

ICEBERG

v10_05_00d00

The image shows a VS Code editor with two JSON files side-by-side. The left file is `wcls-sim-drift-simchannel-splushn.json` and the right is `wcls-sim-drift-simchannel-splushn.jsonnet`. Both files contain simulation parameters. The left file has a search bar with `G4RefTime` and `No results`. The right file has a search bar with `start_time`. Handwritten annotations in blue and red highlight specific values and formulas. A terminal window at the bottom shows system logs.

Left File: `wcls-sim-drift-simchannel-splushn.json`

```
simchannel > {} wcls-sim-drift-simchannel-splushn.json > {} 5 > {} data > ## readout_time
57 {
58   "data": {
59     "faces": [
60       ...
61     ],
62     "ident": 0,
63     "nimpacts": 10,
64     "wire_schema": "WireSchemaFile"
65   },
66   "name": "apa0",
67   "type": "AnodePlane"
68 },
69 {
70   "data": {
71     "anodes_tn": [
72       "AnodePlane:apa0"
73     ],
74     "artlabel": "simpleSC",
75     "drift_speed": 0.0016056299999999998,
76     "g4_ref_time": 0,
77     "nsigma": 3,
78     "readout_time": 3000000,
79     "rng": "Random",
80     "start_time": -250000,
81     "tick": 500,
82     "u_time_offset": 0,
83     "u_to_rp": 100,
84     "use_energy": true,
85     "v_time_offset": 0,
86     "v_to_rp": 100,
87     "y_time_offset": 0,
88     "y_to_rp": 100
89   },
90   "name": "postdrift",
91   "type": "wclsSimChannelSink"
92 },
93 {
94   "data": {
95     "gate": [
96       -62280.849261660536
97     ]
98   }
99 }
```

Right File: `wcls-sim-drift-simchannel-splushn.jsonnet`

```
simchannel > {} wcls-sim-drift-simchannel-splushn.json > {} 17 > {} data > ## start_time
204 {
205   "data": {
206     "short_responses": [
207       "ColdElecResponse:elecresp0"
208     ],
209     "tick": 500
210   },
211   "name": "PIRfield0plane2",
212   "type": "PlaneImpactResponse"
213 },
214 {
215   "data": {
216     "anode": "AnodePlane:apa0",
217     "dft": "FftwDFT",
218     "drift_speed": 0.0016056299999999998,
219     "first_frame_number": 100,
220     "fluctuate": true,
221     "nsigma": 3,
222     "pirs": [
223       "PlaneImpactResponse:PIRfield0plane0",
224       "PlaneImpactResponse:PIRfield0plane1",
225       "PlaneImpactResponse:PIRfield0plane2"
226     ],
227     "readout_time": 4190500,
228     "rng": "Random",
229     "start_time": -62280.849261660536,
230     "tick": 500
231   },
232   "name": "depottransform0",
233   "type": "DepoTransform"
234 },
235 {
236   "data": {
237     "anode": "AnodePlane:apa0",
238     "fill": 0,
239     "nticks": 8256,
240     "tags": [],
241     "tbin": 125,
242     "toffset": 0
243   }
244 }
```

Handwritten Annotations:

- Left File:** `readout_time: 3000000` is annotated with `6000` in blue.
- Right File:** `readout_time: 4190500` is annotated with `8381` in blue.
- Right File:** `start_time: -62280.849261660536` is annotated with `100/1.60563*1000 ns` in red.

Terminal Window:

```
bash - simchannel
$ln -s /cvmfs/dune.opensciencegrid.org/products/dune/dunereco/v10_05_00d00/wire-cell-cfg/pgrapher/experiment/iceberg .
/exp/dune/app/users/yuhw/wct-ci/simchannel
$ll
total 75K
lrwxrwxrwx 1 yuhw dune 55 Aug 12 22:00 cosmics -> /exp/dune/app/users/mwang/iceberg/nosimch_issue/cosmics
-rw-r--r-- 1 yuhw dune 17K Aug 13 12:02 detsim.fcl
-rw-r--r-- 1 yuhw dune 13K Aug 13 12:01 dune_radiological_model_decay0_local.fcl
lrwxrwxrwx 1 yuhw dune 109 Aug 13 12:10 iceberg -> /cvmfs/dune.opensciencegrid.org/products/dune/dunereco/v10_05_00d00/wire-cell-cfg/pgrapher/experiment/iceberg
-rwxr-xr-x 1 yuhw dune 985 Aug 13 12:06 js.sh
-rw-r--r-- 1 yuhw dune 142 Aug 13 11:53 setup.sh
-rw-r--r-- 1 yuhw dune 35K Aug 13 12:07 wcls-sim-drift-simchannel-splushn.json
-rw-r--r-- 1 yuhw dune 8.7K Aug 13 12:07 wcls-sim-drift-simchannel-splushn.jsonnet
/exp/dune/app/users/yuhw/wct-ci/simchannel
$ll
```

DepoTransform/ductor

```
sim: super.sim={

  ..// For running in LArSoft, the simulation must be in fixed time mode.
  ..fixed: true,

  ..// The "absolute" time (ie, in G4 time) that the lower edge of
  ..// of final readout tick #0 should correspond to. This is a
  ..// "fixed" notion.
  ..local tick0_time = if std.objectHas(params, 'G4RefTime') then params.G4RefTime else 0,

  ..// Open the ductor's gate a bit early.
  ..local response_time_offset = $.det.response_plane / $.lar.drift_speed,
  ..local response_nticks = wc.roundToInt(response_time_offset / $.daq.tick),

  ..ductor: {
    ..nticks: $.daq.nticks + response_nticks,
    ..readout_time: self.nticks * $.daq.tick,
    ..start_time: tick0_time - response_time_offset,
  },

  ..// To counter the enlarged duration of the ductor, a Reframer
  ..// chops off the little early, extra time. Note, tags depend on how
  ..reframer: {
    ..tbin: response_nticks,
    ..nticks: $.daq.nticks,
  },

},
```

My understanding:

- Depo times are G4 times drifted at the response plane
- Here the start/during decide a window to include which depositions

DepoFluxWriter

```
local wcls_depoflux_writer = g.pnode({
  -- type: 'wclsDepoFluxWriter',
  -- name: 'postdrift',
  -- data: {
  --   anodes: [wc.tn(anode) for anode in tools.anodes],
  --   field_response: wc.tn(tools.field),
  --   tick: 0.5 * wc.us,
  --   window_start: params.sim.tick0_time, -- -205 * wc.us,
  --   window_duration: self.tick * params.daq.nticks,
  --   nsigma: 3.0,

  --   reference_time: -1700 * wc.us -- self.window_start, -- target is tick 410 should be 3400

  --   //energy: 1, # equivalent to use_energy = true
  --   simchan_label: 'simpleSC',
  --   sed_label: if (savetid == 'true') then 'ionandscint' else '',
  --   sparse: false,
  -- },
}, nin=1, nout=1, uses=tools.anodes + [tools.field]);
```

- input depots have times at resp. plane
- shift time to collection plane
- window start/duration are for times at collection plane

SimChannelSink

```
local wcls_simchannel_sink = g.pnode({
  type: 'wclsSimChannelSink',
  name: 'postdrift',
  data: {
    artlabel: 'simpleSC', -- where to save in art::Event
    anodes_tn: [wc.tn(anode) for anode in tools.anodes],
    rng: wc.tn(rng),
    tick: 0.5 * wc.us,
    start_time: -0.25 * wc.ms,
    readout_time: self.tick * 6000,
    nsigma: 3.0,
    drift_speed: params.lar.drift_speed,
    u_to_rp: 100 * wc.mm, -- 90.58 * wc.mm,
    v_to_rp: 100 * wc.mm, -- 95.29 * wc.mm,
    y_to_rp: 100 * wc.mm,
    u_time_offset: 0.0 * wc.us,
    v_time_offset: 0.0 * wc.us,
    y_time_offset: 0.0 * wc.us,
    g4_ref_time: fcl_params.G4RefTime, -- -250 * wc.us,
    use_energy: true,
  },
}, nin=1, nout=1, uses=tools.anodes);
```

```
void SimChannelSink::save_as_simchannel(const WireCell::IDepo::pointer& depo)
{
  // Binning tbins(m_readout_time/m_tick, m_start_time, m_start_time+m_readout_time);

  /* Start the gate earlier for the depots between the response
   * plane and the anode plane. Those depots are anti-drifted
   * to the response plane, so the start time is earlier.
   * c.f. jsonnet config in wirecell toolkit: params.sim.ductortor
   */
  // double response_plane = 10.0 * units::cm;
  double response_time_offset = m_response_plane / m_drift_speed;
  int response_nticks = (int)(response_time_offset / m_tick);
  Binning tbins(m_readout_time / m_tick + response_nticks,
                m_start_time - response_time_offset,
                m_start_time + m_readout_time);
```

g4_ref_time is used to shift the tdc filled in SimChannel

```
unsigned int temp_time = (unsigned int)((tdc - m_g4_ref_time) / m_tick);
charge = abs(charge);
if (charge > 1) {
  sc.AddIonizationElectrons(
    id, temp_time, charge, xyz, energy * abs(charge / depo->charge()));
}
}
```

fixing

```
/exp/dune/app/users/yuhw/dunereco
$git diff
diff --git a/dunereco/DUNEWireCell/iceberg/params.jsonnet b/dunereco/DUNEWireCell/iceberg/params.jsonnet
index 1ec5b352..4093135f 100644
--- a/dunereco/DUNEWireCell/iceberg/params.jsonnet
+++ b/dunereco/DUNEWireCell/iceberg/params.jsonnet
@@ -86,7 +86,7 @@ function(params) base {
    // The "absolute" time (ie, in G4 time) that the lower edge of
    // of final readout tick #0 should correspond to. This is a
    // "fixed" notion.
-   local tick0_time = if std.objectHas(params, 'G4RefTime') then params.G4RefTime else 0,
+   tick0_time: if std.objectHas(params, 'G4RefTime') then params.G4RefTime else 0,

    // Open the ductor's gate a bit early.
    local response_time_offset = $.det.response_plane / $.lar.drift_speed,
@@ -95,7 +95,7 @@ function(params) base {
    ductor: {
      nticks: $.daq.nticks + response_nticks,
      readout_time: self.nticks * $.daq.tick,
-     start_time: tick0_time - response_time_offset,
+     start_time: $.sim.tick0_time - response_time_offset,
    },

    // To counter the enlarged duration of the ductor, a Reframer
diff --git a/dunereco/DUNEWireCell/iceberg/wcls-sim-drift-simchannel-splushn.jsonnet b/dunereco/DUNEWireCell/iceberg/wcls-sim-drift-simchannel-splushn.jsonnet
index 0282b8e9..9c41d4df 100644
--- a/dunereco/DUNEWireCell/iceberg/wcls-sim-drift-simchannel-splushn.jsonnet
+++ b/dunereco/DUNEWireCell/iceberg/wcls-sim-drift-simchannel-splushn.jsonnet
@@ -138,9 +138,9 @@ local wcls_simchannel_sink = g.pnode({
  artlabel: 'simpleSC', // where to save in art::Event
  anodes_tn: [wc.tn(anode) for anode in tools.anodes],
  rng: wc.tn(rng),
-  tick: 0.5 * wc.us,
-  start_time: -0.25 * wc.ms,
-  readout_time: self.tick * 6000,
+  tick: params.daq.tick,
+  start_time: params.sim.tick0_time,
+  readout_time: self.tick * params.daq.nticks,
  nsigma: 3.0,
  drift_speed: params.lar.drift_speed,
  u_to_rp: 100 * wc.mm, // 90.58 * wc.mm,
```

after fixing

The image shows a VS Code editor window with two JSON files open. The left file is `wcls-sim-drift-simchannel-splushn.json` and the right file is `wcls-sim-drift-simchannel-splushn.jsonnet U`. The terminal at the bottom shows the command `export WIRECELL_PATH=/exp/dune/app/users/yuhw/wct-ci/simchannel/cfg:WIRECELL_PATH`. The status bar at the bottom indicates the current position is Ln 239, Col 24 (8 selected) in the `JSON` file.

```
{
  "data": {
    "anodes_tn": [
      "AnodePlane:apa0"
    ],
    "artlabel": "simpleSC",
    "drift_speed": 0.0016056299999999998,
    "g4_ref_time": 0,
    "nsigma": 3,
    "readout_time": 412800,
    "rng": "Random",
    "start_time": 0,
    "tick": 500,
    "u_time_offset": 0,
    "u_to_rp": 100,
    "use_energy": true,
    "v_time_offset": 0,
    "v_to_rp": 100,
    "y_time_offset": 0,
    "y_to_rp": 100
  },
  "name": "postdrift",
  "type": "wclsSimChannelSink"
},
{
  "data": {
    "gate": [
      -62280.849261660536,
      4128219.1507383394
    ]
  },
  "name": "bagger",
  "type": "DenoBagger"
}
```

```
220
221
222   "data": {
223     "anode": "AnodePlane:apa0",
224     "dft": "FftwDFT",
225     "drift_speed": 0.0016056299999999998,
226     "first_frame_number": 100,
227     "fluctuate": true,
228     "nsigma": 3,
229     "pirs": [
230       "PlaneImpactResponse:PIRfield0plane0",
231       "PlaneImpactResponse:PIRfield0plane1",
232       "PlaneImpactResponse:PIRfield0plane2"
233     ],
234     "readout_time": 4190500,
235     "rng": "Random",
236     "start_time": -62280.849261660536,
237     "tick": 500
238   },
239   "name": "depotransform0",
240   "type": "DepoTransform"
241 },
242 {
243   "data": {
244     "anode": "AnodePlane:apa0",
245     "fill": 0,
246     "nticks": 8256,
247     "tags": [],
248     "tbin": 125,
249     "toffset": 0
250   },
251   "name": "reframer0",
252   "type": "Reframer"
253 },
254 }
```

```
1
2 bash
3 export WIRECELL_PATH=/exp/dune/app/users/yuhw/wct-ci/simchannel/cfg:WIRECELL_PATH
4
```

Ln 239, Col 24 (8 selected) Spaces: 4 UTF-8 LF JSON