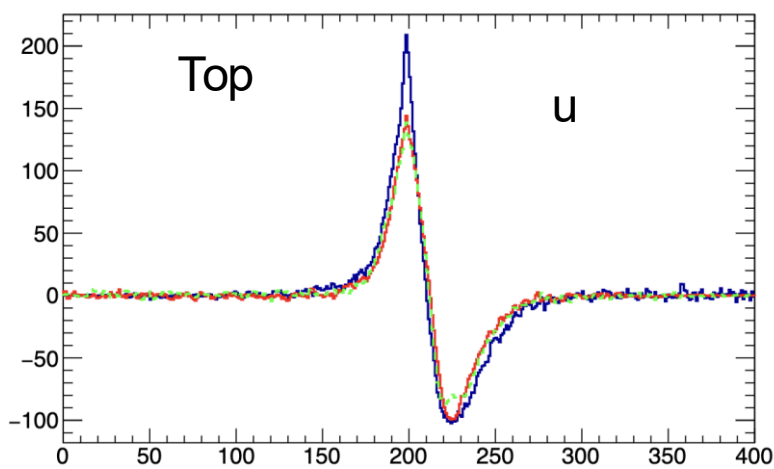


Generate new FR

```
{  
  "origin": 181.0,  
  "speed": 0.00153,  
  "tstart": 0.0,  
  "period": 100.0,  
  
  "totstrip": 21,  
  "npaths": 6,  
  
  "planeUpitch": 7.65,  
  "planeVpitch": 7.65,  
  "planeWpitch": 5.1,  
  
  "planeUpathdist": 0.765,  
  "planeVpathdist": 0.765,  
  "planeWpathdist": 0.51,  
  
  "planeUlocation": 13.2,  
  "planeVlocation": 3.2,  
  "planeWlocation": 0.0  
}
```



Signal shape compare with updated field response

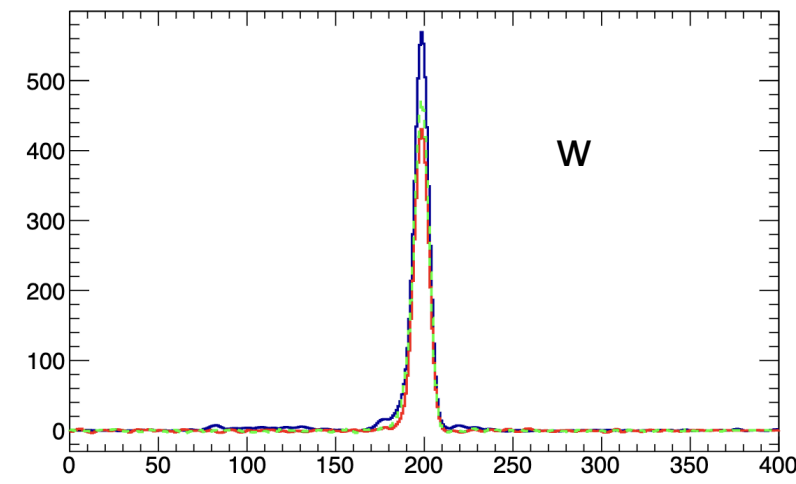
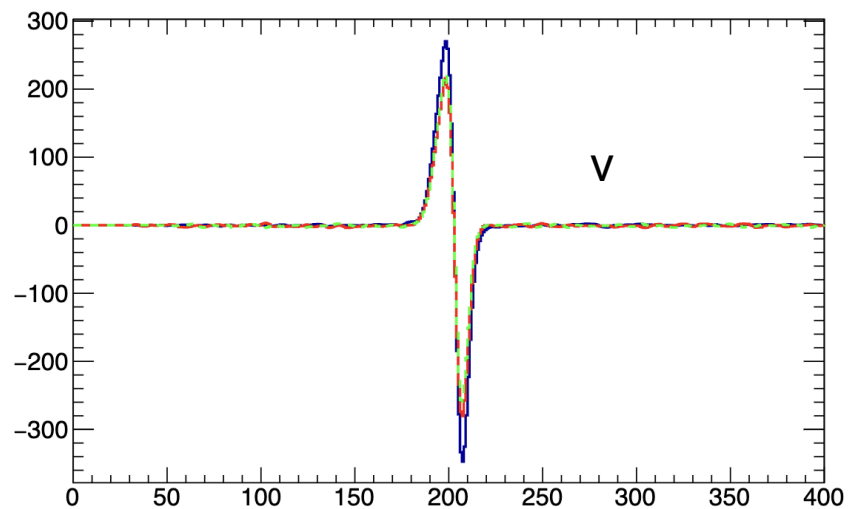
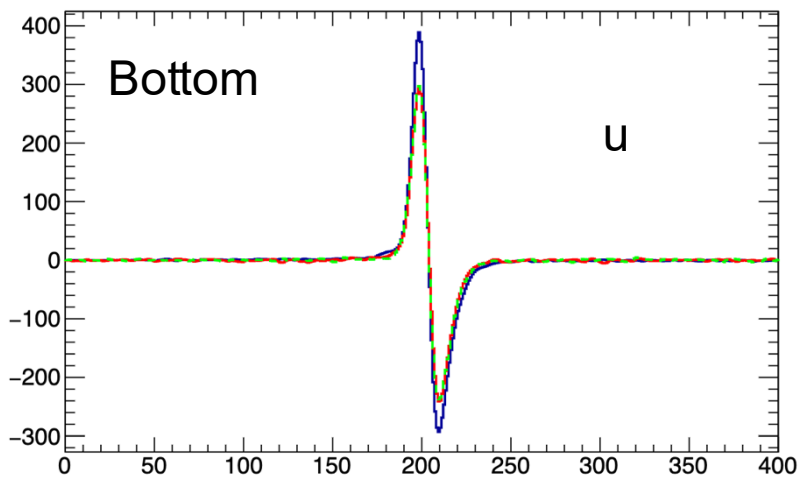


No scale according to w;

blue: data.

red: FR from me

Green: Old FR



backup

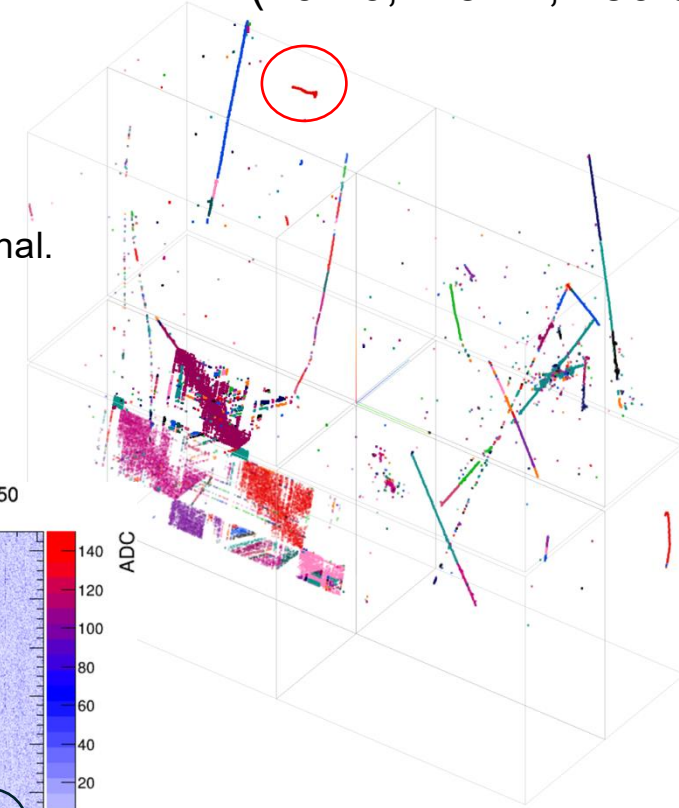
Signal shape Comparison for TDE:

Track start: (240.5, -128.1, 207.8)
Track end: (204.6, -134.7, 250.9)

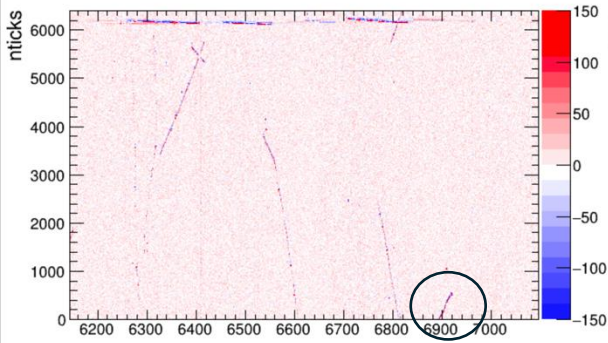
- **Track Selection and Simulation**

- Select clean, **non-prolonged** tracks from data
 - Shape of the signal is different in different direction.
 - For prolonged tracks, the bipolar response can partially cancel itself, leading to a faint signal.
- Derive track directions using **WireCell 3D imaging**
- Simulate tracks with the same directions in **WireCell standalone simulation**
 - x position is randomized; no light information is used

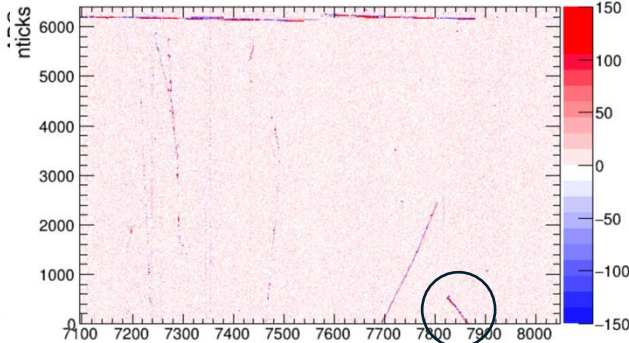
data



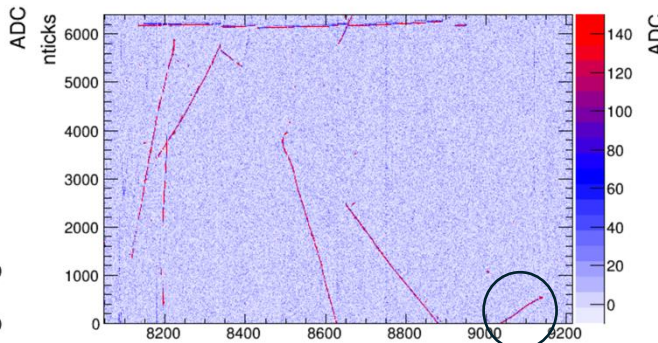
Raw waveform ANf CRP3_u_39324_339850



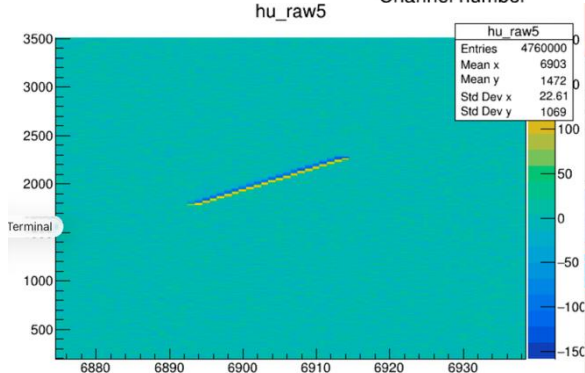
Raw waveform ANf CRP3_v_39324_339850



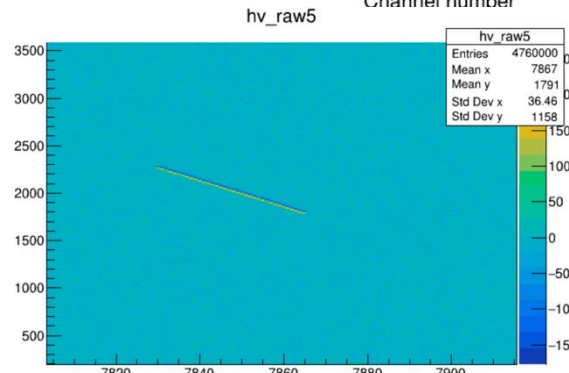
Raw waveform ANf CRP3_w_39324_339850



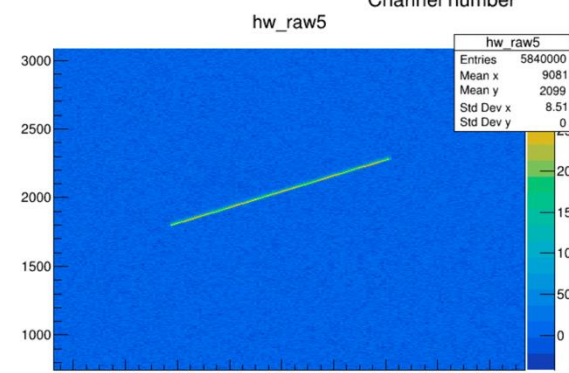
hu_raw5 Channel number



hv_raw5 Channel number



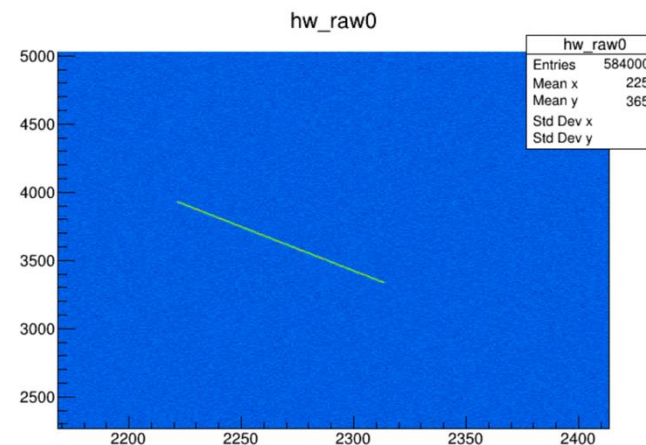
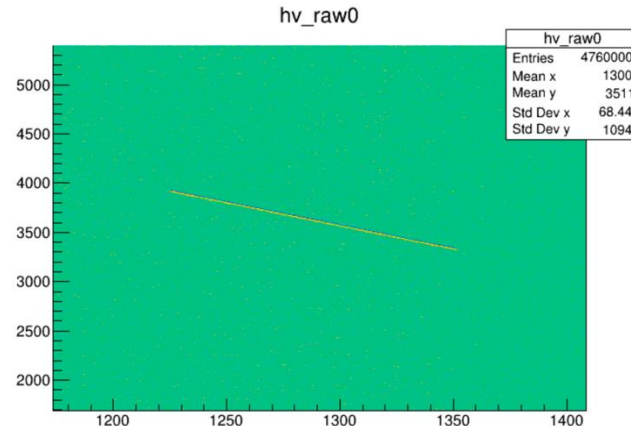
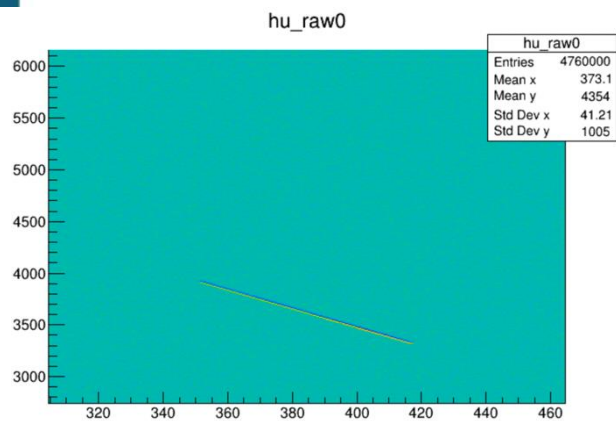
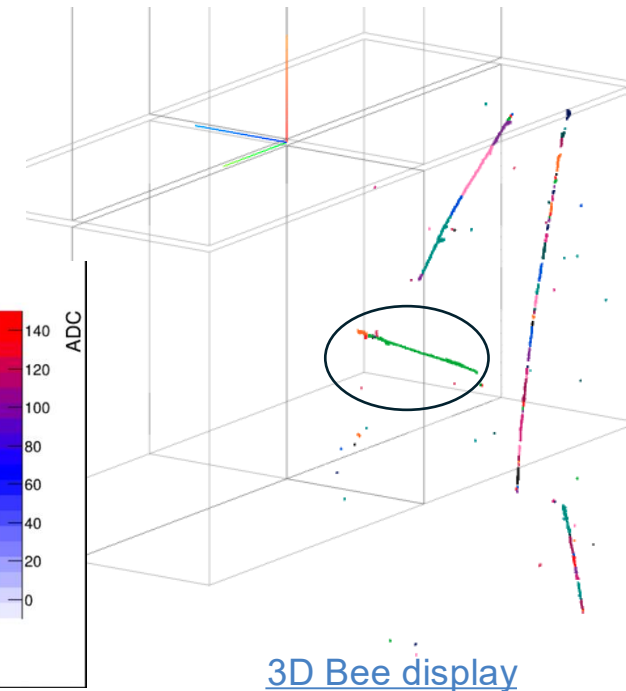
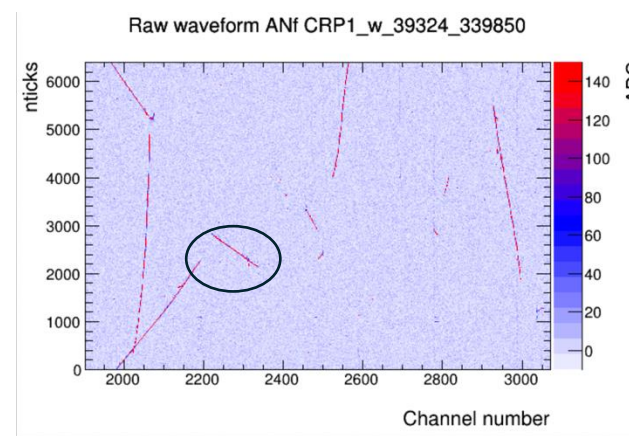
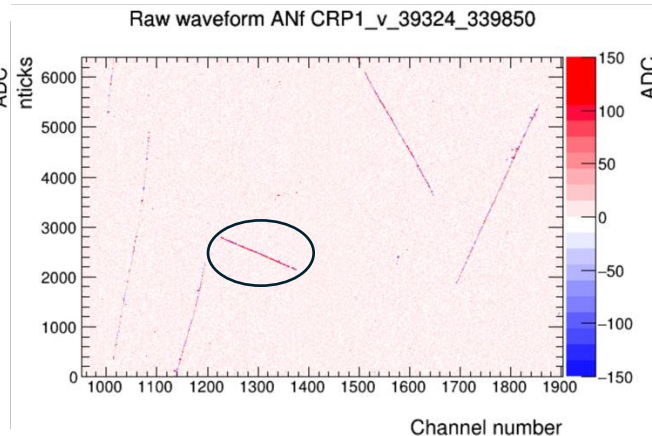
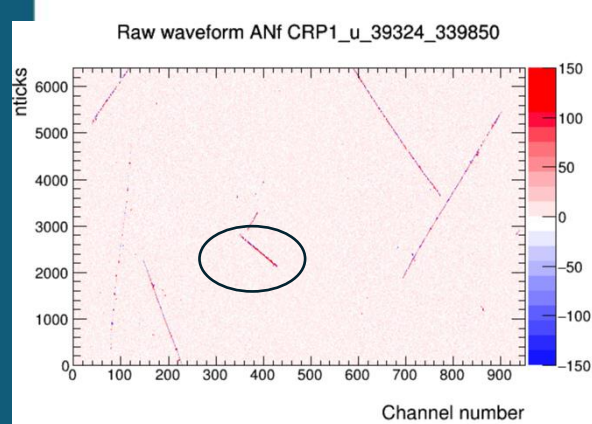
hw_raw5 Channel number



[3D Bee display:](#)

Signal shape Comparison for BDE:

data



x axis is random.
start: (-116.7, -102.4, 13.4)
end: (-272.9, -17.5, 60.4)

simulation

