



Wire-Cell ProtoDUNE Local Meeting

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Wire-Cell 3D Imaging & Clustering

Blob Depo Fill: Time_offset Tuning

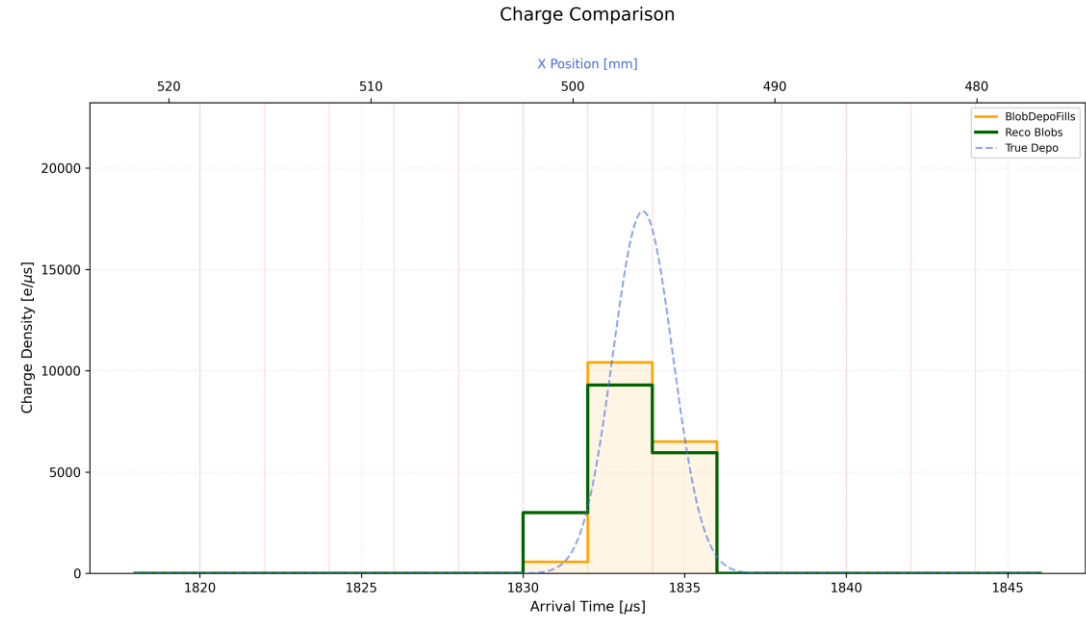
Grid Search using Point Depos

- A diffused depo and Blobs have to be overlapped.
- Charge ratios of each slice have to be similar
- 0.5us units
- > Minimize the defined RSS value

$$RSS = \sum (Ratio_{Depo,i} - Ratio_{Blob,i})^2$$

With only one point depo

- 3 reconstructed blobs
- Optimal time_offset= 314.5 us



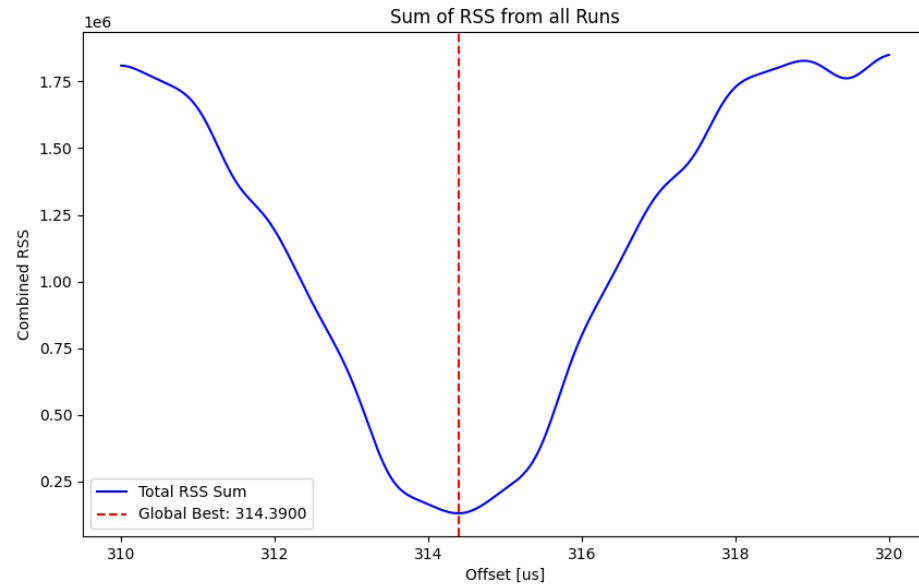
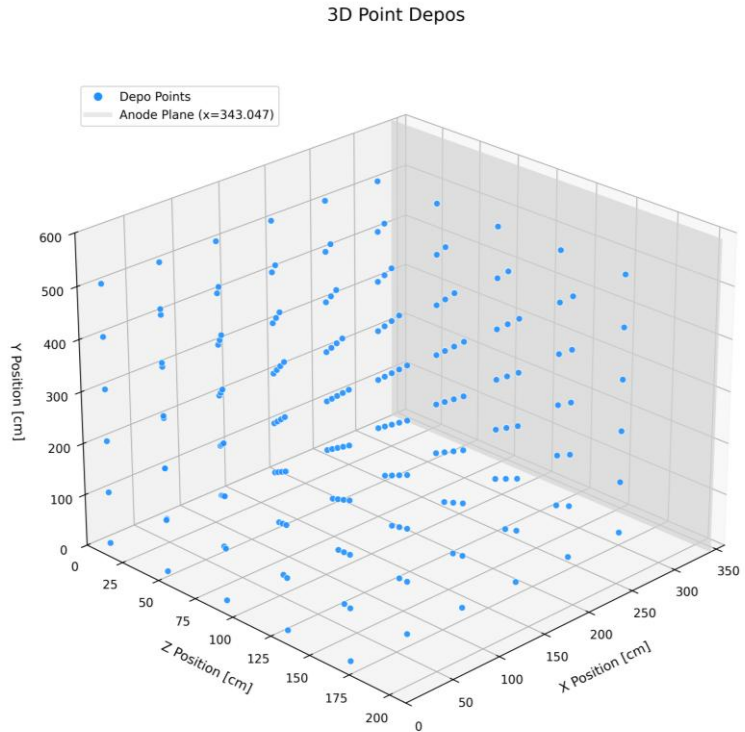
Time [us]	True (e)	(%)	Fill (e)	(%)	Reco (e)	(%)
1828.0~1830.0	1.25e+00	0.0%	0.00e+00	0.0%	0.00e+00	0.0%
1830.0~1832.0	1.34e+03	3.2%	1.14e+03	3.3%	5.99e+03	16.4%
1832.0~1834.0	2.45e+04	59.2%	2.08e+04	59.6%	1.86e+04	50.9%
1834.0~1836.0	1.53e+04	36.9%	1.30e+04	37.2%	1.19e+04	32.6%
1836.0~1838.0	2.72e+02	0.7%	0.00e+00	0.0%	0.00e+00	0.0%
SUM [e-]	4.14e+04	100%	3.50e+04	100%	3.65e+04	100%
[% vs True]		100.0%		84.4%		88.1%

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Blob Depo Fill: Time_offset Tuning

To validate with more depos

- Test with 180 point depos in APA2
- Also, 314.5us gives a minimal RSS vales

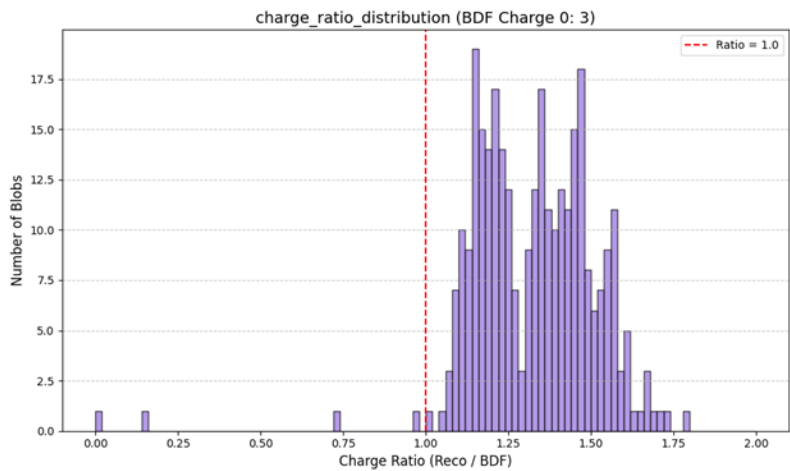
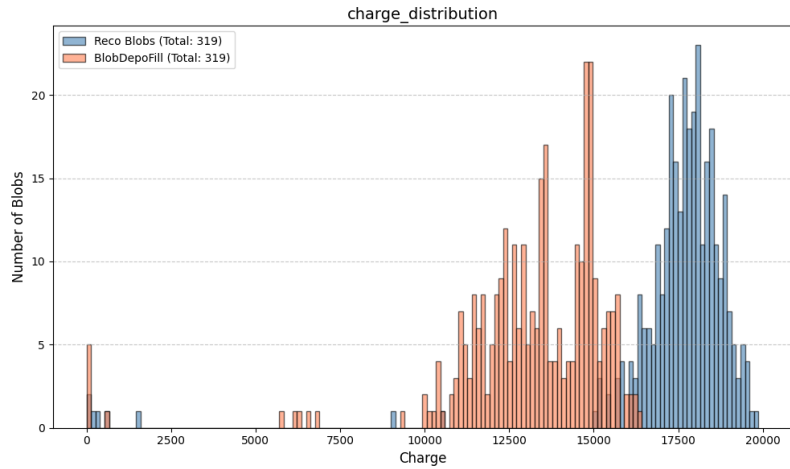


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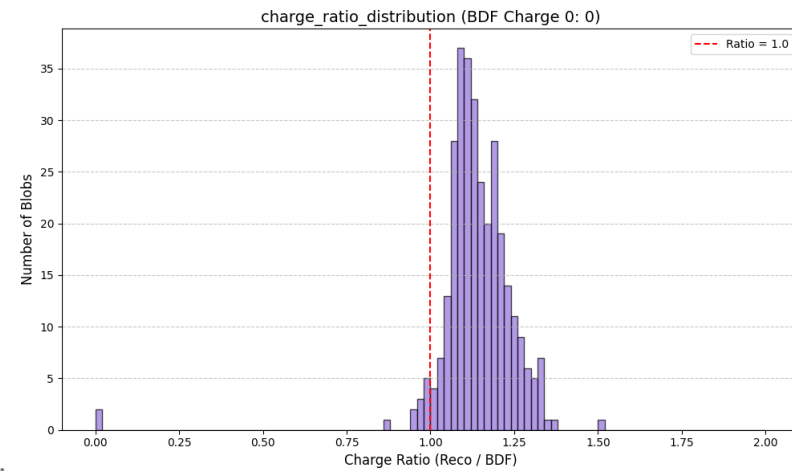
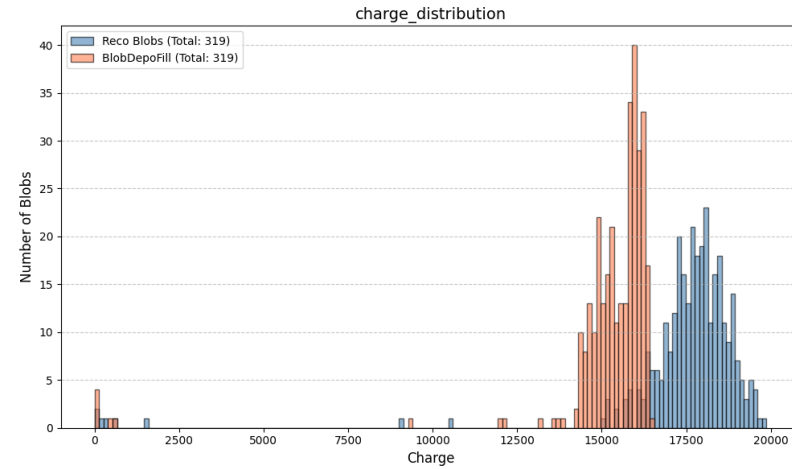
Blob Depo Fill: Time_offset Tuning

Sim with a track (apa2, thetaXZ=45 deg)

- Before tuning(312.5us)



- After tuning(314.5us)



Backup

Wire-Cell 3D Imaging & Clustering

Blob Depo Fill: Adding true info in the conventional pipeline

Metrics

- Two metrics for 3D Imaging performance evaluations in the **Blob level**

blob size -> charge smearing
ghost evaluation
de-ghosting algorithm performance

$$\text{Purity} = \frac{\text{Number of blobs with non-zero true charge}}{\text{Total number of reconstructed blobs}}$$

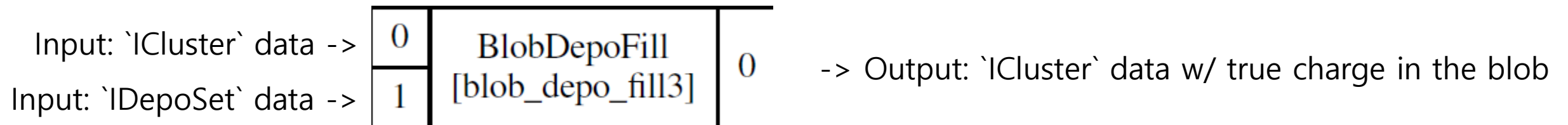
$$\text{Efficiency} = \frac{\text{Total true charge in blob}}{\text{Total true charge}}$$

BlobDepoFill

(<https://github.com/WireCell/wire-cell-toolkit/blob/18a8a5c06c8f8001e8dea5e3a577570ee473b79b/img/src/BlobDepoFill.cxx#L2>)

- Replace charges of reco blob with true charges in the blobs
- This node only replace the charge info, not position info, giving the position of reco blob

→ BlobDeopFill approach can be used for only evaluating about charge

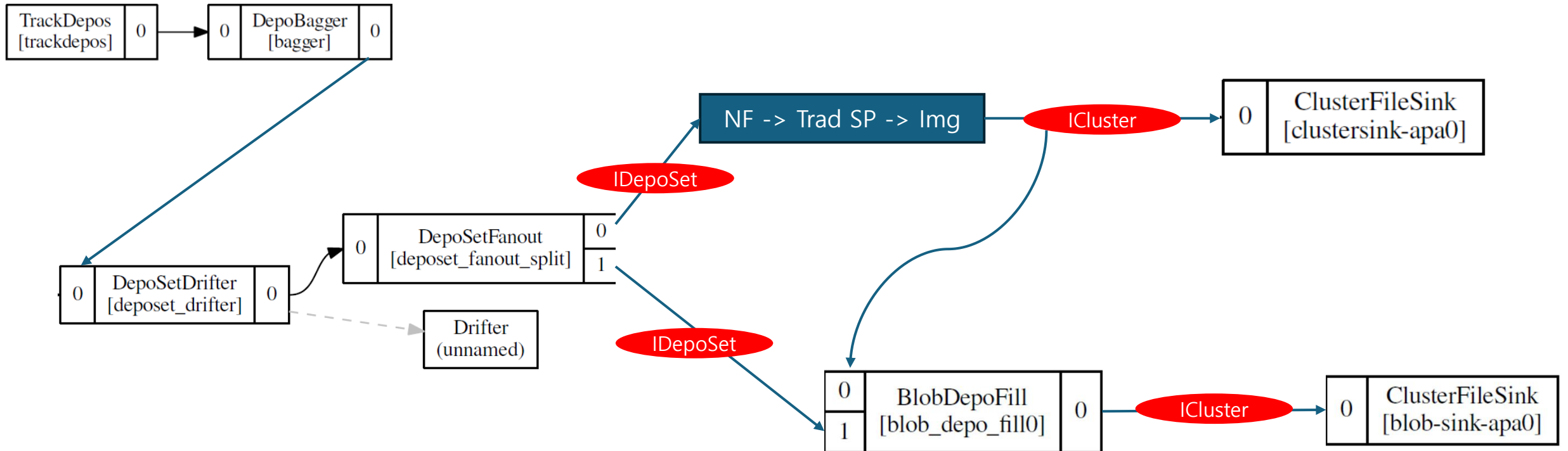


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Blob Depo Fill: Adding true info in the conventional pipeline

New PDHD configuration including BlobDepoFill nodes

- Wire-Cell standalone simulation: NF -> Trad SP -> Img
- Add BlobDepoFill nodes to the conventional img pipeline



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Blob Depo Fill: Adding true info in the conventional pipeline

✓ Zero charge in BlobDepoFill is due to the time offset value

PDHD : Single track sim(apa2, thetaXZ=45 deg)

```
blob_depo_fill(anode, name, drift_speed=params.lar.drift_speed) :: g.pnode({
  type: "BlobDepoFill",
  name: "blobdepo-filler-%s"%name,
  data: {
    // fixme, breaks detector independence
    speed: drift_speed, //1.56*wc.mm/wc.us,
    time_offset: 312.5*wc.us, //314*wc.us,
```

- **drift_speed: 1.6 mm/us**
- **time_offset: 0 -> 312.5 us**

The values came from `'sim.ducto.start_time'` in PDHD `'params.jsonnet'`

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

local response_time_offset = $.det.response_plane / $.lar.drift_speed,
```

- tick0_time = -250 us (the absolute time of the first tick)
- response_plane = 10cm (where the field response functions start)
- response_time_offset = 62.5us
- **start_time = - 312.5 us**