Wire-Cell configuration summary

`physics.producers.tpcrawdecoder`

`multi-sim-320.fcl`
`wcls-sim-drift-simchannel-nf-sp.jsonnet`
job types: Simulation, Signal processing

2026-10-27 09:54

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1 Job

This document summarizes the Wire-Cell Toolkit (WCT) configuration produced by compiling a Jsonnet file with the external variables given by a WCLS FHiCL configuration. All quantities are given in WCT system of units (mm, ns, MeV, e^+) followed, where known, by a conversion to more common units.

1.1 FHiCL source

Table 1: WCLS configuration table found in FHiCL.

Parameter	**Value**	**Source**
FHiCL file	`/home/bviren/dune/xerosere/multi-sim-320.fcl`	
WCLS table	`physics.producers.tpcrawdecoder`	FHiCL
module_type	`WireCellToolkit`	FHiCL
`wcls_main.tool_type`	`"WCLS"`	FHiCL
`wcls_main.apps`	`["TbbFlow"]`	FHiCL
`wcls_main.plugins`	`["WireCellPgraph", "WireCellGen", "WireCellSio", "WireCellRoot", "WireCellLarsoft", "WireCellTbb"]`	FHiCL
`wcls_main.configs`	`["pgrapher/experiment/dune10kt-vd/wcls-sim-drift-simchannel-nf-sp.jsonnet"]`	FHiCL
`wcls_main.inputers`	`["wclsSimDepoSetSource:"]`	FHiCL

Table 1: WCLS configuration table found in FHiCL.

Parameter	Value	Source
wcls_main.outputers	["wclsDepoFluxWriter:postdrift0", "wclsFrameSaver:simdigits0", "wclsFrameSaver:spsignals0", "wclsDepoFluxWriter:postdrift1", "wclsFrameSaver:simdigits1", "wclsFrameSaver:spsignals1", "wclsDepoFluxWriter:postdrift2", "wclsFrameSaver:simdigits2", "wclsFrameSaver:spsignals2", "wclsDepoFluxWriter:postdrift3", "wclsFrameSaver:simdigits3", "wclsFrameSaver:spsignals3", "wclsDepoFluxWriter:postdrift4", "wclsFrameSaver:simdigits4", "wclsFrameSaver:spsignals4", "wclsDepoFluxWriter:postdrift5", "wclsFrameSaver:simdigits5", "wclsFrameSaver:spsignals5", "wclsDepoFluxWriter:postdrift6", "wclsFrameSaver:simdigits6", "wclsFrameSaver:spsignals6", "wclsDepoFluxWriter:postdrift7", "wclsFrameSaver:simdigits7", "wclsFrameSaver:spsignals7", "wclsDepoFluxWriter:postdrift8", "wclsFrameSaver:simdigits8", "wclsFrameSaver:spsignals8", "wclsDepoFluxWriter:postdrift9", "wclsFrameSaver:simdigits9", "wclsFrameSaver:spsignals9", "wclsDepoFluxWriter:postdrift10", "wclsFrameSaver:simdigits10", "wclsFrameSaver:spsignals10", "wclsDepoFluxWriter:postdrift11", "wclsFrameSaver:simdigits11", "wclsFrameSaver:spsignals11", "wclsDepoFluxWriter:postdrift12", "wclsFrameSaver:simdigits12", "wclsFrameSaver:spsignals12", "wclsDepoFluxWriter:postdrift13", "wclsFrameSaver:simdigits13", "wclsFrameSaver:spsignals13", "wclsDepoFluxWriter:postdrift14", "wclsFrameSaver:simdigits14", "wclsFrameSaver:spsignals14", "wclsDepoFluxWriter:postdrift15", "wclsFrameSaver:simdigits15", "wclsFrameSaver:spsignals15", "wclsDepoFluxWriter:postdrift16", "wclsFrameSaver:simdigits16", "wclsFrameSaver:spsignals16", "wclsDepoFluxWriter:postdrift17", "wclsFrameSaver:simdigits17", "wclsFrameSaver:spsignals17", "wclsDepoFluxWriter:postdrift18", "wclsFrameSaver:simdigits18", "wclsFrameSaver:spsignals18", "wclsDepoFluxWriter:postdrift19", "wclsFrameSaver:simdigits19", "wclsFrameSaver:spsignals19", "wclsDepoFluxWriter:postdrift20", "wclsFrameSaver:simdigits20", "wclsFrameSaver:spsignals20", "wclsDepoFluxWriter:postdrift21", "wclsFrameSaver:simdigits21", "wclsFrameSaver:spsignals21", "wclsDepoFluxWriter:postdrift22", "wclsFrameSaver:simdigits22", "wclsFrameSaver:spsignals22", "wclsDepoFluxWriter:postdrift23", "wclsFrameSaver:simdigits23", "wclsFrameSaver:spsignals23", "wclsDepoFluxWriter:postdrift24", "wclsFrameSaver:simdigits24", "wclsFrameSaver:spsignals24", "wclsDepoFluxWriter:postdrift25", "wclsFrameSaver:simdigits25", "wclsFrameSaver:spsignals25", "wclsDepoFluxWriter:postdrift26", "wclsFrameSaver:simdigits26", "wclsFrameSaver:spsignals26", "wclsDepoFluxWriter:postdrift27", "wclsFrameSaver:simdigits27", "wclsFrameSaver:spsignals27", "wclsDepoFluxWriter:postdrift28", "wclsFrameSaver:simdigits28", "wclsFrameSaver:spsignals28", "wclsDepoFluxWriter:postdrift29", "wclsFrameSaver:simdigits29", "wclsFrameSaver:spsignals29", "wclsDepoFluxWriter:postdrift30", "wclsFrameSaver:simdigits30", "wclsFrameSaver:spsignals30", "wclsDepoFluxWriter:postdrift31", "wclsFrameSaver:simdigits31", "wclsFrameSaver:spsignals31", "wclsDepoFluxWriter:postdrift32", "wclsFrameSaver:simdigits32", "wclsFrameSaver:spsignals32", "wclsDepoFluxWriter:postdrift33", "wclsFrameSaver:simdigits33", "wclsFrameSaver:spsignals33", "wclsDepoFluxWriter:postdrift34", "wclsFrameSaver:simdigits34", "wclsFrameSaver:spsignals34", "wclsDepoFluxWriter:postdrift35", "wclsFrameSaver:simdigits35", "wclsFrameSaver:spsignals35", "wclsDepoFluxWriter:postdrift36", "wclsFrameSaver:simdigits36", "wclsFrameSaver:spsignals36", "wclsDepoFluxWriter:postdrift37", "wclsFrameSaver:simdigits37", "wclsFrameSaver:spsignals37", "wclsDepoFluxWriter:postdrift38", "wclsFrameSaver:simdigits38", "wclsFrameSaver:spsignals38", "wclsDepoFluxWriter:postdrift39", "wclsFrameSaver:simdigits39", "wclsFrameSaver:	FHiCL

Table 1: WCLS configuration table found in FHiCL.

Parameter	Value	Source
wcls_main.logsinks	["stdout:debug"]	FHiCL
wcls_main.loglevels	["debug"]	FHiCL

FHiCL includes not found (values from these are unresolved unless overridden):
PhotonCalibratorProtoDUNESP.fcl, channelstatus_pdsp.fcl, dataprep_dune.fcl, lifetimecalib_dune.fcl, opticaldetectorservices_dune.fcl, photpropservices_dune.fcl, protodune_dataprep_services.fcl, seedservice.fcl, xyzcalib_dune.fcl

1.2 Jsonnet external variables

The WCLS tool passes each wcls_main.params entry as a Jsonnet external *string* and each wcls_main.structs entry as external *code*. The "origin column gives where the value was defined in FHiCL and the references through which it was obtained.

Table 2: Jsonnet std.extVar() values.

Name	Kind	Value	Origin
files_wires	str	dunevd10kt_3view_30deg_v6_refactored.json.bz2	wcls-sim-drift-simchannel-nf-sp.fcl:61
files_fields	str	protodunevd_FR_imbalance3p_260501.json.bz2	wcls-sim-drift-simchannel-nf-sp.fcl:66
geo_planeid_labels	str	default	wcls-sim-drift-simchannel-nf-sp.fcl:72
input_depos_tag	str	IonAndScint	wcls-sim-drift-simchannel-nf-sp.fcl:76
engine	str	TbbFlow	wcls-sim-drift-simchannel-nf-sp.fcl:97
process_mode	str	multi-sim	multi-sim-320.fcl:8
frame_tag_pattern	str	daq%d	multi-sim-320.fcl:9
elecGain	code	14	wcls-sim-drift-simchannel-nf-sp.fcl:102
nticks	code	8500	detectorproperties_dune.fcl:24 via @local::dunefdvd_detproperties.NumberTimeSamples
DL	code	4.0e-9	simulationservices_dune.fcl:9 via @local::dunefd_largeantparameters.LongitudinalDiffusion
DT	code	8.8e-9	simulationservices_dune.fcl:10 via @local::dunefd_largeantparameters.TransverseDiffusion
lifetime	code	10.4e3	wcls-sim-drift-simchannel-nf-sp.fcl:109
efield	code	0.5	detectorproperties_dune.fcl:22 via @local::dunefdvd_detproperties.Efield[0]
temperature	code	87	detectorproperties_dune.fcl:20 via @local::dunefdvd_detproperties.Temperature
G4RefTime	code	0.0	detectorclocks_dune.fcl:9 via @local::dunefd_detectorclocks.G4RefTime
response_plane	code	18.1	wcls-sim-drift-simchannel-nf-sp.fcl:116
process_anode_index	code	0	wcls-sim-drift-simchannel-nf-sp.fcl:118
use_hydra	code	true	wcls-sim-drift-simchannel-nf-sp.fcl:124
use_dnnroi	code	false	wcls-sim-drift-simchannel-nf-sp.fcl:127
adc_resolution	code	14	wcls-sim-drift-simchannel-nf-sp.fcl:128
max_threads	code	0	wcls-sim-drift-simchannel-nf-sp.fcl:131

Table 2: Jsonnet std.extVar() values.

Name	Kind	Value	Origin
process_anode_indices	code	[0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319]	multi-sim-320.fcl:10
save_rawdigits	code	true	multi-sim-320.fcl:11

1.3 Jsonnet compilation

Main Jsonnet file(s): /home/bviren/dune/xerosere/multi-sim-320/jmap/pgrapher/experiment/dune10kt-vd/wcls-sim-drift-simchannel-nf-sp.jsonnet

Command:

```
jsonnet -J /home/bviren/dune/xerosere/reference/dunereco/dunereco/DUNEWireCell/protodunevd -J /home/bviren/dune/xerosere/reference/
    ↪ wire-cell-data -J /home/bviren/dune/xerosere/devel/wire-cell-toolkit/cfg -J /home/bviren/dune/xerosere/multi-sim-320/jmap --
    ↪ ext-str files_wires=dunevd10kt_3view_30deg_v6_refactored.json.bz2 --ext-str files_fields=protodunevd_FR_imbalance3p_260501.
    ↪ json.bz2 --ext-str geo_planeid_labels=default --ext-str input_depos_tag=IonAndScint --ext-str engine=TbbFlow --ext-str
    ↪ process_mode=multi-sim --ext-str 'frame_tag_pattern=daq%d' --ext-code elecGain=14 --ext-code nticks=8500 --ext-code DL=4.0e
    ↪ -9 --ext-code DT=8.8e-9 --ext-code lifetime=10.4e3 --ext-code efield=0.5 --ext-code temperature=87 --ext-code G4RefTime=0.0
    ↪ --ext-code response_plane=18.1 --ext-code process_anode_index=0 --ext-code use_hydra=true --ext-code use_dnnroi=false --ext-
    ↪ code adc_resolution=14 --ext-code max_threads=0 --ext-code 'process_anode_indices=[0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12,
    ↪  13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43,
    ↪  44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74,
    ↪  75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103,
    ↪ 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128,
    ↪  129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152,
    ↪ 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177,
    ↪  178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201,
    ↪ 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226,
    ↪  227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250,
    ↪ 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275,
    ↪  276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299,
    ↪ 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319]' --ext-code
    ↪ save_rawdigits=true /home/bviren/dune/xerosere/multi-sim-320/jmap/pgrapher/experiment/dune10kt-vd/wcls-sim-drift-simchannel-
    ↪ nf-sp.jsonnet
```

1.4 Job types

Table 3: Job types detected from the component types present in the configuration.

Job type	Detected by component types
Simulation	`AddNoise, DepoSetDrifter, DepoTransform, Digitizer, Drifter, wclsDepoFluxWriter, wclsSimDepoSetSource`
Signal processing	`OmnibusSigProc`

Table 4: All 5510 configured components by type.

Component type	Count
`AddNoise`	320
`AnodePlane`	320
`ColdElecResponse`	1
`DepoSetDrifter`	1
`DepoSetFanout`	37
`DepoSetFilter`	320
`DepoTransform`	320
`DeposOrBust`	320
`Digitizer`	320
`Drifter`	1
`DumpFrames`	320
`EmpiricalNoiseModel`	320
`FftwDFT`	1
`FieldResponse`	2
`FrameFanin`	320
`FrameSync`	320
`HfFilter`	10
`JsonElecResponse`	1
`LfFilter`	3
`MegaAnodePlane`	320
`OmnibusSigProc`	320
`PlaneImpactResponse`	6
`RCResponse`	1
`Random`	1
`Reframer`	320
`ResponseSys`	1
`Retagger`	320
`TbbDataFlowGraph`	1
`TbbFlow`	1
`WireSchemaFile`	1
`wclsDepoFluxWriter`	320
`wclsFrameSaver`	640
`wclsSimDepoSetSource`	1

1.5 Data flow graph: `TbbFlow`

The application `TbbFlow` has 4838 edges between 4519 nodes of 16 types. The figure collapses all nodes of one type into one box (with the number of instances); edge labels count the collapsed edges.

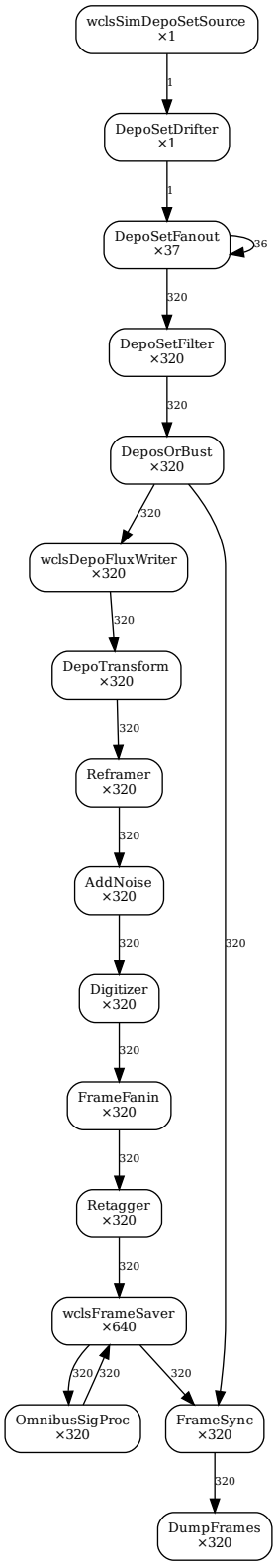


Figure 1: Type-collapsed data flow graph of `TbbFlow`.

2 Detector

The detector is described by 320 `AnodePlane` components. Each anode has up to two faces. For each face the configuration gives the x position of the anode plane (`anode`), of the plane where the field response calculation starts (`response`) and of the cathode (`cathode`). Wire (strip) geometry comes from the wire schema file of the `WireSchemaFile` component.

Coordinate system: WCT uses the global coordinates of the wire schema file. The x axis is the drift axis (field responses are calculated along their `axis`, normally $(1, 0, 0)$) and wires lie in y–z planes. In the DUNE/LArSoft convention y is vertical (up) and z is along the beam. Electrons drift from the cathode toward the anode.

Table 5: Wire schema and common anode parameters.

Parameter	Value	Source
`filename`	`dunevd10kt_3view_30deg_v6_refactored.json.bz2`	`WireSchemaFile`
`(found at)`	`/home/bviren/dune/xerosere/devel/dunereco/dunereco/DUNEWireCell/dune10kt-vd/dunevd10kt_3view_30deg_v6_refactored.json.bz2`	
`nimpacts`	10	`AnodePlane` (all)

2.1 Overall dimensions

Table 6: Overall detector dimensions.

Parameter	Value	Source
number of anodes (TPCs)	320	`AnodePlane`
number of configured faces	640	`AnodePlane.data.faces`
number of wires (all faces)	552960	wire schema
channel range span	491520 (upper bound on channel count)	wire schema
y extent	-672.4 to 672.4 cm (1344.7 cm)	wire schema
z extent	0.5 to 5976.3 cm (5975.8 cm)	wire schema
x extent (anode/cathode)	-651.9 to 652.1 cm (1304.0 cm)	`AnodePlane.data.faces`

2.2 Consistency checks

For each distinct face configuration: x distances relative to the last (collection) wire plane of the face, the drift length (cathode–anode) and, for comparison, the `origin` of the field response(s) used by the anode. The magnitude of the response plane distance should equal the field response origin.

Table 7: Face geometry consistency.

Faces	anode-coll. [cm]	response-coll. [cm]	drift length [cm]	Field response check
`AnodePlane:crm{0-159}/face{0-1}`	0.09	18.19	650.06	FieldResponse:field0 origin=18.10 cm: differs by +0.90 mm
`AnodePlane:crm{160-319}/face{0-1}`	0.00	-18.10	-650.06	FieldResponse:field0 origin=18.10 cm: OK; FieldResponse:field1 origin=18.10 cm: OK

2.3 Detector drawings

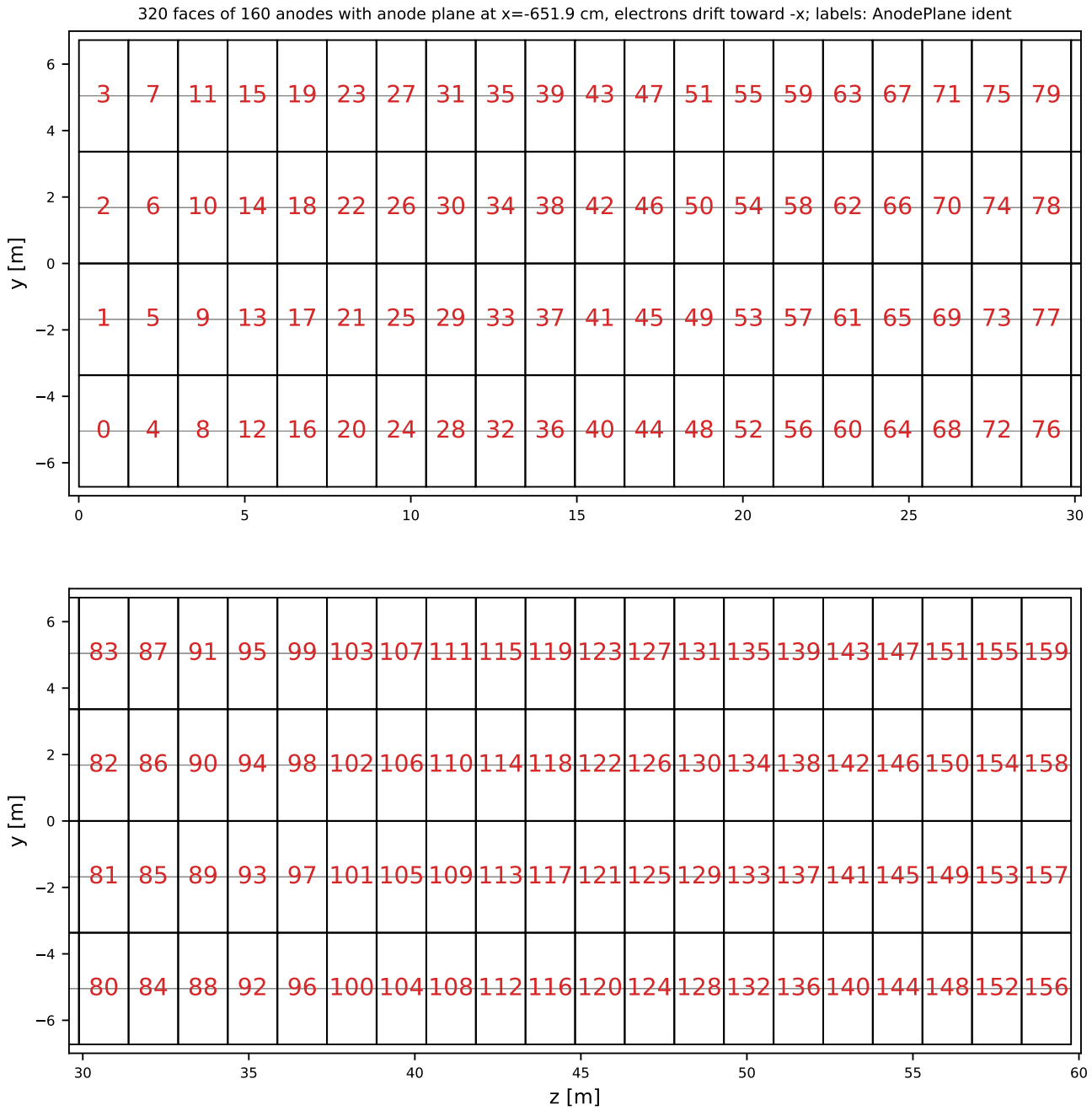


Figure 2: Anodes seen along the drift (x) axis with anode plane at $x = -651.9\,\mathrm{cm}$. Black: y–z extent of all wires of each anode (labeled with the `AnodePlane ident`, the per-TPC number); gray: individual faces. Overall extent $59.76 \times 13.45\,\mathrm{m}^2$ ($z \times y$). Source: `AnodePlane` components and wire schema.

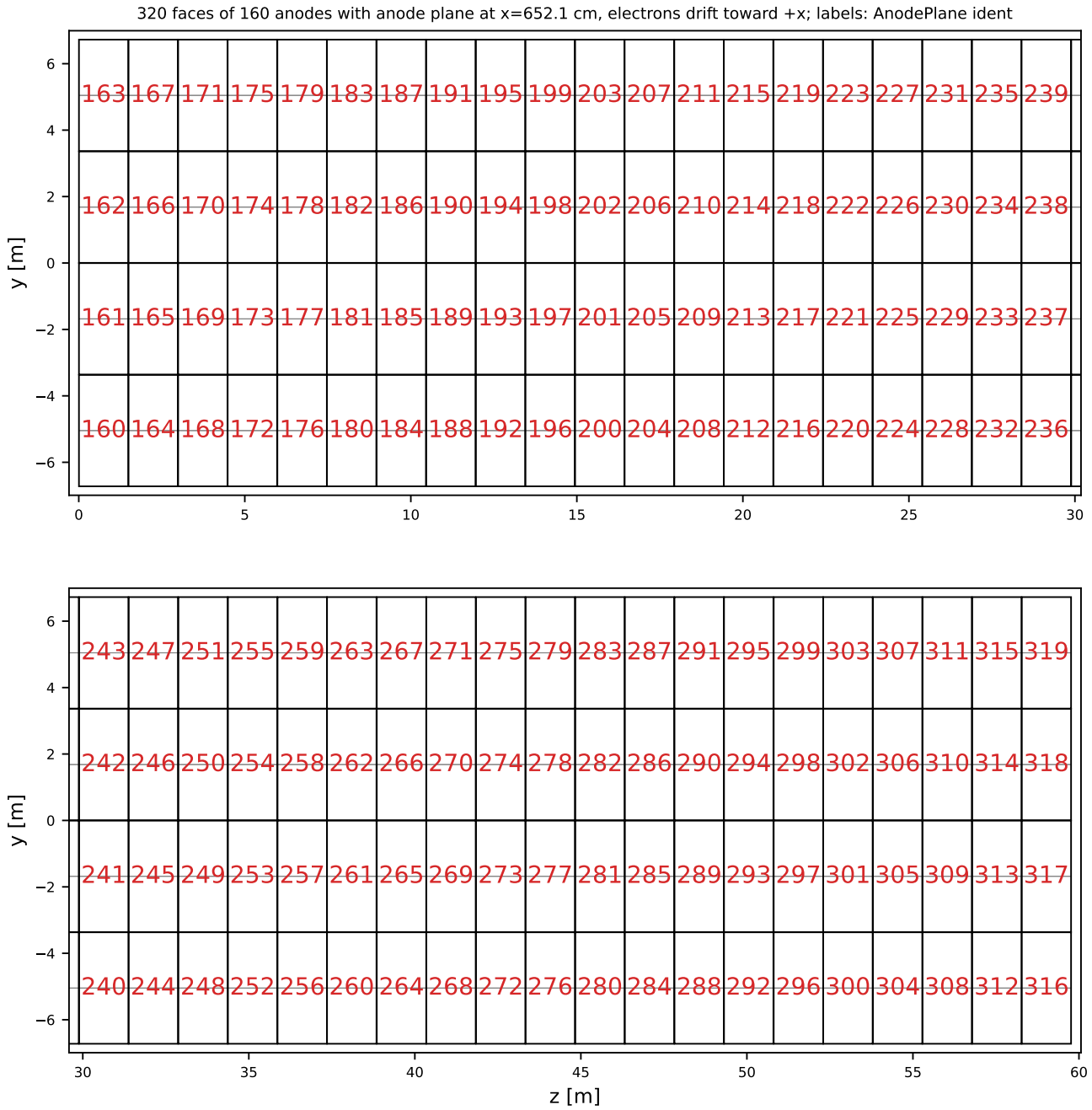


Figure 3: Anodes seen along the drift (x) axis with anode plane at $x = 652.1\,\mathrm{cm}$. Black: y–z extent of all wires of each anode (labeled with the `AnodePlane ident`, the per-TPC number); gray: individual faces. Overall extent $59.76 \times 13.45\,\mathrm{m}^2$ ($z \times y$). Source: `AnodePlane` components and wire schema.

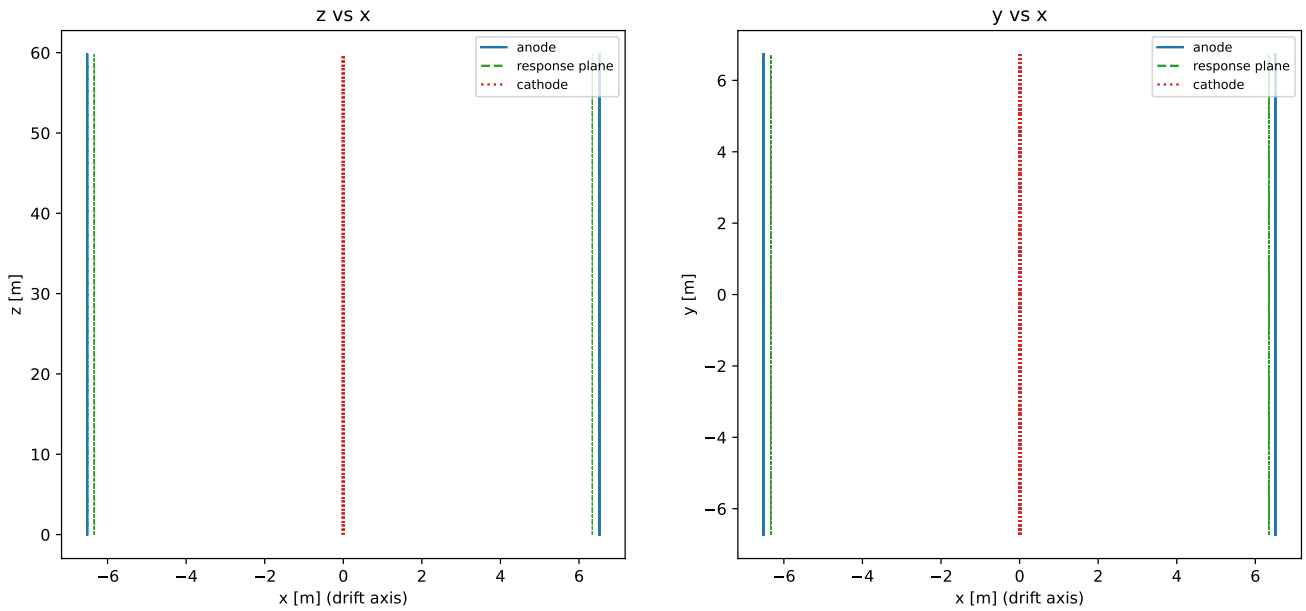


Figure 4: Drift volumes seen from above (z vs x) and from the side (y vs x). Shaded: volume between anode and cathode of each face. Source: `AnodePlane.data.faces`.

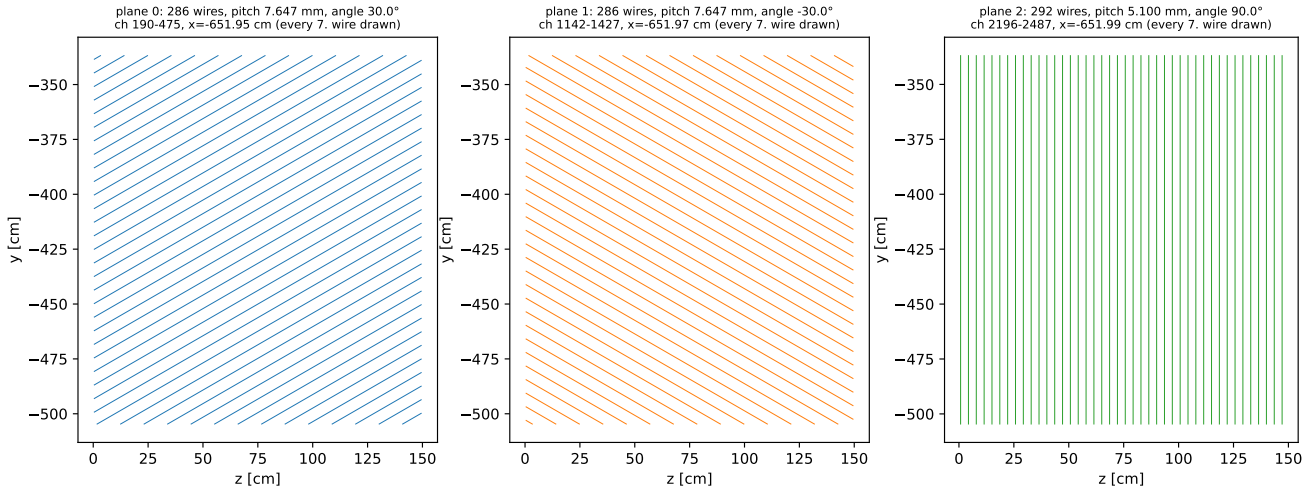


Figure 5: Wires of each plane of face 0 of `AnodePlane:crm0` (angle measured from the z axis toward y). Source: wire schema, `AnodePlane` ident 0.

Table 8: Distinct wire plane layouts (from the wire schema).

Faces	Plane	Wires	Pitch [mm]	Angle [deg]
`AnodePlane:crm{0-159}/face{0-1}`	0	286	7.650	30.0
	1	286	7.650	-30.0
	2	292	5.100	90.0
`AnodePlane:crm{160-319}/face{0-1}`	0	286	7.650	-30.0
	1	286	7.650	30.0
	2	292	5.100	90.0

2.4 Per-anode response and noise assignment

Anodes grouped by the responses, noise spectra and digitizer settings that the configuration attaches to them (via the `anode` parameter of the simulation, noise, digitizer and signal processing components).

Table 9: Per-anode assignment of responses, noise and digitization.

Anodes	Aspect	Value
AnodePlane:crm{0-159}	SP elec response	ColdElecResponse:elecresp0
	SP field response	FieldResponse:field0
	digitizer	14 bit, baselines ['1003.4', '1003.4', '507.7'] mV, fullscale ['200', '1600'] mV
	noise spectra	pdvd-bottom-noise-spectra-14mVfC-v1.json.bz2
	sim RC responses	0
	sim field response	FieldResponse:field0
	sim short responses	ColdElecResponse:elecresp0
AnodePlane:crm{160-319}	SP elec response	JsonElecResponse:elecresp1
	SP field response	FieldResponse:field0
	digitizer	14 bit, baselines ['1000', '1000', '1000'] mV, fullscale ['0', '2000'] mV
	noise spectra	pdvd-top-noise-spectra-v3.json.bz2
	sim RC responses	0
	sim field response	FieldResponse:field1
	sim short responses	JsonElecResponse:elecresp1

2.5 Anodes

Table 10: Per anode geometry: x positions of anode plane, response plane and cathode from AnodePlane faces (one value per distinct face), y/z ranges and channel range from the wire schema.

ident	name	faces	x anode [cm]	x resp. [cm]	x cath. [cm]	y min/max [cm]	z min/max [cm]	channels
0	crm0	0,1	-651.90	-633.80	-1.84	-672.4 / -336.8	0.5 / 149.4	0-2487
1	crm1	0,1	-651.90	-633.80	-1.84	-336.0 / -0.4	0.5 / 149.4	3072-5559
2	crm2	0,1	-651.90	-633.80	-1.84	0.4 / 336.0	0.5 / 149.4	6144-8631
3	crm3	0,1	-651.90	-633.80	-1.84	336.8 / 672.4	0.5 / 149.4	9216-11703
4	crm4	0,1	-651.90	-633.80	-1.84	-672.4 / -336.8	149.4 / 298.3	476-3071
5	crm5	0,1	-651.90	-633.80	-1.84	-336.0 / -0.4	149.4 / 298.3	3548-6143
6	crm6	0,1	-651.90	-633.80	-1.84	0.4 / 336.0	149.4 / 298.3	6620-9215
7	crm7	0,1	-651.90	-633.80	-1.84	336.8 / 672.4	149.4 / 298.3	9692-12287
8	crm8	0,1	-651.90	-633.80	-1.84	-672.4 / -336.8	299.3 / 448.3	12288-14775
9	crm9	0,1	-651.90	-633.80	-1.84	-336.0 / -0.4	299.3 / 448.3	15360-17847
10	crm10	0,1	-651.90	-633.80	-1.84	0.4 / 336.0	299.3 / 448.3	18432-20919
11	crm11	0,1	-651.90	-633.80	-1.84	336.8 / 672.4	299.3 / 448.3	21504-23991
12	crm12	0,1	-651.90	-633.80	-1.84	-672.4 / -336.8	448.3 / 597.2	12764-15359
13	crm13	0,1	-651.90	-633.80	-1.84	-336.0 / -0.4	448.3 / 597.2	15836-18431
14	crm14	0,1	-651.90	-633.80	-1.84	0.4 / 336.0	448.3 / 597.2	18908-21503
15	crm15	0,1	-651.90	-633.80	-1.84	336.8 / 672.4	448.3 / 597.2	21980-24575
16	crm16	0,1	-651.90	-633.80	-1.84	-672.4 / -336.8	598.2 / 747.1	24576-27063
17	crm17	0,1	-651.90	-633.80	-1.84	-336.0 / -0.4	598.2 / 747.1	27648-30135
18	crm18	0,1	-651.90	-633.80	-1.84	0.4 / 336.0	598.2 / 747.1	30720-33207
19	crm19	0,1	-651.90	-633.80	-1.84	336.8 / 672.4	598.2 / 747.1	33792-36279
20	crm20	0,1	-651.90	-633.80	-1.84	-672.4 / -336.8	747.1 / 896.0	25052-27647
21	crm21	0,1	-651.90	-633.80	-1.84	-336.0 / -0.4	747.1 / 896.0	28124-30719
22	crm22	0,1	-651.90	-633.80	-1.84	0.4 / 336.0	747.1 / 896.0	31196-33791
23	crm23	0,1	-651.90	-633.80	-1.84	336.8 / 672.4	747.1 / 896.0	34268-36863
24	crm24	0,1	-651.90	-633.80	-1.84	-672.4 / -336.8	897.0 / 1045.9	36864-39351
25	crm25	0,1	-651.90	-633.80	-1.84	-336.0 / -0.4	897.0 / 1045.9	39936-42423
26	crm26	0,1	-651.90	-633.80	-1.84	0.4 / 336.0	897.0 / 1045.9	43008-45495
27	crm27	0,1	-651.90	-633.80	-1.84	336.8 / 672.4	897.0 / 1045.9	46080-48567
28	crm28	0,1	-651.90	-633.80	-1.84	-672.4 / -336.8	1045.9 / 1194.9	37340-39935
29	crm29	0,1	-651.90	-633.80	-1.84	-336.0 / -0.4	1045.9 / 1194.9	40412-43007
30	crm30	0,1	-651.90	-633.80	-1.84	0.4 / 336.0	1045.9 / 1194.9	43484-46079
31	crm31	0,1	-651.90	-633.80	-1.84	336.8 / 672.4	1045.9 / 1194.9	46556-49151
32	crm32	0,1	-651.90	-633.80	-1.84	-672.4 / -336.8	1195.9 / 1344.8	49152-51639
33	crm33	0,1	-651.90	-633.80	-1.84	-336.0 / -0.4	1195.9 / 1344.8	52224-54711
34	crm34	0,1	-651.90	-633.80	-1.84	0.4 / 336.0	1195.9 / 1344.8	55296-57783
35	crm35	0,1	-651.90	-633.80	-1.84	336.8 / 672.4	1195.9 / 1344.8	58368-60855
36	crm36	0,1	-651.90	-633.80	-1.84	-672.4 / -336.8	1344.8 / 1493.7	49628-52223
37	crm37	0,1	-651.90	-633.80	-1.84	-336.0 / -0.4	1344.8 / 1493.7	52700-55295
38	crm38	0,1	-651.90	-633.80	-1.84	0.4 / 336.0	1344.8 / 1493.7	55772-58367
39	crm39	0,1	-651.90	-633.80	-1.84	336.8 / 672.4	1344.8 / 1493.7	58844-61439
40	crm40	0,1	-651.90	-633.80	-1.84	-672.4 / -336.8	1494.7 / 1643.6	61440-63927
41	crm41	0,1	-651.90	-633.80	-1.84	-336.0 / -0.4	1494.7 / 1643.6	64512-66999
42	crm42	0,1	-651.90	-633.80	-1.84	0.4 / 336.0	1494.7 / 1643.6	67584-70071
43	crm43	0,1	-651.90	-633.80	-1.84	336.8 / 672.4	1494.7 / 1643.6	70656-73143
44	crm44	0,1	-651.90	-633.80	-1.84	-672.4 / -336.8	1643.6 / 1792.5	61916-64511
45	crm45	0,1	-651.90	-633.80	-1.84	-336.0 / -0.4	1643.6 / 1792.5	64988-67583
46	crm46	0,1	-651.90	-633.80	-1.84	0.4 / 336.0	1643.6 / 1792.5	68060-70655

Table 10: Per anode geometry: x positions of anode plane, response plane and cathode from AnodePlane faces (one value per distinct face), y/z ranges and channel range from the wire schema.

ident	name	faces	x anode [cm]	x resp. [cm]	x cath. [cm]	y min/max [cm]	z min/max [cm]	channels
47	crm47	0,1	-651.90	-633.80	-1.84	336.8 / 672.4	1643.6 / 1792.5	71132-73727
48	crm48	0,1	-651.90	-633.80	-1.84	-672.4 / -336.8	1793.5 / 1942.5	73728-76215
49	crm49	0,1	-651.90	-633.80	-1.84	-336.0 / -0.4	1793.5 / 1942.5	76800-79287
50	crm50	0,1	-651.90	-633.80	-1.84	0.4 / 336.0	1793.5 / 1942.5	79872-82359
51	crm51	0,1	-651.90	-633.80	-1.84	336.8 / 672.4	1793.5 / 1942.5	82944-85431
52	crm52	0,1	-651.90	-633.80	-1.84	-672.4 / -336.8	1942.5 / 2091.4	74204-76799
53	crm53	0,1	-651.90	-633.80	-1.84	-336.0 / -0.4	1942.5 / 2091.4	77276-79871
54	crm54	0,1	-651.90	-633.80	-1.84	0.4 / 336.0	1942.5 / 2091.4	80348-82943
55	crm55	0,1	-651.90	-633.80	-1.84	336.8 / 672.4	1942.5 / 2091.4	83420-86015
56	crm56	0,1	-651.90	-633.80	-1.84	-672.4 / -336.8	2092.4 / 2241.3	86016-88503
57	crm57	0,1	-651.90	-633.80	-1.84	-336.0 / -0.4	2092.4 / 2241.3	89088-91575
58	crm58	0,1	-651.90	-633.80	-1.84	0.4 / 336.0	2092.4 / 2241.3	92160-94647
59	crm59	0,1	-651.90	-633.80	-1.84	336.8 / 672.4	2092.4 / 2241.3	95232-97719
60	crm60	0,1	-651.90	-633.80	-1.84	-672.4 / -336.8	2241.3 / 2390.2	86492-89087
61	crm61	0,1	-651.90	-633.80	-1.84	-336.0 / -0.4	2241.3 / 2390.2	89564-92159
62	crm62	0,1	-651.90	-633.80	-1.84	0.4 / 336.0	2241.3 / 2390.2	92636-95231
63	crm63	0,1	-651.90	-633.80	-1.84	336.8 / 672.4	2241.3 / 2390.2	95708-98303
64	crm64	0,1	-651.90	-633.80	-1.84	-672.4 / -336.8	2391.2 / 2540.1	98304-100791
65	crm65	0,1	-651.90	-633.80	-1.84	-336.0 / -0.4	2391.2 / 2540.1	101376-103863
66	crm66	0,1	-651.90	-633.80	-1.84	0.4 / 336.0	2391.2 / 2540.1	104448-106935
67	crm67	0,1	-651.90	-633.80	-1.84	336.8 / 672.4	2391.2 / 2540.1	107520-110007
68	crm68	0,1	-651.90	-633.80	-1.84	-672.4 / -336.8	2540.1 / 2689.1	98780-101375
69	crm69	0,1	-651.90	-633.80	-1.84	-336.0 / -0.4	2540.1 / 2689.1	101852-104447
70	crm70	0,1	-651.90	-633.80	-1.84	0.4 / 336.0	2540.1 / 2689.1	104924-107519
71	crm71	0,1	-651.90	-633.80	-1.84	336.8 / 672.4	2540.1 / 2689.1	107996-110591
72	crm72	0,1	-651.90	-633.80	-1.84	-672.4 / -336.8	2690.1 / 2839.0	110592-113079
73	crm73	0,1	-651.90	-633.80	-1.84	-336.0 / -0.4	2690.1 / 2839.0	113664-116151
74	crm74	0,1	-651.90	-633.80	-1.84	0.4 / 336.0	2690.1 / 2839.0	116736-119223
75	crm75	0,1	-651.90	-633.80	-1.84	336.8 / 672.4	2690.1 / 2839.0	119808-122295
76	crm76	0,1	-651.90	-633.80	-1.84	-672.4 / -336.8	2839.0 / 2987.9	111068-113663
77	crm77	0,1	-651.90	-633.80	-1.84	-336.0 / -0.4	2839.0 / 2987.9	114140-116735
78	crm78	0,1	-651.90	-633.80	-1.84	0.4 / 336.0	2839.0 / 2987.9	117212-119807
79	crm79	0,1	-651.90	-633.80	-1.84	336.8 / 672.4	2839.0 / 2987.9	120284-122879
80	crm80	0,1	-651.90	-633.80	-1.84	-672.4 / -336.8	2988.9 / 3137.8	122880-125367
81	crm81	0,1	-651.90	-633.80	-1.84	-336.0 / -0.4	2988.9 / 3137.8	125952-128439
82	crm82	0,1	-651.90	-633.80	-1.84	0.4 / 336.0	2988.9 / 3137.8	129024-131511
83	crm83	0,1	-651.90	-633.80	-1.84	336.8 / 672.4	2988.9 / 3137.8	132096-134583
84	crm84	0,1	-651.90	-633.80	-1.84	-672.4 / -336.8	3137.8 / 3286.7	123356-125951
85	crm85	0,1	-651.90	-633.80	-1.84	-336.0 / -0.4	3137.8 / 3286.7	126428-129023
86	crm86	0,1	-651.90	-633.80	-1.84	0.4 / 336.0	3137.8 / 3286.7	129500-132095
87	crm87	0,1	-651.90	-633.80	-1.84	336.8 / 672.4	3137.8 / 3286.7	132572-135167
88	crm88	0,1	-651.90	-633.80	-1.84	-672.4 / -336.8	3287.7 / 3436.7	135168-137655
89	crm89	0,1	-651.90	-633.80	-1.84	-336.0 / -0.4	3287.7 / 3436.7	138240-140727
90	crm90	0,1	-651.90	-633.80	-1.84	0.4 / 336.0	3287.7 / 3436.7	141312-143799
91	crm91	0,1	-651.90	-633.80	-1.84	336.8 / 672.4	3287.7 / 3436.7	144384-146871
92	crm92	0,1	-651.90	-633.80	-1.84	-672.4 / -336.8	3436.7 / 3585.6	135644-138239
93	crm93	0,1	-651.90	-633.80	-1.84	-336.0 / -0.4	3436.7 / 3585.6	138716-141311
94	crm94	0,1	-651.90	-633.80	-1.84	0.4 / 336.0	3436.7 / 3585.6	141788-144383
95	crm95	0,1	-651.90	-633.80	-1.84	336.8 / 672.4	3436.7 / 3585.6	144860-147455
96	crm96	0,1	-651.90	-633.80	-1.84	-672.4 / -336.8	3586.6 / 3735.5	147456-149943
97	crm97	0,1	-651.90	-633.80	-1.84	-336.0 / -0.4	3586.6 / 3735.5	150528-153015
98	crm98	0,1	-651.90	-633.80	-1.84	0.4 / 336.0	3586.6 / 3735.5	153600-156087
99	crm99	0,1	-651.90	-633.80	-1.84	336.8 / 672.4	3586.6 / 3735.5	156672-159159
100	crm100	0,1	-651.90	-633.80	-1.84	-672.4 / -336.8	3735.5 / 3884.4	147932-150527
101	crm101	0,1	-651.90	-633.80	-1.84	-336.0 / -0.4	3735.5 / 3884.4	151004-153599
102	crm102	0,1	-651.90	-633.80	-1.84	0.4 / 336.0	3735.5 / 3884.4	154076-156671
103	crm103	0,1	-651.90	-633.80	-1.84	336.8 / 672.4	3735.5 / 3884.4	157148-159743
104	crm104	0,1	-651.90	-633.80	-1.84	-672.4 / -336.8	3885.4 / 4034.3	159744-162231
105	crm105	0,1	-651.90	-633.80	-1.84	-336.0 / -0.4	3885.4 / 4034.3	162816-165303
106	crm106	0,1	-651.90	-633.80	-1.84	0.4 / 336.0	3885.4 / 4034.3	165888-168375
107	crm107	0,1	-651.90	-633.80	-1.84	336.8 / 672.4	3885.4 / 4034.3	168960-171447
108	crm108	0,1	-651.90	-633.80	-1.84	-672.4 / -336.8	4034.3 / 4183.3	160220-162815
109	crm109	0,1	-651.90	-633.80	-1.84	-336.0 / -0.4	4034.3 / 4183.3	163292-165887
110	crm110	0,1	-651.90	-633.80	-1.84	0.4 / 336.0	4034.3 / 4183.3	166364-168959
111	crm111	0,1	-651.90	-633.80	-1.84	336.8 / 672.4	4034.3 / 4183.3	169436-172031
112	crm112	0,1	-651.90	-633.80	-1.84	-672.4 / -336.8	4184.3 / 4333.2	172032-174519
113	crm113	0,1	-651.90	-633.80	-1.84	-336.0 / -0.4	4184.3 / 4333.2	175104-177591
114	crm114	0,1	-651.90	-633.80	-1.84	0.4 / 336.0	4184.3 / 4333.2	178176-180663
115	crm115	0,1	-651.90	-633.80	-1.84	336.8 / 672.4	4184.3 / 4333.2	181248-183735
116	crm116	0,1	-651.90	-633.80	-1.84	-672.4 / -336.8	4333.2 / 4482.1	172508-175103
117	crm117	0,1	-651.90	-633.80	-1.84	-336.0 / -0.4	4333.2 / 4482.1	175580-178175
118	crm118	0,1	-651.90	-633.80	-1.84	0.4 / 336.0	4333.2 / 4482.1	178652-181247
119	crm119	0,1	-651.90	-633.80	-1.84	336.8 / 672.4	4333.2 / 4482.1	181724-184319
120	crm120	0,1	-651.90	-633.80	-1.84	-672.4 / -336.8	4483.1 / 4632.0	184320-186807
121	crm121	0,1	-651.90	-633.80	-1.84	-336.0 / -0.4	4483.1 / 4632.0	187392-189879
122	crm122	0,1	-651.90	-633.80	-1.84	0.4 / 336.0	4483.1 / 4632.0	190464-192951
123	crm123	0,1	-651.90	-633.80	-1.84	336.8 / 672.4	4483.1 / 4632.0	193536-196023
124	crm124	0,1	-651.90	-633.80	-1.84	-672.4 / -336.8	4632.0 / 4780.9	184796-187391

Table 10: Per anode geometry: x positions of anode plane, response plane and cathode from AnodePlane faces (one value per distinct face), y/z ranges and channel range from the wire schema.

ident	name	faces	x anode [cm]	x resp. [cm]	x cath. [cm]	y min/max [cm]	z min/max [cm]	channels
125	crm125	0,1	-651.90	-633.80	-1.84	-336.0 / -0.4	4632.0 / 4780.9	187868-190463
126	crm126	0,1	-651.90	-633.80	-1.84	0.4 / 336.0	4632.0 / 4780.9	190940-193535
127	crm127	0,1	-651.90	-633.80	-1.84	336.8 / 672.4	4632.0 / 4780.9	194012-196607
128	crm128	0,1	-651.90	-633.80	-1.84	-672.4 / -336.8	4781.9 / 4930.9	196608-199095
129	crm129	0,1	-651.90	-633.80	-1.84	-336.0 / -0.4	4781.9 / 4930.9	199680-202167
130	crm130	0,1	-651.90	-633.80	-1.84	0.4 / 336.0	4781.9 / 4930.9	202752-205239
131	crm131	0,1	-651.90	-633.80	-1.84	336.8 / 672.4	4781.9 / 4930.9	205824-208311
132	crm132	0,1	-651.90	-633.80	-1.84	-672.4 / -336.8	4930.9 / 5079.8	197084-199679
133	crm133	0,1	-651.90	-633.80	-1.84	-336.0 / -0.4	4930.9 / 5079.8	200156-202751
134	crm134	0,1	-651.90	-633.80	-1.84	0.4 / 336.0	4930.9 / 5079.8	203228-205823
135	crm135	0,1	-651.90	-633.80	-1.84	336.8 / 672.4	4930.9 / 5079.8	206300-208895
136	crm136	0,1	-651.90	-633.80	-1.84	-672.4 / -336.8	5080.8 / 5229.7	208896-211383
137	crm137	0,1	-651.90	-633.80	-1.84	-336.0 / -0.4	5080.8 / 5229.7	211968-214455
138	crm138	0,1	-651.90	-633.80	-1.84	0.4 / 336.0	5080.8 / 5229.7	215040-217527
139	crm139	0,1	-651.90	-633.80	-1.84	336.8 / 672.4	5080.8 / 5229.7	218112-220599
140	crm140	0,1	-651.90	-633.80	-1.84	-672.4 / -336.8	5229.7 / 5378.6	209372-211967
141	crm141	0,1	-651.90	-633.80	-1.84	-336.0 / -0.4	5229.7 / 5378.6	212444-215039
142	crm142	0,1	-651.90	-633.80	-1.84	0.4 / 336.0	5229.7 / 5378.6	215516-218111
143	crm143	0,1	-651.90	-633.80	-1.84	336.8 / 672.4	5229.7 / 5378.6	218588-221183
144	crm144	0,1	-651.90	-633.80	-1.84	-672.4 / -336.8	5379.6 / 5528.5	221184-223671
145	crm145	0,1	-651.90	-633.80	-1.84	-336.0 / -0.4	5379.6 / 5528.5	224256-226743
146	crm146	0,1	-651.90	-633.80	-1.84	0.4 / 336.0	5379.6 / 5528.5	227328-229815
147	crm147	0,1	-651.90	-633.80	-1.84	336.8 / 672.4	5379.6 / 5528.5	230400-232887
148	crm148	0,1	-651.90	-633.80	-1.84	-672.4 / -336.8	5528.5 / 5677.5	221660-224255
149	crm149	0,1	-651.90	-633.80	-1.84	-336.0 / -0.4	5528.5 / 5677.5	224732-227327
150	crm150	0,1	-651.90	-633.80	-1.84	0.4 / 336.0	5528.5 / 5677.5	227804-230399
151	crm151	0,1	-651.90	-633.80	-1.84	336.8 / 672.4	5528.5 / 5677.5	230876-233471
152	crm152	0,1	-651.90	-633.80	-1.84	-672.4 / -336.8	5678.5 / 5827.4	233472-235959
153	crm153	0,1	-651.90	-633.80	-1.84	-336.0 / -0.4	5678.5 / 5827.4	236544-239031
154	crm154	0,1	-651.90	-633.80	-1.84	0.4 / 336.0	5678.5 / 5827.4	239616-242103
155	crm155	0,1	-651.90	-633.80	-1.84	336.8 / 672.4	5678.5 / 5827.4	242688-245175
156	crm156	0,1	-651.90	-633.80	-1.84	-672.4 / -336.8	5827.4 / 5976.3	233948-236543
157	crm157	0,1	-651.90	-633.80	-1.84	-336.0 / -0.4	5827.4 / 5976.3	237020-239615
158	crm158	0,1	-651.90	-633.80	-1.84	0.4 / 336.0	5827.4 / 5976.3	240092-242687
159	crm159	0,1	-651.90	-633.80	-1.84	336.8 / 672.4	5827.4 / 5976.3	243164-245759
160	crm160	0,1	652.15	634.05	2.09	-672.4 / -336.8	0.5 / 149.4	245760-248247
161	crm161	0,1	652.15	634.05	2.09	-336.0 / -0.4	0.5 / 149.4	248832-251319
162	crm162	0,1	652.15	634.05	2.09	0.4 / 336.0	0.5 / 149.4	251904-254391
163	crm163	0,1	652.15	634.05	2.09	336.8 / 672.4	0.5 / 149.4	254976-257463
164	crm164	0,1	652.15	634.05	2.09	-672.4 / -336.8	149.4 / 298.3	246236-248831
165	crm165	0,1	652.15	634.05	2.09	-336.0 / -0.4	149.4 / 298.3	249308-251903
166	crm166	0,1	652.15	634.05	2.09	0.4 / 336.0	149.4 / 298.3	252380-254975
167	crm167	0,1	652.15	634.05	2.09	336.8 / 672.4	149.4 / 298.3	255452-258047
168	crm168	0,1	652.15	634.05	2.09	-672.4 / -336.8	299.3 / 448.3	258048-260535
169	crm169	0,1	652.15	634.05	2.09	-336.0 / -0.4	299.3 / 448.3	261120-263607
170	crm170	0,1	652.15	634.05	2.09	0.4 / 336.0	299.3 / 448.3	264192-266679
171	crm171	0,1	652.15	634.05	2.09	336.8 / 672.4	299.3 / 448.3	267264-269751
172	crm172	0,1	652.15	634.05	2.09	-672.4 / -336.8	448.3 / 597.2	258524-261119
173	crm173	0,1	652.15	634.05	2.09	-336.0 / -0.4	448.3 / 597.2	261596-264191
174	crm174	0,1	652.15	634.05	2.09	0.4 / 336.0	448.3 / 597.2	264668-267263
175	crm175	0,1	652.15	634.05	2.09	336.8 / 672.4	448.3 / 597.2	267740-270335
176	crm176	0,1	652.15	634.05	2.09	-672.4 / -336.8	598.2 / 747.1	270336-272823
177	crm177	0,1	652.15	634.05	2.09	-336.0 / -0.4	598.2 / 747.1	273408-275895
178	crm178	0,1	652.15	634.05	2.09	0.4 / 336.0	598.2 / 747.1	276480-278967
179	crm179	0,1	652.15	634.05	2.09	336.8 / 672.4	598.2 / 747.1	279552-282039
180	crm180	0,1	652.15	634.05	2.09	-672.4 / -336.8	747.1 / 896.0	270812-273407
181	crm181	0,1	652.15	634.05	2.09	-336.0 / -0.4	747.1 / 896.0	273884-276479
182	crm182	0,1	652.15	634.05	2.09	0.4 / 336.0	747.1 / 896.0	276956-279551
183	crm183	0,1	652.15	634.05	2.09	336.8 / 672.4	747.1 / 896.0	280028-282623
184	crm184	0,1	652.15	634.05	2.09	-672.4 / -336.8	897.0 / 1045.9	282624-285111
185	crm185	0,1	652.15	634.05	2.09	-336.0 / -0.4	897.0 / 1045.9	285696-288183
186	crm186	0,1	652.15	634.05	2.09	0.4 / 336.0	897.0 / 1045.9	288768-291255
187	crm187	0,1	652.15	634.05	2.09	336.8 / 672.4	897.0 / 1045.9	291840-294327
188	crm188	0,1	652.15	634.05	2.09	-672.4 / -336.8	1045.9 / 1194.9	283100-285695
189	crm189	0,1	652.15	634.05	2.09	-336.0 / -0.4	1045.9 / 1194.9	286172-288767
190	crm190	0,1	652.15	634.05	2.09	0.4 / 336.0	1045.9 / 1194.9	289244-291839
191	crm191	0,1	652.15	634.05	2.09	336.8 / 672.4	1045.9 / 1194.9	292316-294911
192	crm192	0,1	652.15	634.05	2.09	-672.4 / -336.8	1195.9 / 1344.8	294912-297399
193	crm193	0,1	652.15	634.05	2.09	-336.0 / -0.4	1195.9 / 1344.8	297984-300471
194	crm194	0,1	652.15	634.05	2.09	0.4 / 336.0	1195.9 / 1344.8	301056-303543
195	crm195	0,1	652.15	634.05	2.09	336.8 / 672.4	1195.9 / 1344.8	304128-306615
196	crm196	0,1	652.15	634.05	2.09	-672.4 / -336.8	1344.8 / 1493.7	295388-297983
197	crm197	0,1	652.15	634.05	2.09	-336.0 / -0.4	1344.8 / 1493.7	298460-301055
198	crm198	0,1	652.15	634.05	2.09	0.4 / 336.0	1344.8 / 1493.7	301532-304127
199	crm199	0,1	652.15	634.05	2.09	336.8 / 672.4	1344.8 / 1493.7	304604-307199
200	crm200	0,1	652.15	634.05	2.09	-672.4 / -336.8	1494.7 / 1643.6	307200-309687
201	crm201	0,1	652.15	634.05	2.09	-336.0 / -0.4	1494.7 / 1643.6	310272-312759
202	crm202	0,1	652.15	634.05	2.09	0.4 / 336.0	1494.7 / 1643.6	313344-315831

Table 10: Per anode geometry: x positions of anode plane, response plane and cathode from AnodePlane faces (one value per distinct face), y/z ranges and channel range from the wire schema.

ident	name	faces	x anode [cm]	x resp. [cm]	x cath. [cm]	y min/max [cm]	z min/max [cm]	channels
203	crm203	0,1	652.15	634.05	2.09	336.8 / 672.4	1494.7 / 1643.6	316416-318903
204	crm204	0,1	652.15	634.05	2.09	-672.4 / -336.8	1643.6 / 1792.5	307676-310271
205	crm205	0,1	652.15	634.05	2.09	-336.0 / -0.4	1643.6 / 1792.5	310748-313343
206	crm206	0,1	652.15	634.05	2.09	0.4 / 336.0	1643.6 / 1792.5	313820-316415
207	crm207	0,1	652.15	634.05	2.09	336.8 / 672.4	1643.6 / 1792.5	316892-319487
208	crm208	0,1	652.15	634.05	2.09	-672.4 / -336.8	1793.5 / 1942.5	319488-321975
209	crm209	0,1	652.15	634.05	2.09	-336.0 / -0.4	1793.5 / 1942.5	322560-325047
210	crm210	0,1	652.15	634.05	2.09	0.4 / 336.0	1793.5 / 1942.5	325632-328119
211	crm211	0,1	652.15	634.05	2.09	336.8 / 672.4	1793.5 / 1942.5	328704-331191
212	crm212	0,1	652.15	634.05	2.09	-672.4 / -336.8	1942.5 / 2091.4	319964-322559
213	crm213	0,1	652.15	634.05	2.09	-336.0 / -0.4	1942.5 / 2091.4	323036-325631
214	crm214	0,1	652.15	634.05	2.09	0.4 / 336.0	1942.5 / 2091.4	326108-328703
215	crm215	0,1	652.15	634.05	2.09	336.8 / 672.4	1942.5 / 2091.4	329180-331775
216	crm216	0,1	652.15	634.05	2.09	-672.4 / -336.8	2092.4 / 2241.3	331776-334263
217	crm217	0,1	652.15	634.05	2.09	-336.0 / -0.4	2092.4 / 2241.3	334848-337335
218	crm218	0,1	652.15	634.05	2.09	0.4 / 336.0	2092.4 / 2241.3	337920-340407
219	crm219	0,1	652.15	634.05	2.09	336.8 / 672.4	2092.4 / 2241.3	340992-343479
220	crm220	0,1	652.15	634.05	2.09	-672.4 / -336.8	2241.3 / 2390.2	332252-334847
221	crm221	0,1	652.15	634.05	2.09	-336.0 / -0.4	2241.3 / 2390.2	335324-337919
222	crm222	0,1	652.15	634.05	2.09	0.4 / 336.0	2241.3 / 2390.2	338396-340991
223	crm223	0,1	652.15	634.05	2.09	336.8 / 672.4	2241.3 / 2390.2	341468-344063
224	crm224	0,1	652.15	634.05	2.09	-672.4 / -336.8	2391.2 / 2540.1	344064-346551
225	crm225	0,1	652.15	634.05	2.09	-336.0 / -0.4	2391.2 / 2540.1	347136-349623
226	crm226	0,1	652.15	634.05	2.09	0.4 / 336.0	2391.2 / 2540.1	350208-352695
227	crm227	0,1	652.15	634.05	2.09	336.8 / 672.4	2391.2 / 2540.1	353280-355767
228	crm228	0,1	652.15	634.05	2.09	-672.4 / -336.8	2540.1 / 2689.1	344540-347135
229	crm229	0,1	652.15	634.05	2.09	-336.0 / -0.4	2540.1 / 2689.1	347612-350207
230	crm230	0,1	652.15	634.05	2.09	0.4 / 336.0	2540.1 / 2689.1	350684-353279
231	crm231	0,1	652.15	634.05	2.09	336.8 / 672.4	2540.1 / 2689.1	353756-356351
232	crm232	0,1	652.15	634.05	2.09	-672.4 / -336.8	2690.1 / 2839.0	356352-358839
233	crm233	0,1	652.15	634.05	2.09	-336.0 / -0.4	2690.1 / 2839.0	359424-361911
234	crm234	0,1	652.15	634.05	2.09	0.4 / 336.0	2690.1 / 2839.0	362496-364983
235	crm235	0,1	652.15	634.05	2.09	336.8 / 672.4	2690.1 / 2839.0	365568-368055
236	crm236	0,1	652.15	634.05	2.09	-672.4 / -336.8	2839.0 / 2987.9	356828-359423
237	crm237	0,1	652.15	634.05	2.09	-336.0 / -0.4	2839.0 / 2987.9	359900-362495
238	crm238	0,1	652.15	634.05	2.09	0.4 / 336.0	2839.0 / 2987.9	362972-365567
239	crm239	0,1	652.15	634.05	2.09	336.8 / 672.4	2839.0 / 2987.9	366044-368639
240	crm240	0,1	652.15	634.05	2.09	-672.4 / -336.8	2988.9 / 3137.8	368640-371127
241	crm241	0,1	652.15	634.05	2.09	-336.0 / -0.4	2988.9 / 3137.8	371712-374199
242	crm242	0,1	652.15	634.05	2.09	0.4 / 336.0	2988.9 / 3137.8	374784-377271
243	crm243	0,1	652.15	634.05	2.09	336.8 / 672.4	2988.9 / 3137.8	377856-380343
244	crm244	0,1	652.15	634.05	2.09	-672.4 / -336.8	3137.8 / 3286.7	369116-371711
245	crm245	0,1	652.15	634.05	2.09	-336.0 / -0.4	3137.8 / 3286.7	372188-374783
246	crm246	0,1	652.15	634.05	2.09	0.4 / 336.0	3137.8 / 3286.7	375260-377855
247	crm247	0,1	652.15	634.05	2.09	336.8 / 672.4	3137.8 / 3286.7	378332-380927
248	crm248	0,1	652.15	634.05	2.09	-672.4 / -336.8	3287.7 / 3436.7	380928-383415
249	crm249	0,1	652.15	634.05	2.09	-336.0 / -0.4	3287.7 / 3436.7	384000-386487
250	crm250	0,1	652.15	634.05	2.09	0.4 / 336.0	3287.7 / 3436.7	387072-389559
251	crm251	0,1	652.15	634.05	2.09	336.8 / 672.4	3287.7 / 3436.7	390144-392631
252	crm252	0,1	652.15	634.05	2.09	-672.4 / -336.8	3436.7 / 3585.6	381404-383999
253	crm253	0,1	652.15	634.05	2.09	-336.0 / -0.4	3436.7 / 3585.6	384476-387071
254	crm254	0,1	652.15	634.05	2.09	0.4 / 336.0	3436.7 / 3585.6	387548-390143
255	crm255	0,1	652.15	634.05	2.09	336.8 / 672.4	3436.7 / 3585.6	390620-393215
256	crm256	0,1	652.15	634.05	2.09	-672.4 / -336.8	3586.6 / 3735.5	393216-395703
257	crm257	0,1	652.15	634.05	2.09	-336.0 / -0.4	3586.6 / 3735.5	396288-398775
258	crm258	0,1	652.15	634.05	2.09	0.4 / 336.0	3586.6 / 3735.5	399360-401847
259	crm259	0,1	652.15	634.05	2.09	336.8 / 672.4	3586.6 / 3735.5	402432-404919
260	crm260	0,1	652.15	634.05	2.09	-672.4 / -336.8	3735.5 / 3884.4	393692-396287
261	crm261	0,1	652.15	634.05	2.09	-336.0 / -0.4	3735.5 / 3884.4	396764-399359
262	crm262	0,1	652.15	634.05	2.09	0.4 / 336.0	3735.5 / 3884.4	399836-402431
263	crm263	0,1	652.15	634.05	2.09	336.8 / 672.4	3735.5 / 3884.4	402908-405503
264	crm264	0,1	652.15	634.05	2.09	-672.4 / -336.8	3885.4 / 4034.3	405504-407991
265	crm265	0,1	652.15	634.05	2.09	-336.0 / -0.4	3885.4 / 4034.3	408576-411063
266	crm266	0,1	652.15	634.05	2.09	0.4 / 336.0	3885.4 / 4034.3	411648-414135
267	crm267	0,1	652.15	634.05	2.09	336.8 / 672.4	3885.4 / 4034.3	414720-417207
268	crm268	0,1	652.15	634.05	2.09	-672.4 / -336.8	4034.3 / 4183.3	405980-408575
269	crm269	0,1	652.15	634.05	2.09	-336.0 / -0.4	4034.3 / 4183.3	409052-411647
270	crm270	0,1	652.15	634.05	2.09	0.4 / 336.0	4034.3 / 4183.3	412124-414719
271	crm271	0,1	652.15	634.05	2.09	336.8 / 672.4	4034.3 / 4183.3	415196-417791
272	crm272	0,1	652.15	634.05	2.09	-672.4 / -336.8	4184.3 / 4333.2	417792-420279
273	crm273	0,1	652.15	634.05	2.09	-336.0 / -0.4	4184.3 / 4333.2	420864-423351
274	crm274	0,1	652.15	634.05	2.09	0.4 / 336.0	4184.3 / 4333.2	423936-426423
275	crm275	0,1	652.15	634.05	2.09	336.8 / 672.4	4184.3 / 4333.2	427008-429495
276	crm276	0,1	652.15	634.05	2.09	-672.4 / -336.8	4333.2 / 4482.1	418268-420863
277	crm277	0,1	652.15	634.05	2.09	-336.0 / -0.4	4333.2 / 4482.1	421340-423935
278	crm278	0,1	652.15	634.05	2.09	0.4 / 336.0	4333.2 / 4482.1	424412-427007
279	crm279	0,1	652.15	634.05	2.09	336.8 / 672.4	4333.2 / 4482.1	427484-430079
280	crm280	0,1	652.15	634.05	2.09	-672.4 / -336.8	4483.1 / 4632.0	430080-432567

Table 10: Per anode geometry: x positions of anode plane, response plane and cathode from AnodePlane faces (one value per distinct face), y/z ranges and channel range from the wire schema.

ident	name	faces	x anode [cm]	x resp. [cm]	x cath. [cm]	y min/max [cm]	z min/max [cm]	channels
281	crm281	0,1	652.15	634.05	2.09	-336.0 / -0.4	4483.1 / 4632.0	433152-435639
282	crm282	0,1	652.15	634.05	2.09	0.4 / 336.0	4483.1 / 4632.0	436224-438711
283	crm283	0,1	652.15	634.05	2.09	336.8 / 672.4	4483.1 / 4632.0	439296-441783
284	crm284	0,1	652.15	634.05	2.09	-672.4 / -336.8	4632.0 / 4780.9	430556-433151
285	crm285	0,1	652.15	634.05	2.09	-336.0 / -0.4	4632.0 / 4780.9	433628-436223
286	crm286	0,1	652.15	634.05	2.09	0.4 / 336.0	4632.0 / 4780.9	436700-439295
287	crm287	0,1	652.15	634.05	2.09	336.8 / 672.4	4632.0 / 4780.9	439772-442367
288	crm288	0,1	652.15	634.05	2.09	-672.4 / -336.8	4781.9 / 4930.9	442368-444855
289	crm289	0,1	652.15	634.05	2.09	-336.0 / -0.4	4781.9 / 4930.9	445440-447927
290	crm290	0,1	652.15	634.05	2.09	0.4 / 336.0	4781.9 / 4930.9	448512-450999
291	crm291	0,1	652.15	634.05	2.09	336.8 / 672.4	4781.9 / 4930.9	451584-454071
292	crm292	0,1	652.15	634.05	2.09	-672.4 / -336.8	4930.9 / 5079.8	442844-445439
293	crm293	0,1	652.15	634.05	2.09	-336.0 / -0.4	4930.9 / 5079.8	445916-448511
294	crm294	0,1	652.15	634.05	2.09	0.4 / 336.0	4930.9 / 5079.8	448988-451583
295	crm295	0,1	652.15	634.05	2.09	336.8 / 672.4	4930.9 / 5079.8	452060-454655
296	crm296	0,1	652.15	634.05	2.09	-672.4 / -336.8	5080.8 / 5229.7	454656-457143
297	crm297	0,1	652.15	634.05	2.09	-336.0 / -0.4	5080.8 / 5229.7	457728-460215
298	crm298	0,1	652.15	634.05	2.09	0.4 / 336.0	5080.8 / 5229.7	460800-463287
299	crm299	0,1	652.15	634.05	2.09	336.8 / 672.4	5080.8 / 5229.7	463872-466359
300	crm300	0,1	652.15	634.05	2.09	-672.4 / -336.8	5229.7 / 5378.6	455132-457727
301	crm301	0,1	652.15	634.05	2.09	-336.0 / -0.4	5229.7 / 5378.6	458204-460799
302	crm302	0,1	652.15	634.05	2.09	0.4 / 336.0	5229.7 / 5378.6	461276-463871
303	crm303	0,1	652.15	634.05	2.09	336.8 / 672.4	5229.7 / 5378.6	464348-466943
304	crm304	0,1	652.15	634.05	2.09	-672.4 / -336.8	5379.6 / 5528.5	466944-469431
305	crm305	0,1	652.15	634.05	2.09	-336.0 / -0.4	5379.6 / 5528.5	470016-472503
306	crm306	0,1	652.15	634.05	2.09	0.4 / 336.0	5379.6 / 5528.5	473088-475575
307	crm307	0,1	652.15	634.05	2.09	336.8 / 672.4	5379.6 / 5528.5	476160-478647
308	crm308	0,1	652.15	634.05	2.09	-672.4 / -336.8	5528.5 / 5677.5	467420-470015
309	crm309	0,1	652.15	634.05	2.09	-336.0 / -0.4	5528.5 / 5677.5	470492-473087
310	crm310	0,1	652.15	634.05	2.09	0.4 / 336.0	5528.5 / 5677.5	473564-476159
311	crm311	0,1	652.15	634.05	2.09	336.8 / 672.4	5528.5 / 5677.5	476636-479231
312	crm312	0,1	652.15	634.05	2.09	-672.4 / -336.8	5678.5 / 5827.4	479232-481719
313	crm313	0,1	652.15	634.05	2.09	-336.0 / -0.4	5678.5 / 5827.4	482304-484791
314	crm314	0,1	652.15	634.05	2.09	0.4 / 336.0	5678.5 / 5827.4	485376-487863
315	crm315	0,1	652.15	634.05	2.09	336.8 / 672.4	5678.5 / 5827.4	488448-490935
316	crm316	0,1	652.15	634.05	2.09	-672.4 / -336.8	5827.4 / 5976.3	479708-482303
317	crm317	0,1	652.15	634.05	2.09	-336.0 / -0.4	5827.4 / 5976.3	482780-485375
318	crm318	0,1	652.15	634.05	2.09	0.4 / 336.0	5827.4 / 5976.3	485852-488447
319	crm319	0,1	652.15	634.05	2.09	336.8 / 672.4	5827.4 / 5976.3	488924-491519

3 Physics constants

Liquid argon transport parameters as used by the simulation. The `Drifter` applies diffusion (DL, DT), attachment (lifetime) and fluctuations while drifting depositions to the response plane. The drift speed is also used by the components that convert drifted depositions into signals.

Table 11: Physics constants.

Parameter	Value	Source
`DL`	`4e-07` = 4 cm^2/s	`Drifter`
`DT`	`8.8e-07` = 8.8 cm^2/s	`Drifter`
`lifetime`	`10400000` = 10.4 ms	`Drifter`
`drift_speed`	`0.00160563` = 1.6056 mm/μs	`Drifter`
`drift_speed`	`0.00160563` = 1.6056 mm/μs	`DepoTransform:ductor{0-319}`
`fluctuate`	`true`	`Drifter`
`fluctuate`	`true`	`DepoTransform:ductor{0-319}`
`time_offset`	`0` = 0 μs	`Drifter`

Table 12: Drift speed assumed by field response calculations (for comparison).

Field response	Drift speed in FR calculation	File
`FieldResponse:field0`	1.53 mm/μs	`protodunevd_FR_imbalance3p_260501.json.bz2`
`FieldResponse:field1`	1.53 mm/μs	`protodunevd_FR_imbalance3p_260501.json.bz2`

Table 13: Drift regions (`xregions`) of `Drifter`. Depositions outside are dropped; those inside are drifted to the response plane.

Region	anode x [cm]	response x [cm]	cathode x [cm]
0	-651.90	-633.80	-1.84
1	652.15	634.05	2.09

4 Field responses

Each `FieldResponse` component loads a file of induced currents on the wires of each plane for electrons drifting from the response plane (at distance `origin` from the last plane) along paths at a set of transverse impact positions (`pitchpos`).

4.1 Field response `protodunevd_FR_imbalance3p_260501.json.bz2`

Table 14: Field response `protodunevd_FR_imbalance3p_260501.json.bz2`.

Parameter	Value	Source
filename	`protodunevd_FR_imbalance3p_260501.json.bz2`	`FieldResponse:field{0-1}`
path	`/home/bviren/dune/xerosere/devel/dunereco/dunereco/DUNEWireCell/protodunevd/protodunevd_FR_imbalance3p_260501.json.bz2`	
axis	`[1, 0, 0]`	file
origin	`181` = 181 mm	file
tstart	`0` = 0 μs	file
period	`100` = 0.1 μs	file
speed	`0.00153` = 1.53 mm/μs	file
samples per path	1325	file
plane 0	planeid=0, location=`13.2` = 13.2 mm, pitch=`7.65` = 7.65 mm, 126 paths, pitchpos -80.33 to 76.50 mm, wire-0 integrated charge 0.020 e	file
plane 1	planeid=1, location=`3.2` = 3.2 mm, pitch=`7.65` = 7.65 mm, 126 paths, pitchpos -80.33 to 76.50 mm, wire-0 integrated charge 0.017 e	file
plane 2	planeid=2, location=`0` = 0 mm, pitch=`5.1` = 5.1 mm, 126 paths, pitchpos -53.55 to 51.00 mm, wire-0 integrated charge -0.879 e	file

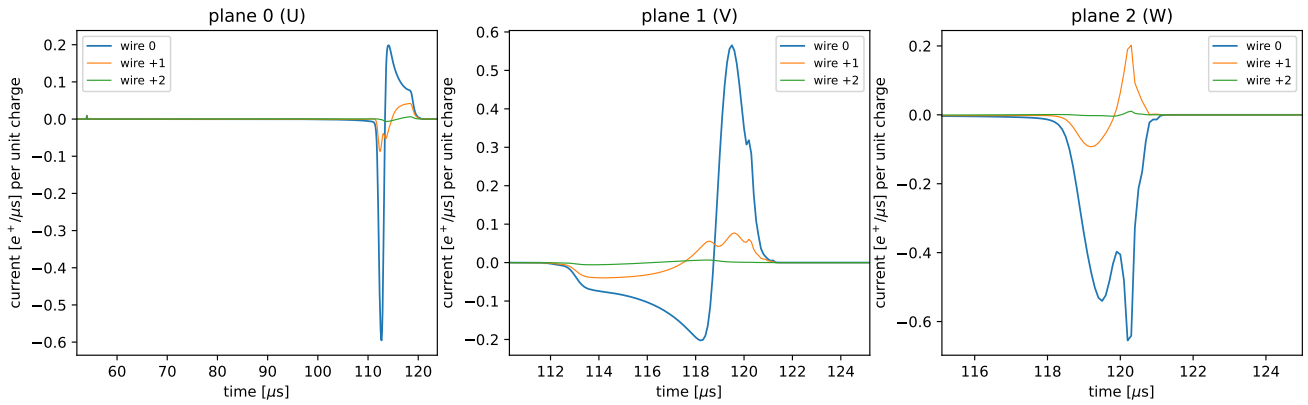


Figure 6: Field response `protodunevd_FR_imbalance3p_260501.json.bz2`: induced current, as stored, averaged over impact positions within the region of the central wire (wire 0) and its neighbors. WCT multiplies this by the charge of each deposition (negative for ionization electrons). Source: `FieldResponse:field{0-1}`.

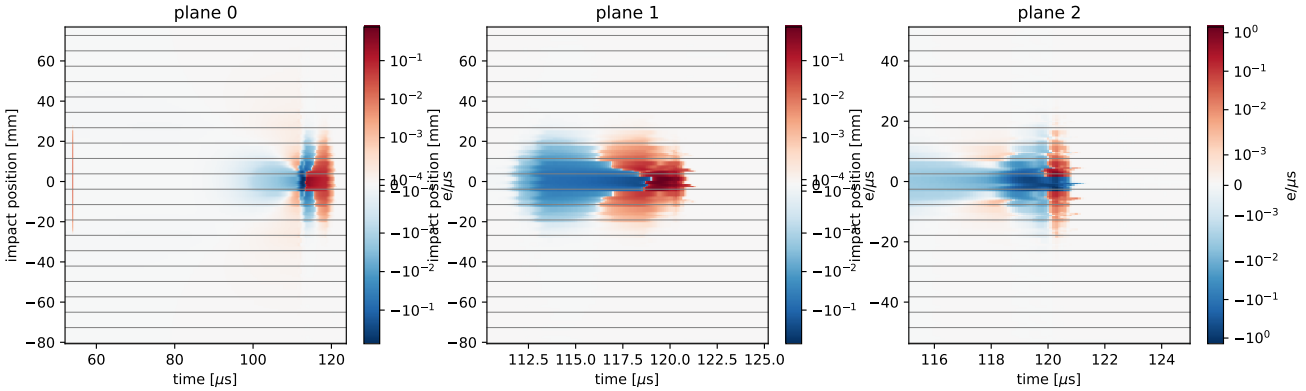


Figure 7: Field response `protodunevd_FR_imbalance3p_260501.json.bz2`: current vs time and impact position for all paths (symmetric log color scale; gray lines are wire region boundaries).

5 Electronics and total responses

Electronics response components give the response of the front end electronics to a unit charge. The simulation combines a field response with "short (electronics) and "long (RC) responses in `PlaneImpactResponse` components; signal processing uses the field and electronics responses named in its configuration.

Table 15: Parameters of 1 `ColdElecResponse` component(s): `ColdElecResponse:elecresp0`

Parameter	Value	Source
`filename`	`''`	`ColdElecResponse:elecresp0`
`gain`	`2.24305e-12` = 14 mV/fC	`ColdElecResponse:elecresp0`
`nticks`	`8725`	`ColdElecResponse:elecresp0`
`postgain`	`1`	`ColdElecResponse:elecresp0`
`shaping`	`2200` = 2.2 μs	`ColdElecResponse:elecresp0`
`tick`	`500` = 0.5 μs	`ColdElecResponse:elecresp0`

Table 16: Parameters of 1 `JsonElecResponse` component(s): `JsonElecResponse:elecresp1`

Parameter	Value	Source
`filename`	`dunevd-coldbox-elecresp-top-psnorm_400.json.bz2`	`JsonElecResponse:elecresp1`
`gain`	`2.24305e-12` = 14 mV/fC	`JsonElecResponse:elecresp1`
`nticks`	`8725`	`JsonElecResponse:elecresp1`
`postgain`	`1.36`	`JsonElecResponse:elecresp1`
`shaping`	`2000` = 2 μs	`JsonElecResponse:elecresp1`
`tick`	`500` = 0.5 μs	`JsonElecResponse:elecresp1`

Table 17: Parameters of 1 `RCResponse` component(s): `RCResponse`

Parameter	Value	Source
`nticks`	`8725`	`RCResponse`
`tick`	`500` = 0.5 μs	`RCResponse`
`width`	`1100000` = 1.1 ms	`RCResponse`

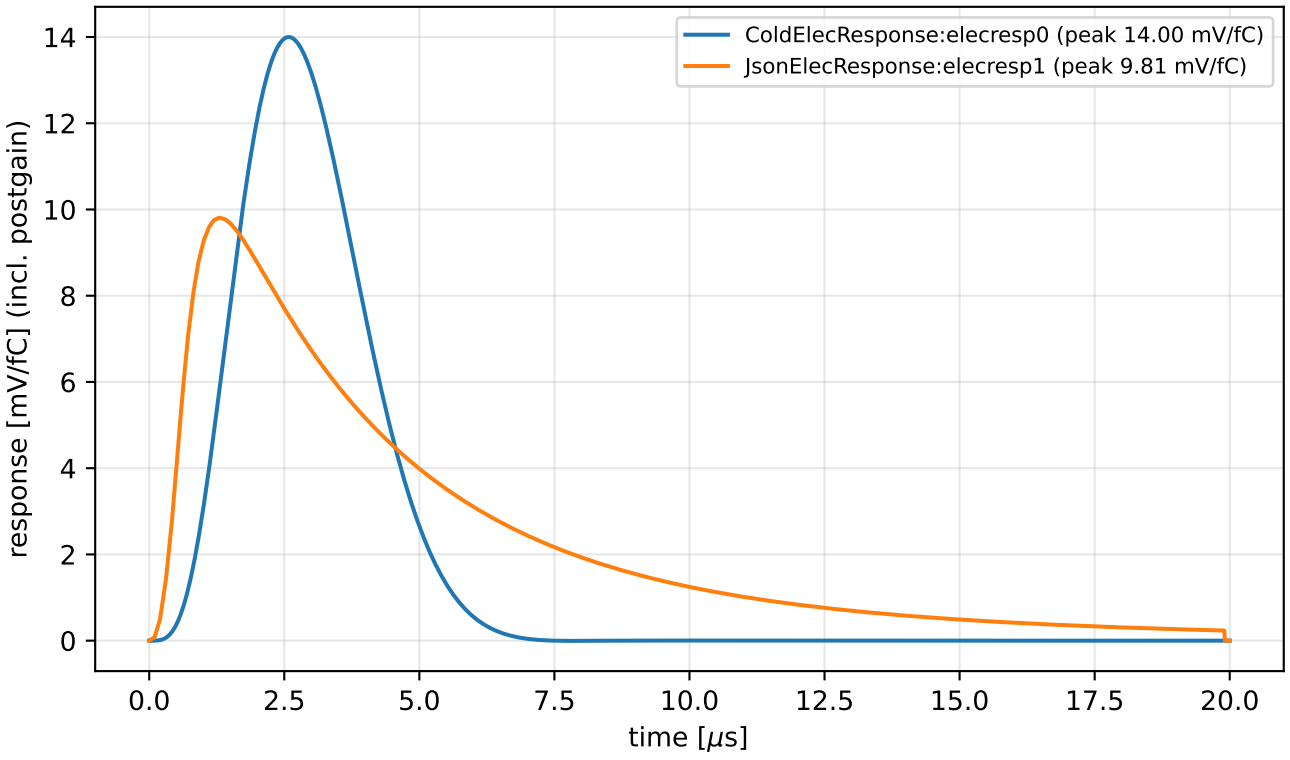


Figure 8: Electronics responses (including postgain). Source: `ColdElecResponse:elecresp0`, `JsonElecResponse:elecresp1`.

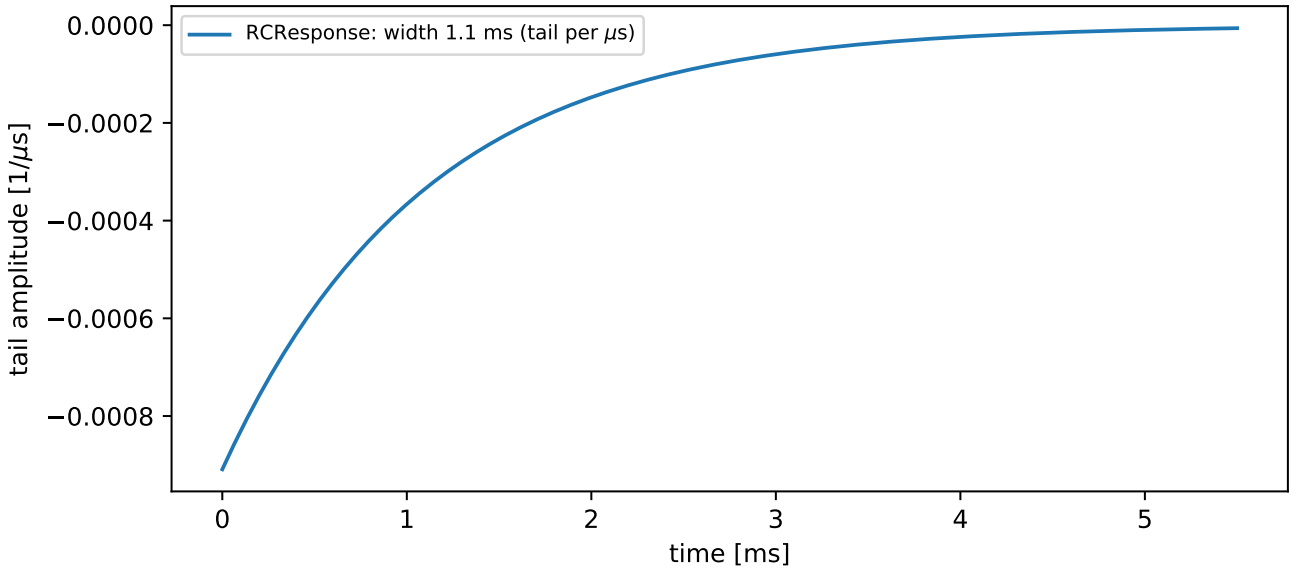


Figure 9: RC responses: a delta function followed by a negative exponential tail. The number of RC responses applied by each `PlaneImpactResponse` is given by its `long_responses`: 6 PIRs apply 0 RC.

5.1 Plane impact responses (simulation)

Table 18: Parameters of 6 `PlaneImpactResponse` component(s): `PlaneImpactResponse:PIRfield{0-1}plane{0-2}`

Parameter	Value	Source
`dft`	`FftwDFT`	all 6
`field_response`	`FieldResponse:field0`	`PlaneImpactResponse:PIRfield0plane{0-2}`
	`FieldResponse:field1`	`PlaneImpactResponse:PIRfield1plane{0-2}`
`long_padding`	1500000 = 1.5 ms	all 6
`long_responses`	`[]`	all 6
`nticks`	8725	all 6
`overall_short_padding`	200000 = 0.2 ms	all 6
`plane`	0	`PlaneImpactResponse:PIRfield{0-1}plane0`
	1	`PlaneImpactResponse:PIRfield{0-1}plane1`
	2	`PlaneImpactResponse:PIRfield{0-1}plane2`
`short_responses`	`["ColdElecResponse:elecresp0"]`	`PlaneImpactResponse:PIRfield0plane{0-2}`
	`["JsonElecResponse:elecresp1"]`	`PlaneImpactResponse:PIRfield1plane{0-2}`
`tick`	500 = 0.5 μs	all 6

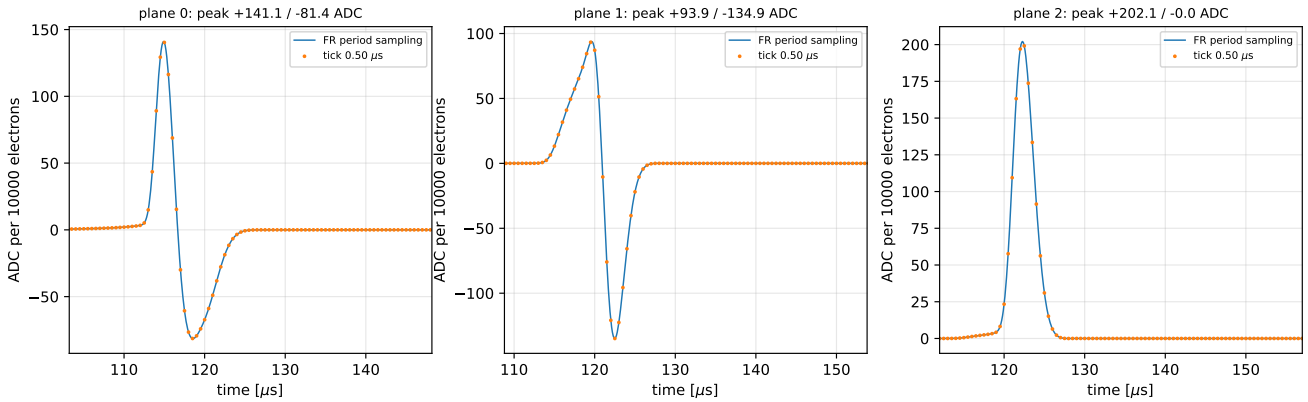


Figure 10: Total response (field response wire-0 average ⊗ `ColdElecResponse:elecresp0`) for 10000 ionization electrons (charge $-10000\,e$) at the response plane, without diffusion. PIRs: `PlaneImpactResponse:PIRfield0plane{0-2}`. Field: `FieldResponse:field0`. Converted to ADC with `Digitizer:digitizer0`. Used by anodes: `AnodePlane:crm{0-159}`.

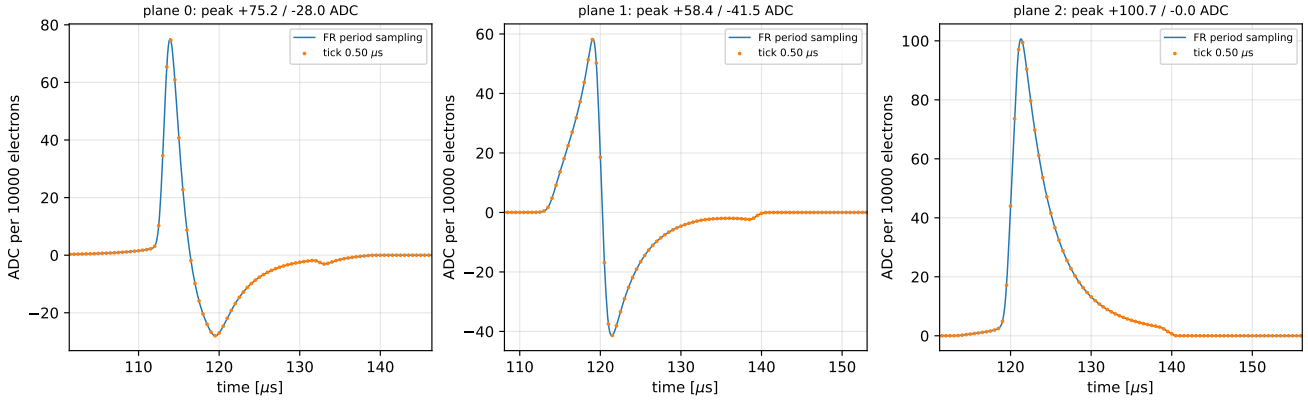


Figure 11: Total response (field response wire-0 average ⊗ `JsonElecResponse:elecresp1`) for 10000 ionization electrons (charge $-10000\,e$) at the response plane, without diffusion. PIRs: `PlaneImpactResponse:PIRfield1plane{0-2}`. Field: `FieldResponse:field1`. Converted to ADC with `Digitizer:digitizer160`. Used by anodes: `AnodePlane:crm{160-319}`.

6 Simulation

Components of the simulation chain. Parameters are grouped over all instances of each component type; where values differ between instances each distinct value is listed with the instances that use it.

6.1 wclsSimDepoSetSource

Table 19: Parameters of 1 wclsSimDepoSetSource component(s): wclsSimDepoSetSource

Parameter	Value	Source
art_tag	IonAndScint	wclsSimDepoSetSource
assn_art_tag	"	wclsSimDepoSetSource
id_is_track	false	wclsSimDepoSetSource
model	"	wclsSimDepoSetSource
scale	-1	wclsSimDepoSetSource

6.2 DepoSetDrifter

Table 20: Parameters of 1 DepoSetDrifter component(s): DepoSetDrifter

Parameter	Value	Source
drifter	Drifter	DepoSetDrifter

6.3 Drifter

Table 21: Parameters of 1 Drifter component(s): Drifter

Parameter	Value	Source
DL	4e-07 = 4 cm^2/s	Drifter
DT	8.8e-07 = 8.8 cm^2/s	Drifter
ar39activity	1.60218e-34 = 1 Bq/kg	Drifter
density	8669456899850258432 = 1.389 g/cm^3	Drifter
drift_speed	0.00160563 = 1.6056 mm/μs	Drifter
fluctuate	true	Drifter
lifetime	10400000 = 10.4 ms	Drifter
rng	Random	Drifter
time_offset	0 = 0 μs	Drifter
xregions[0].anode	-6519 = -651.9 cm	Drifter
xregions[0].cathode	-18.4 = -1.84 cm	Drifter
xregions[0].response	-6338 = -633.8 cm	Drifter
xregions[1].anode	6521.5 = 652.15 cm	Drifter
xregions[1].cathode	20.9 = 2.09 cm	Drifter
xregions[1].response	6340.5 = 634.05 cm	Drifter

6.4 DepoSetFilter

Table 22: Parameters of 320 DepoSetFilter component(s): DepoSetFilter:ds-filter-multi-{0-319}

Parameter	Value	Source
anode	AnodePlane:crm{0-319} *(320 distinct values)*	one per instance

6.5 DepoTransform

Table 23: Parameters of 320 `DepoTransform` component(s): `DepoTransform:ductor{0-319}`

Parameter	Value	Source
`anode`	`AnodePlane:crm{0-319}` *(320 distinct values)*	one per instance
`dft`	`FftwDFT`	all 320
`drift_speed`	`0.00160563` = 1.6056 mm/μs	all 320
`first_frame_number`	`100`	all 320
`fluctuate`	`true`	all 320
`nsigma`	`3`	all 320
`pirs`	`["PlaneImpactResponse:PIRfield0plane0", "PlaneImpactResponse:PIRfield0plane1", "PlaneImpactResponse:PIRfield0plane2"]`	`DepoTransform:ductor{0-159}`
	`["PlaneImpactResponse:PIRfield1plane0", "PlaneImpactResponse:PIRfield1plane1", "PlaneImpactResponse:PIRfield1plane2"]`	`DepoTransform:ductor{160-319}`
`readout_time`	`4362500` = 4.3625 ms	all 320
`rng`	`Random`	all 320
`start_time`	`-112728` = -0.112728 ms	all 320
`tick`	`500` = 0.5 μs	all 320

6.6 `Reframer`

Table 24: Parameters of 320 `Reframer` component(s): `Reframer:reframer{0-319}`

Parameter	Value	Source
`anode`	`AnodePlane:crm{0-319}` *(320 distinct values)*	one per instance
`fill`	`0`	all 320
`nticks`	`8500`	all 320
`tags`	`[]`	all 320
`tbin`	`225`	all 320
`toffset`	`0` = 0 μs	all 320

6.7 `AddNoise`

Table 25: Parameters of 320 `AddNoise` component(s): `AddNoise: addnoiseempericalnoisecrm{0-319}`

Parameter	Value	Source
`dft`	`FftwDFT`	all 320
`model`	`EmpiricalNoiseModel:empericalnoisecrm{0-319}` *(320 distinct values)*	one per instance
`nsamples`	`8500`	all 320
`replacement_percentage`	`0.02`	all 320
`rng`	`Random`	all 320

6.8 `EmpiricalNoiseModel`

Table 26: Parameters of 320 `EmpiricalNoiseModel` component(s): `EmpiricalNoiseModel: empericalnoisecrm{0-319}`

Parameter	Value	Source
`anode`	`AnodePlane:crm{0-319}` *(320 distinct values)*	one per instance
`chanstat`	`"`	all 320
`dft`	`FftwDFT`	all 320
`nsamples`	`8500`	all 320
`period`	`500` = 0.5 μs	all 320
`spectra_file`	`pdvd-bottom-noise-spectra-14mVfC-v1.json.bz2`	`EmpiricalNoiseModel: empericalnoisecrm{0-159}`
	`pdvd-top-noise-spectra-v3.json.bz2`	`EmpiricalNoiseModel: empericalnoisecrm{160-319}`
`wire_length_scale`	`10` = 1 cm	all 320

6.9 Digitizer

Table 27: Parameters of 320 Digitizer component(s): Digitizer:digitizer{0-319}

Parameter	Value	Source
anode	AnodePlane:crm{0-319} *(320 distinct values)*	one per instance
baselines	[1.0034e-06, 1.0034e-06, 5.077e-07] → [1003.4 mV, 1003.4 mV, 507.7 mV]	Digitizer:digitizer{0-159}
	[1e-06, 1e-06, 1e-06] → [1000 mV, 1000 mV, 1000 mV]	Digitizer:digitizer{160-319}
frame_tag	orig{0-319} *(320 distinct values)*	one per instance
fullscale	[2e-07, 1.6e-06] → [200 mV, 1600 mV]	Digitizer:digitizer{0-159}
	[0, 2e-06] → [0 mV, 2000 mV]	Digitizer:digitizer{160-319}
gain	1	all 320
resolution	14	all 320

6.10 wclsDepoFluxWriter

Table 28: Parameters of 320 wclsDepoFluxWriter component(s): wclsDepoFluxWriter:postdrift{0-319}

Parameter	Value	Source
anodes	AnodePlane:crm{0-319} *(320 distinct values)*	one per instance
field_response	FieldResponse:field0	all 320
nsigma	3	all 320
reference_time	0 = 0 μs	all 320
sed_label	IonAndScint	all 320
simchan_label	simpleSC{0-319} *(320 distinct values)*	one per instance
sparse	true	all 320
tick	500 = 0.5 μs	all 320
window_duration	4250000 = 4.25 ms	all 320
window_start	0 = 0 μs	all 320

6.11 wclsFrameSaver

Table 29: Parameters of 640 wclsFrameSaver component(s): wclsFrameSaver:simdigits{0-319}, wclsFrameSaver:spsignals{0-319}

Parameter	Value	Source
anode	MegaAnodePlane:meganodes_{0-319} *(320 distinct values)*	wclsFrameSaver:simdigits{0-319}, wclsFrameSaver:spsignals{0-319}
digitize	true	wclsFrameSaver:simdigits{0-319}
	false	wclsFrameSaver:spsignals{0-319}
frame_tags	["daq0"]	wclsFrameSaver:simdigits0
	["gauss0","wiener0"]	wclsFrameSaver:spsignals0
	["daq1"]	wclsFrameSaver:simdigits1
	["gauss1","wiener1"]	wclsFrameSaver:spsignals1
	["daq2"]	wclsFrameSaver:simdigits2
	["gauss2","wiener2"]	wclsFrameSaver:spsignals2
	... 634 more distinct values	
pedestal_mean	native	wclsFrameSaver:simdigits{0-319}
chanmaskmaps	[]	wclsFrameSaver:spsignals{0-319}
frame_scale	[0.005, 0.005]	wclsFrameSaver:spsignals{0-319}
nticks	8500	wclsFrameSaver:spsignals{0-319}
plane_map.1	0	wclsFrameSaver:spsignals{0-319}

Table 29: Parameters of 640 `wclsFrameSaver` component(s): `wclsFrameSaver:simdigits{0-319}, wclsFrameSaver:spsignals{0-319}`

Parameter	Value	Source
`plane_map.2`	`1`	`wclsFrameSaver:spsignals{0-319}`
`plane_map.4`	`2`	`wclsFrameSaver:spsignals{0-319}`
`sparse`	`true`	`wclsFrameSaver:spsignals{0-319}`

6.12 Noise spectra

`EmpiricalNoiseModel` components provide, per plane, noise amplitude spectra measured or modeled for several wire lengths; the model interpolates in wire length and `AddNoise` adds random noise with this spectrum to the (voltage) waveforms before digitization. Amplitudes are shown as stored (WCT voltage units converted to mV).

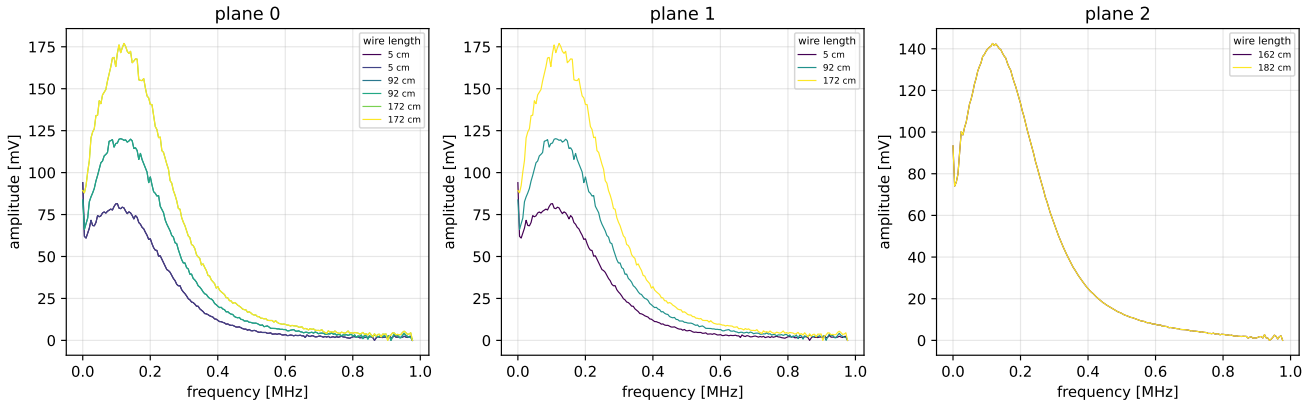


Figure 12: Noise spectra in `pdvd-bottom-noise-spectra-14mVfC-v1.json.bz2`, used by `EmpiricalNoiseModel:empericalnoisecrm{0-159}` (anodes `AnodePlane:crm{0-159}`).

Table 30: Entries of noise spectra file `pdvd-bottom-noise-spectra-14mVfC-v1.json.bz2`.

Plane	Wire length [cm]	Gain [mV/fC]	Shaping [μs]	nsamples	Period [μs]	Const [mV]	nfreqs
0	5.2	14	2.2	6000	0.5	6.765	201
0	5.2	14	2.2	6000	0.5	6.765	201
0	91.8	14	2.2	6000	0.5	8.863	201
0	91.8	14	2.2	6000	0.5	8.863	201
0	172.1	14	2.2	6000	0.5	10.9	201
0	172.1	14	2.2	6000	0.5	10.9	201
1	5.2	14	2.2	6000	0.5	6.765	201
1	91.8	14	2.2	6000	0.5	8.863	201
1	172.1	14	2.2	6000	0.5	10.9	201
2	162.1	14	2.2	6000	0.5	11.72	201
2	182.1	14	2.2	6000	0.5	11.72	201

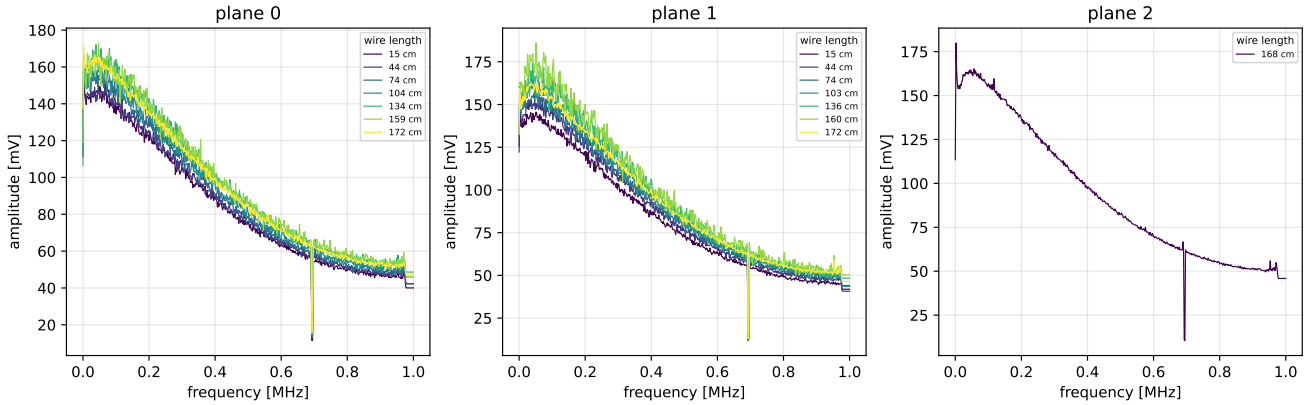


Figure 13: Noise spectra in `pdvd-top-noise-spectra-v3.json.bz2`, used by `EmpiricalNoiseModel: empericalnoisecrm{160-319}` (anodes `AnodePlane:crm{160-319}`).

Table 31: Entries of noise spectra file `pdvd-top-noise-spectra-v3.json.bz2`.

Plane	**Wire length [cm]**	**Gain [mV/fC]**	**Shaping [μs]**	**nsamples**	**Period [μs]**	**Const [mV]**	**nfreqs**
0	15.5	7.2	2.2	6250	0.5	0	512
0	44.1	7.2	2.2	6250	0.5	0	512
0	73.8	7.2	2.2	6250	0.5	0	512
0	103.6	7.2	2.2	6250	0.5	0	512
0	134.2	7.2	2.2	6250	0.5	0	512
0	159.5	7.2	2.2	6250	0.5	0	512
0	172.0	7.2	2.2	6250	0.5	0	512
1	15.3	7.2	2.2	6250	0.5	0	512
1	44.5	7.2	2.2	6250	0.5	0	512
1	74.4	7.2	2.2	6250	0.5	0	512
1	103.3	7.2	2.2	6250	0.5	0	512
1	136.2	7.2	2.2	6250	0.5	0	512
1	159.6	7.2	2.2	6250	0.5	0	512
1	172.0	7.2	2.2	6250	0.5	0	512
2	167.9	7.2	2.2	6250	0.5	0	512

7 Signal processing

`OmnibusSigProc` deconvolves the field and electronics responses from the waveforms (2D in time and wire), applying time-domain (Wiener, Gaussian), low-frequency (ROI) and wire-domain filters, and finds regions of interest.

7.1 `OmnibusSigProc`

Table 32: Parameters of 320 `OmnibusSigProc` component(s): `OmnibusSigProc:crm#sigproc##={0-319}`

Parameter	Value	Source
`ADC_mV`	`1.17021e+10` = 11.702 ADC/mV	`OmnibusSigProc:crm#sigproc##={0-159}`
	`8191500000` = 8.1915 ADC/mV	`OmnibusSigProc:crm#sigproc##={160-319}`
`anode`	`AnodePlane:crm{0-319}` *(320 distinct values)*	one per instance
`break_roi_loop1_tag`	`break_roi_1st{0-319}` *(320 distinct values)*	one per instance
`break_roi_loop2_tag`	`break_roi_2nd{0-319}` *(320 distinct values)*	one per instance
`cleanup_roi_tag`	`cleanup_roi{0-319}` *(320 distinct values)*	one per instance
`ctoffset`	`4000` = 4 μs	all 320
`decon_charge_tag`	`decon_charge{0-319}` *(320 distinct values)*	one per instance
`dft`	`FftwDFT`	all 320
`elecresponse`	`ColdElecResponse:elecresp0`	`OmnibusSigProc:crm#sigproc##={0-159}`
	`JsonElecResponse:elecresp1`	`OmnibusSigProc:crm#sigproc##={160-319}`
`extend_roi_tag`	`extend_roi{0-319}` *(320 distinct values)*	one per instance
`fft_flag`	`0`	all 320
`field_response`	`FieldResponse:field0`	all 320
`ftoffset`	`0` = 0 μs	all 320
`gauss_tag`	`gauss{0-319}` *(320 distinct values)*	one per instance
`loose_lf_tag`	`loose_lf{0-319}` *(320 distinct values)*	one per instance
`lroi_jump_one_bin`	`1`	all 320
`lroi_rebin`	`6`	all 320
`lroi_th_factor`	`3.5`	all 320
`lroi_th_factor1`	`0.7`	all 320
`mp2_roi_tag`	`mp2_roi{0-319}` *(320 distinct values)*	one per instance
`mp3_roi_tag`	`mp3_roi{0-319}` *(320 distinct values)*	one per instance
`per_chan_resp`	`"`	all 320
`postgain`	`1`	all 320
`r_fake_signal_high_th`	`750`	all 320
`r_fake_signal_high_th_ind_factor`	`1`	all 320
`r_fake_signal_low_th`	`375`	all 320
`r_fake_signal_low_th_ind_factor`	`1`	all 320
`r_low_peak_sep_threshold_pre`	`1200`	all 320
`r_sep_peak`	`6`	all 320
`r_th_factor`	`3`	all 320
`r_th_peak`	`3`	all 320
`shrink_roi_tag`	`shrink_roi{0-319}` *(320 distinct values)*	one per instance
`sparse`	`true`	all 320
`tight_lf_tag`	`tight_lf{0-319}` *(320 distinct values)*	one per instance
`troi_col_th_factor`	`5`	all 320
`troi_ind_th_factor`	`3`	all 320
`use_multi_plane_protection`	`false`	all 320
`use_roi_debug_mode`	`false`	all 320
`wiener_tag`	`wiener{0-319}` *(320 distinct values)*	one per instance

7.2 Filters

Table 33: Filter components. HfFilter: $\exp(-\frac{1}{2}(f/\sigma)^p)$ (zero at $f = 0$ if flag); LfFilter: $1 - \exp(-(f/\tau)^2)$.

Filter	Parameter	Value	Type
`ROI_tight_lf`	`max_freq`	`0.001` = 1 MHz	`LfFilter`

Table 33: Filter components. HfFilter: $\exp(-\frac{1}{2}(f/\sigma)^p)$ (zero at $f = 0$ if flag); LfFilter: $1 - \exp(-(f/\tau)^2)$.

Filter	Parameter	Value	Type
ROI_tight_lf	tau	1.4e-05 = 0.014 MHz	LfFilter
ROI_tighter_lf	max_freq	0.001 = 1 MHz	LfFilter
ROI_tighter_lf	tau	6e-05 = 0.06 MHz	LfFilter
ROI_loose_lf	max_freq	0.001 = 1 MHz	LfFilter
ROI_loose_lf	tau	2e-06 = 0.002 MHz	LfFilter
Gaus_tight	flag	true	HfFilter
Gaus_tight	max_freq	0.001 = 1 MHz	HfFilter
Gaus_tight	power	2	HfFilter
Gaus_tight	sigma	0 = 0 MHz	HfFilter
Gaus_wide	flag	true	HfFilter
Gaus_wide	max_freq	0.001 = 1 MHz	HfFilter
Gaus_wide	power	2	HfFilter
Gaus_wide	sigma	0.00012 = 0.12 MHz	HfFilter
Wiener_tight_U	flag	true	HfFilter
Wiener_tight_U	max_freq	0.001 = 1 MHz	HfFilter
Wiener_tight_U	power	3.76194	HfFilter
Wiener_tight_U	sigma	0.000148788 = 0.1488 MHz	HfFilter
Wiener_tight_V	flag	true	HfFilter
Wiener_tight_V	max_freq	0.001 = 1 MHz	HfFilter
Wiener_tight_V	power	4.36125	HfFilter
Wiener_tight_V	sigma	0.000159657 = 0.1597 MHz	HfFilter
Wiener_tight_W	flag	true	HfFilter
Wiener_tight_W	max_freq	0.001 = 1 MHz	HfFilter
Wiener_tight_W	power	3.35324	HfFilter
Wiener_tight_W	sigma	0.00013623 = 0.1362 MHz	HfFilter
Wiener_wide_U	flag	true	HfFilter
Wiener_wide_U	max_freq	0.001 = 1 MHz	HfFilter
Wiener_wide_U	power	5.05429	HfFilter
Wiener_wide_U	sigma	0.000186765 = 0.1868 MHz	HfFilter
Wiener_wide_V	flag	true	HfFilter
Wiener_wide_V	max_freq	0.001 = 1 MHz	HfFilter
Wiener_wide_V	power	5.77422	HfFilter
Wiener_wide_V	sigma	0.0001936 = 0.1936 MHz	HfFilter
Wiener_wide_W	flag	true	HfFilter
Wiener_wide_W	max_freq	0.001 = 1 MHz	HfFilter
Wiener_wide_W	power	4.37928	HfFilter
Wiener_wide_W	sigma	0.000175722 = 0.1757 MHz	HfFilter
Wire_ind	flag	false	HfFilter
Wire_ind	max_freq	1	HfFilter
Wire_ind	power	2	HfFilter
Wire_ind	sigma	0.423142	HfFilter
Wire_col	flag	false	HfFilter
Wire_col	max_freq	1	HfFilter
Wire_col	power	2	HfFilter
Wire_col	sigma	1.69257	HfFilter

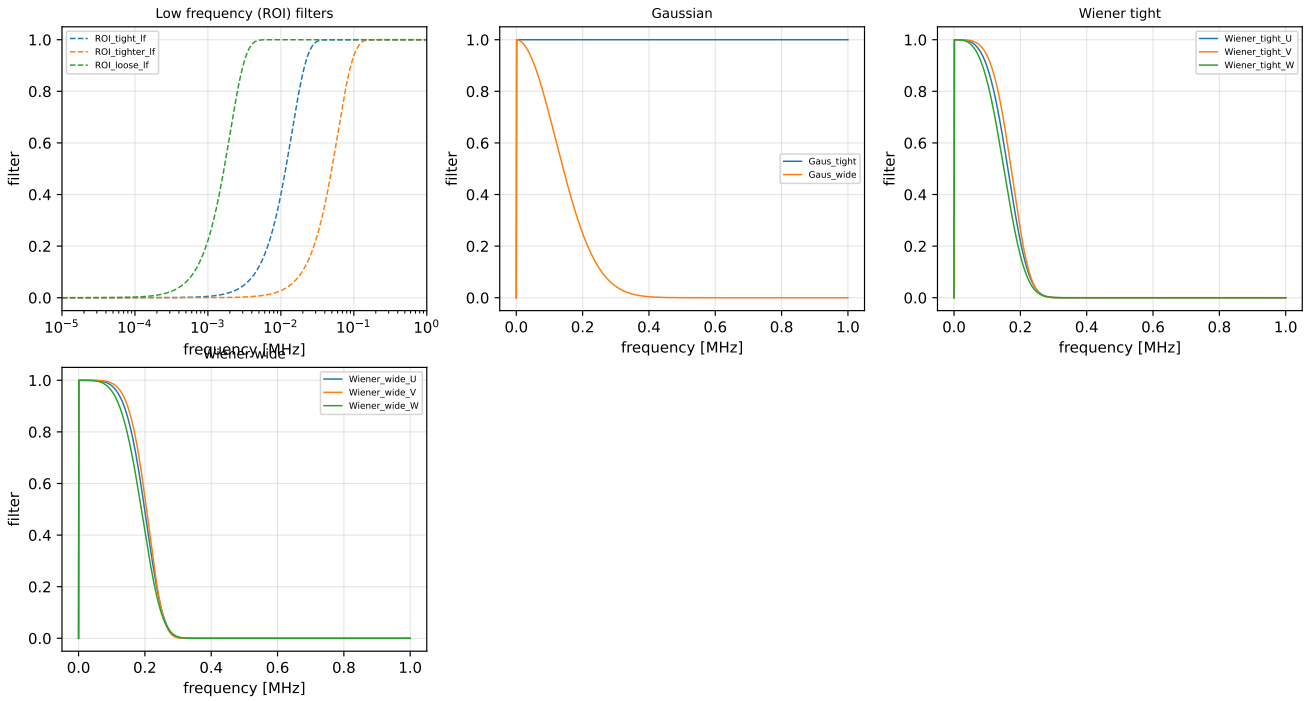


Figure 14: Time-domain filters vs frequency. Source: HfFilter/LfFilter components named in legends.

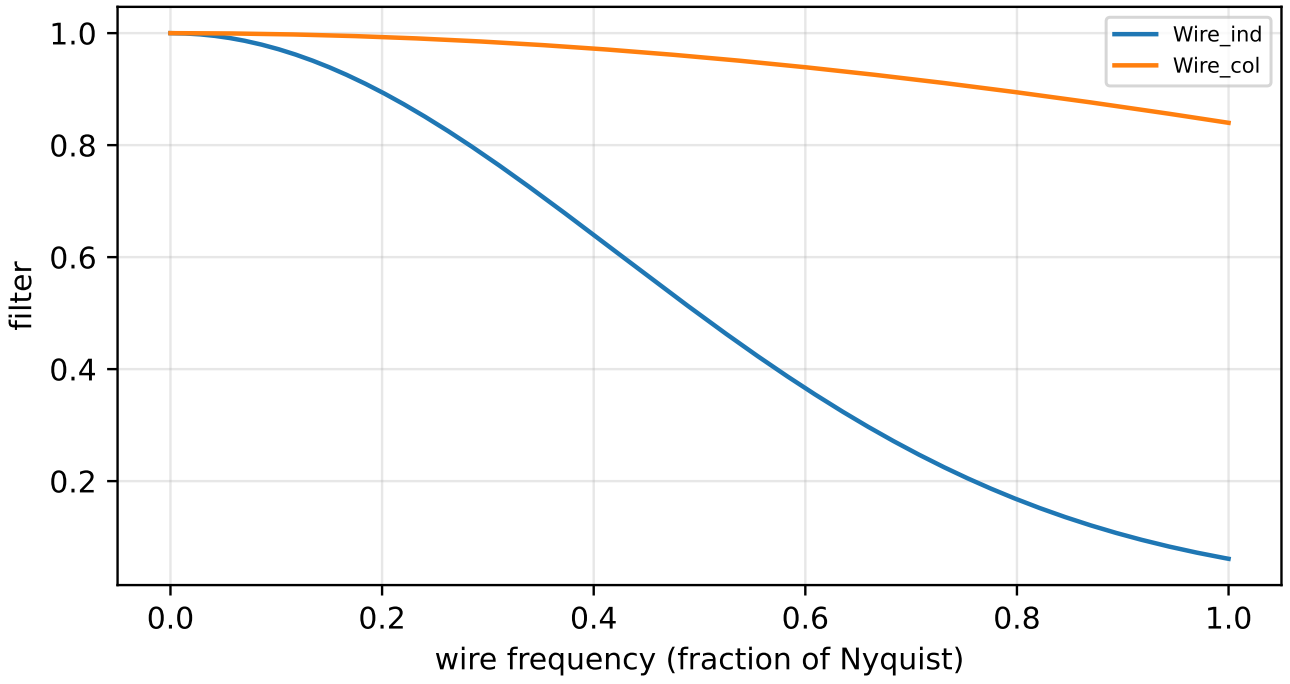


Figure 15: Wire-domain filters. Source: HfFilter components named in legend.

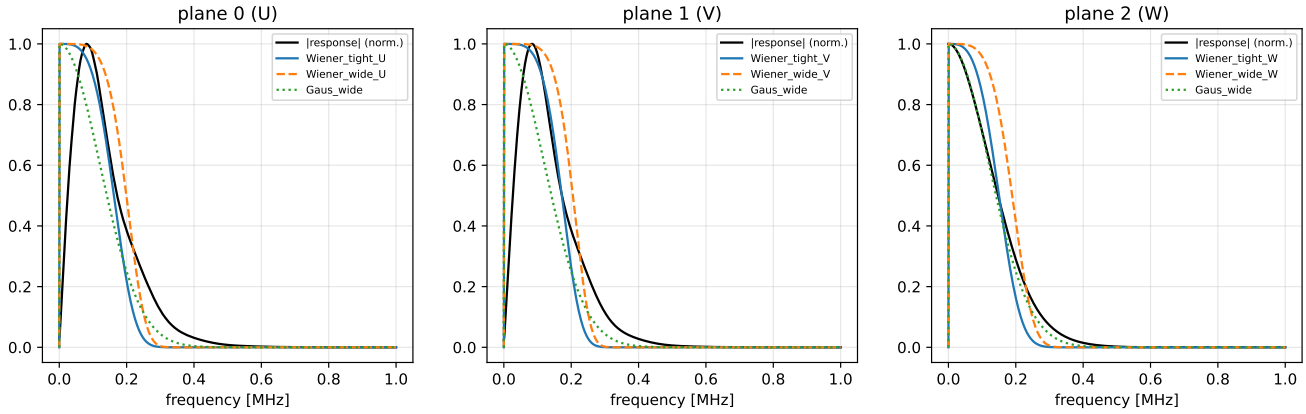


Figure 16: Magnitude of the response spectrum used in deconvolution (field response `FieldResponse:field0` wire-0 average ⊗ `ColdElecResponse:elecresp0`, sampled at 0.50 μs) with the filters applied by `OmnibusSigProc:crm#sigproc# #={0-159}`.

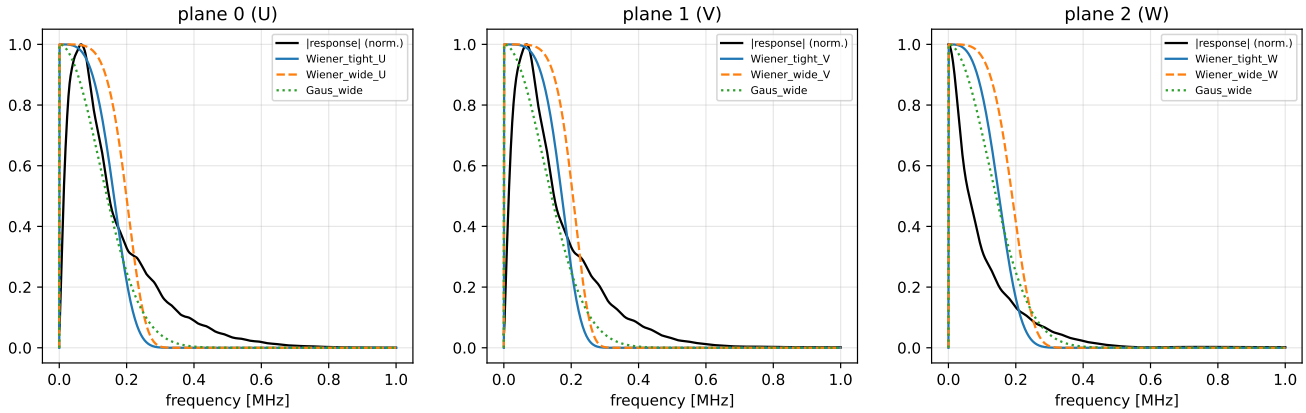


Figure 17: Magnitude of the response spectrum used in deconvolution (field response `FieldResponse:field0` wire-0 average ⊗ `JsonElecResponse:elecresp1`, sampled at 0.50 μs) with the filters applied by `OmnibusSigProc:crm#sigproc# #={160-319}`.

8 Other components

Components not covered above which may affect results.

8.1 ResponseSys

Table 34: Parameters of 1 ResponseSys component(s): ResponseSys

Parameter	Value	Source
magnitude	1	ResponseSys
nticks	8725	ResponseSys
start	$0 = 0$ μs	ResponseSys
tick	$500 = 0.5$ μs	ResponseSys
time_smear	$1000 = 1$ μs	ResponseSys

8.2 TbbDataFlowGraph

Table 35: Parameters of 1 TbbDataFlowGraph component(s): TbbDataFlowGraph

Parameter	Value	Source
max_threads	0	TbbDataFlowGraph

9 Appendix: all components

9.1 AddNoise

Table 36: Parameters of 320 AddNoise component(s): AddNoise: addnoiseempericalnoisecrm{0-319}

Parameter	Value	Source
dft	FftwDFT	all 320
model	EmpiricalNoiseModel:empericalnoisecrm{0-319} *(320 distinct values)*	one per instance
nsamples	8500	all 320
replacement_percentage	0.02	all 320
rng	Random	all 320

9.2 AnodePlane

Table 37: Parameters of 320 AnodePlane component(s): AnodePlane:crm{0-319}

Parameter	Value	Source
faces[0].anode	-6519 = -651.9 cm	AnodePlane:crm{0-159}
	6521.5 = 652.15 cm	AnodePlane:crm{160-319}
faces[0].cathode	-18.4 = -1.84 cm	AnodePlane:crm{0-159}
	20.9 = 2.09 cm	AnodePlane:crm{160-319}
faces[0].response	-6338 = -633.8 cm	AnodePlane:crm{0-159}
	6340.5 = 634.05 cm	AnodePlane:crm{160-319}
faces[1].anode	-6519 = -651.9 cm	AnodePlane:crm{0-159}
	6521.5 = 652.15 cm	AnodePlane:crm{160-319}
faces[1].cathode	-18.4 = -1.84 cm	AnodePlane:crm{0-159}
	20.9 = 2.09 cm	AnodePlane:crm{160-319}
faces[1].response	-6338 = -633.8 cm	AnodePlane:crm{0-159}
	6340.5 = 634.05 cm	AnodePlane:crm{160-319}
ident	0	AnodePlane:crm0
	1	AnodePlane:crm1
	2	AnodePlane:crm2
	3	AnodePlane:crm3
	4	AnodePlane:crm4
	5	AnodePlane:crm5
	... 314 more distinct values	
nimpacts	10	all 320
wire_schema	WireSchemaFile	all 320

9.3 ColdElecResponse

Table 38: Parameters of 1 ColdElecResponse component(s): ColdElecResponse:elecresp0

Parameter	Value	Source
filename	"	ColdElecResponse:elecresp0
gain	2.24305e-12 = 14 mV/fC	ColdElecResponse:elecresp0
nticks	8725	ColdElecResponse:elecresp0
postgain	1	ColdElecResponse:elecresp0
shaping	2200 = 2.2 μs	ColdElecResponse:elecresp0
tick	500 = 0.5 μs	ColdElecResponse:elecresp0

9.4 DepoSetDrifter

Table 39: Parameters of 1 DepoSetDrifter component(s): DepoSetDrifter

Parameter	Value	Source
drifter	Drifter	DepoSetDrifter

9.5 DepoSetFanout

Table 40: Parameters of 37 DepoSetFanout component(s): DepoSetFanout:multi_sim_fanout_{0-3}, DepoSetFanout:multi_sim_fanout_{0-3}_{0-7}, DepoSetFanout:multi_sim_fanout

Parameter	Value	Source
multiplicity	4	DepoSetFanout:multi_sim_fanout
	8	DepoSetFanout:multi_sim_fanout_{0-3}
	10	DepoSetFanout:multi_sim_fanout_{0-3}_{0-7}

9.6 DepoSetFilter

Table 41: Parameters of 320 DepoSetFilter component(s): DepoSetFilter:ds-filter-multi-{0-319}

Parameter	Value	Source
anode	AnodePlane:crm{0-319} *(320 distinct values)*	one per instance

9.7 DepoTransform

Table 42: Parameters of 320 DepoTransform component(s): DepoTransform:ductor{0-319}

Parameter	Value	Source
anode	AnodePlane:crm{0-319} *(320 distinct values)*	one per instance
dft	FftwDFT	all 320
drift_speed	0.00160563 = 1.6056 mm/μs	all 320
first_frame_number	100	all 320
fluctuate	true	all 320
nsigma	3	all 320
pirs	["PlaneImpactResponse:PIRfield0plane0", "PlaneImpactResponse:PIRfield0plane1", "PlaneImpactResponse:PIRfield0plane2"]	DepoTransform:ductor{0-159}
	["PlaneImpactResponse:PIRfield1plane0", "PlaneImpactResponse:PIRfield1plane1", "PlaneImpactResponse:PIRfield1plane2"]	DepoTransform:ductor{160-319}
readout_time	4362500 = 4.3625 ms	all 320
rng	Random	all 320
start_time	-112728 = -0.112728 ms	all 320
tick	500 = 0.5 μs	all 320

9.8 DeposOrBust

DeposOrBust:dorb-multi-{0-319}: *no configuration parameters.*

9.9 Digitizer

Table 43: Parameters of 320 Digitizer component(s): Digitizer:digitizer{0-319}

Parameter	Value	Source
anode	AnodePlane:crm{0-319} *(320 distinct values)*	one per instance
baselines	[1.0034e-06, 1.0034e-06, 5.077e-07] → [1003.4 mV, 1003.4 mV, 507.7 mV]	Digitizer:digitizer{0-159}
	[1e-06, 1e-06, 1e-06] → [1000 mV, 1000 mV, 1000 mV]	Digitizer:digitizer{160-319}
frame_tag	orig{0-319} *(320 distinct values)*	one per instance
fullscale	[2e-07, 1.6e-06] → [200 mV, 1600 mV]	Digitizer:digitizer{0-159}
	[0, 2e-06] → [0 mV, 2000 mV]	Digitizer:digitizer{160-319}

Table 43: Parameters of 320 `Digitizer` component(s): `Digitizer:digitizer{0-319}`

Parameter	Value	Source
gain	1	all 320
resolution	14	all 320

9.10 Drifter

Table 44: Parameters of 1 `Drifter` component(s): `Drifter`

Parameter	Value	Source
DL	4e-07 = 4 cm^2/s	Drifter
DT	8.8e-07 = 8.8 cm^2/s	Drifter
ar39activity	1.60218e-34 = 1 Bq/kg	Drifter
density	8669456899850258432 = 1.389 g/cm^3	Drifter
drift_speed	0.00160563 = 1.6056 mm/μs	Drifter
fluctuate	true	Drifter
lifetime	10400000 = 10.4 ms	Drifter
rng	Random	Drifter
time_offset	0 = 0 μs	Drifter
xregions[0].anode	-6519 = -651.9 cm	Drifter
xregions[0].cathode	-18.4 = -1.84 cm	Drifter
xregions[0].response	-6338 = -633.8 cm	Drifter
xregions[1].anode	6521.5 = 652.15 cm	Drifter
xregions[1].cathode	20.9 = 2.09 cm	Drifter
xregions[1].response	6340.5 = 634.05 cm	Drifter

9.11 DumpFrames

`DumpFrames:multi-dump-{0-319}`: *no configuration parameters.*

9.12 EmpiricalNoiseModel

Table 45: Parameters of 320 `EmpiricalNoiseModel` component(s): `EmpiricalNoiseModel:empericalnoisecrm{0-319}`

Parameter	Value	Source
anode	`AnodePlane:crm{0-319}` *(320 distinct values)*	one per instance
chanstat	"	all 320
dft	FftwDFT	all 320
nsamples	8500	all 320
period	500 = 0.5 μs	all 320
spectra_file	pdvd-bottom-noise-spectra-14mVfC-v1.json.bz2	`EmpiricalNoiseModel:empericalnoisecrm{0-159}`
	pdvd-top-noise-spectra-v3.json.bz2	`EmpiricalNoiseModel:empericalnoisecrm{160-319}`
wire_length_scale	10 = 1 cm	all 320

9.13 FftwDFT

`FftwDFT`: *no configuration parameters.*

9.14 FieldResponse

Table 46: Parameters of 2 `FieldResponse` component(s): `FieldResponse:field{0-1}`

Parameter	Value	Source
filename	protodunevd_FR_imbalance3p_260501.json.bz2	all 2

9.15 FrameFanin

Table 47: Parameters of 320 FrameFanin component(s): FrameFanin:multi-raw-fanin-{0-319}

Parameter	Value	Source
multiplicity	1	all 320
tag_rules[0].frame..*	daq{0-319} *(320 distinct values)*	one per instance
tag_rules[0].trace..*	daq{0-319} *(320 distinct values)*	one per instance
tags	daq{0-319} *(320 distinct values)*	one per instance

9.16 FrameSync

FrameSync:frame-sync-multi-{0-319}: *no configuration parameters.*

9.17 HfFilter

Table 48: Parameters of 10 HfFilter component(s): HfFilter:Gaus_tight, HfFilter:Gaus_wide, HfFilter:Wiener_tight_U, HfFilter:Wiener_tight_V, ... (6 more)

Parameter	Value	Source
flag	true	HfFilter:Gaus_tight, HfFilter:Gaus_wide, HfFilter:Wiener_tight_U, HfFilter:Wiener_tight_V, ... (4 more)
	false	HfFilter:Wire_ind, HfFilter:Wire_col
max_freq	0.001 = 1 MHz	HfFilter:Gaus_tight, HfFilter:Gaus_wide, HfFilter:Wiener_tight_U, HfFilter:Wiener_tight_V, ... (4 more)
	1 = 1000 MHz	HfFilter:Wire_ind, HfFilter:Wire_col
power	2	HfFilter:Gaus_tight, HfFilter:Gaus_wide, HfFilter:Wire_ind, HfFilter:Wire_col
	3.76194	HfFilter:Wiener_tight_U
	4.36125	HfFilter:Wiener_tight_V
	3.35324	HfFilter:Wiener_tight_W
	5.05429	HfFilter:Wiener_wide_U
	5.77422	HfFilter:Wiener_wide_V
	... 1 more distinct values	
sigma	0 = 0 MHz	HfFilter:Gaus_tight
	0.00012 = 0.12 MHz	HfFilter:Gaus_wide
	0.000148788 = 0.1488 MHz	HfFilter:Wiener_tight_U
	0.000159657 = 0.1597 MHz	HfFilter:Wiener_tight_V
	0.00013623 = 0.1362 MHz	HfFilter:Wiener_tight_W
	0.000186765 = 0.1868 MHz	HfFilter:Wiener_wide_U
	... 4 more distinct values	

9.18 JsonElecResponse

Table 49: Parameters of 1 JsonElecResponse component(s): JsonElecResponse:elecresp1

Parameter	Value	Source
filename	dunevd-coldbox-elecresp-top-psnorm_400.json.bz2	JsonElecResponse:elecresp1
gain	2.24305e-12 = 14 mV/fC	JsonElecResponse:elecresp1
nticks	8725	JsonElecResponse:elecresp1
postgain	1.36	JsonElecResponse:elecresp1
shaping	2000 = 2 μs	JsonElecResponse:elecresp1
tick	500 = 0.5 μs	JsonElecResponse:elecresp1

9.19 LfFilter

Table 50: Parameters of 3 LfFilter component(s): LfFilter:ROI_tight_lf, LfFilter:ROI_tighter_lf, LfFilter:ROI_loose_lf

Parameter	Value	Source
max_freq	0.001 = 1 MHz	all 3
tau	1.4e-05 = 0.014 MHz	LfFilter:ROI_tight_lf
	6e-05 = 0.06 MHz	LfFilter:ROI_tighter_lf
	2e-06 = 0.002 MHz	LfFilter:ROI_loose_lf

9.20 MegaAnodePlane

Table 51: Parameters of 320 MegaAnodePlane component(s): MegaAnodePlane:meganodes_{0-319}

Parameter	Value	Source
anodes_tn	AnodePlane:crm{0-319} *(320 distinct values)*	one per instance

9.21 OmnibusSigProc

Table 52: Parameters of 320 OmnibusSigProc component(s): OmnibusSigProc:crm#sigproc#=#{0-319}

Parameter	Value	Source
ADC_mV	1.17021e+10 = 11.702 ADC/mV	OmnibusSigProc:crm#sigproc#=#{0-159}
	8191500000 = 8.1915 ADC/mV	OmnibusSigProc:crm#sigproc#=#{160-319}
anode	AnodePlane:crm{0-319} *(320 distinct values)*	one per instance
break_roi_loop1_tag	break_roi_1st{0-319} *(320 distinct values)*	one per instance
break_roi_loop2_tag	break_roi_2nd{0-319} *(320 distinct values)*	one per instance
cleanup_roi_tag	cleanup_roi{0-319} *(320 distinct values)*	one per instance
ctoffset	4000 = 4 μs	all 320
decon_charge_tag	decon_charge{0-319} *(320 distinct values)*	one per instance
dft	FftwDFT	all 320
elecresponse	ColdElecResponse:elecresp0	OmnibusSigProc:crm#sigproc#=#{0-159}
	JsonElecResponse:elecresp1	OmnibusSigProc:crm#sigproc#=#{160-319}
extend_roi_tag	extend_roi{0-319} *(320 distinct values)*	one per instance
fft_flag	0	all 320
field_response	FieldResponse:field0	all 320
ftoffset	0 = 0 μs	all 320
gauss_tag	gauss{0-319} *(320 distinct values)*	one per instance
loose_lf_tag	loose_lf{0-319} *(320 distinct values)*	one per instance
lroi_jump_one_bin	1	all 320
lroi_rebin	6	all 320
lroi_th_factor	3.5	all 320
lroi_th_factor1	0.7	all 320
mp2_roi_tag	mp2_roi{0-319} *(320 distinct values)*	one per instance
mp3_roi_tag	mp3_roi{0-319} *(320 distinct values)*	one per instance
per_chan_resp	"	all 320
postgain	1	all 320
r_fake_signal_high_th	750	all 320
r_fake_signal_high_th_ind_factor	1	all 320
r_fake_signal_low_th	375	all 320
r_fake_signal_low_th_ind_factor	1	all 320
r_low_peak_sep_threshold_pre	1200	all 320
r_sep_peak	6	all 320
r_th_factor	3	all 320
r_th_peak	3	all 320

Table 52: Parameters of 320 `OmnibusSigProc` component(s): `OmnibusSigProc:crm#sigproc#{0-319}`

Parameter	Value	Source
`shrink_roi_tag`	`shrink_roi{0-319}` *(320 distinct values)*	one per instance
`sparse`	`true`	all 320
`tight_lf_tag`	`tight_lf{0-319}` *(320 distinct values)*	one per instance
`troi_col_th_factor`	`5`	all 320
`troi_ind_th_factor`	`3`	all 320
`use_multi_plane_protection`	`false`	all 320
`use_roi_debug_mode`	`false`	all 320
`wiener_tag`	`wiener{0-319}` *(320 distinct values)*	one per instance

9.22 PlaneImpactResponse

Table 53: Parameters of 6 `PlaneImpactResponse` component(s): `PlaneImpactResponse:PIRfield{0-1}plane{0-2}`

Parameter	Value	Source
`dft`	`FftwDFT`	all 6
`field_response`	`FieldResponse:field0`	`PlaneImpactResponse:PIRfield0plane{0-2}`
	`FieldResponse:field1`	`PlaneImpactResponse:PIRfield1plane{0-2}`
`long_padding`	`1500000` = 1.5 ms	all 6
`long_responses`	`[]`	all 6
`nticks`	`8725`	all 6
`overall_short_padding`	`200000` = 0.2 ms	all 6
`plane`	`0`	`PlaneImpactResponse:PIRfield{0-1}plane0`
	`1`	`PlaneImpactResponse:PIRfield{0-1}plane1`
	`2`	`PlaneImpactResponse:PIRfield{0-1}plane2`
`short_responses`	`["ColdElecResponse:elecresp0"]`	`PlaneImpactResponse:PIRfield0plane{0-2}`
	`["JsonElecResponse:elecresp1"]`	`PlaneImpactResponse:PIRfield1plane{0-2}`
`tick`	`500` = 0.5 μs	all 6

9.23 RCResponse

Table 54: Parameters of 1 `RCResponse` component(s): `RCResponse`

Parameter	Value	Source
`nticks`	`8725`	`RCResponse`
`tick`	`500` = 0.5 μs	`RCResponse`
`width`	`1100000` = 1.1 ms	`RCResponse`

9.24 Random

Table 55: Parameters of 1 `Random` component(s): `Random`

Parameter	Value	Source
`generator`	`default`	`Random`
`seeds`	`[0, 1, 2, 3, 4]`	`Random`

9.25 Reframer

Table 56: Parameters of 320 `Reframer` component(s): `Reframer:reframer{0-319}`

Parameter	Value	Source
anode	`AnodePlane:crm{0-319}` *(320 distinct values)*	one per instance
fill	0	all 320
nticks	8500	all 320
tags	[]	all 320
tbin	225	all 320
toffset	$0 = 0$ μs	all 320

9.26 ResponseSys

Table 57: Parameters of 1 `ResponseSys` component(s): `ResponseSys`

Parameter	Value	Source
magnitude	1	ResponseSys
nticks	8725	ResponseSys
start	$0 = 0$ μs	ResponseSys
tick	$500 = 0.5$ μs	ResponseSys
time_smear	$1000 = 1$ μs	ResponseSys

9.27 Retagger

Table 58: Parameters of 320 `Retagger` component(s): `Retagger:multi-raw-retag-{0-319}`

Parameter	Value	Source
tag_rules[0].frame..*	daq{0-319} *(320 distinct values)*	one per instance
tag_rules[0].merge..*	daq{0-319} *(320 distinct values)*	one per instance

9.28 TbbDataFlowGraph

Table 59: Parameters of 1 `TbbDataFlowGraph` component(s): `TbbDataFlowGraph`

Parameter	Value	Source
max_threads	0	TbbDataFlowGraph

9.29 TbbFlow

Table 60: Parameters of 1 `TbbFlow` component(s): `TbbFlow`

Parameter	Value	Source
edges	[{"head":{"node":"DepoSetDrifter","port":0},"tail": {"node":"wclsSimDepoSetSource","port":0}},{"head": {"node":"DepoSetFanout:multi_sim_fanout","port":0}, "tail":{... (4838 elements)	TbbFlow

9.30 WireSchemaFile

Table 61: Parameters of 1 `WireSchemaFile` component(s): `WireSchemaFile`

Parameter	Value	Source
filename	dunevd10kt_3view_30deg_v6_refactored.json.bz2	WireSchemaFile

9.31 wclsDepoFluxWriter

Table 62: Parameters of 320 wclsDepoFluxWriter component(s): wclsDepoFluxWriter:postdrift{0-319}

Parameter	Value	Source
anodes	AnodePlane:crm{0-319} *(320 distinct values)*	one per instance
field_response	FieldResponse:field0	all 320
nsigma	3	all 320
reference_time	$0 = 0$ μs	all 320
sed_label	IonAndScint	all 320
simchan_label	simpleSC{0-319} *(320 distinct values)*	one per instance
sparse	true	all 320
tick	$500 = 0.5$ μs	all 320
window_duration	$4250000 = 4.25$ ms	all 320
window_start	$0 = 0$ μs	all 320

9.32 wclsFrameSaver

Table 63: Parameters of 640 wclsFrameSaver component(s): wclsFrameSaver:simdigits{0-319}, wclsFrameSaver:spsignals{0-319}

Parameter	Value	Source
anode	MegaAnodePlane:meganodes_{0-319} *(320 distinct values)*	wclsFrameSaver:simdigits{0-319}, wclsFrameSaver:spsignals{0-319}
digitize	true	wclsFrameSaver:simdigits{0-319}
	false	wclsFrameSaver:spsignals{0-319}
frame_tags	["daq0"]	wclsFrameSaver:simdigits0
	["gauss0","wiener0"]	wclsFrameSaver:spsignals0
	["daq1"]	wclsFrameSaver:simdigits1
	["gauss1","wiener1"]	wclsFrameSaver:spsignals1
	["daq2"]	wclsFrameSaver:simdigits2
	["gauss2","wiener2"]	wclsFrameSaver:spsignals2
	... 634 more distinct values	
pedestal_mean	native	wclsFrameSaver:simdigits{0-319}
chanmaskmaps	[]	wclsFrameSaver:spsignals{0-319}
frame_scale	[0.005, 0.005]	wclsFrameSaver:spsignals{0-319}
nticks	8500	wclsFrameSaver:spsignals{0-319}
plane_map.1	0	wclsFrameSaver:spsignals{0-319}
plane_map.2	1	wclsFrameSaver:spsignals{0-319}
plane_map.4	2	wclsFrameSaver:spsignals{0-319}
sparse	true	wclsFrameSaver:spsignals{0-319}

9.33 wclsSimDepoSetSource

Table 64: Parameters of 1 wclsSimDepoSetSource component(s): wclsSimDepoSetSource

Parameter	Value	Source
art_tag	IonAndScint	wclsSimDepoSetSource
assn_art_tag	"	wclsSimDepoSetSource
id_is_track	false	wclsSimDepoSetSource
model	"	wclsSimDepoSetSource
scale	-1	wclsSimDepoSetSource

10 Warnings

- FHiCL include "seedservice.fcl" not found (from seedservice_dune.fcl:17)
- FHiCL include "photpropservices_dune.fcl" not found (from services_common_dune.fcl:15)
- FHiCL include "opticaldetectorservices_dune.fcl" not found (from services_common_dune.fcl:17)
- FHiCL include "channelstatus_pdsp.fcl" not found (from services_common_dune.fcl:20)
- FHiCL include "dataprep_dune.fcl" not found (from services_common_dune.fcl:26)
- FHiCL include "protodune_dataprep_services.fcl" not found (from services_common_dune.fcl:27)
- FHiCL include "xyzcalib_dune.fcl" not found (from services_common_dune.fcl:30)
- FHiCL include "lifetimecalib_dune.fcl" not found (from services_common_dune.fcl:31)
- FHiCL include "PhotonCalibratorProtoDUNESP.fcl" not found (from services_common_dune.fcl:32)