



Wire-Cell ProtoDUNE Local Meeting

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Wire-Cell 3D Imaging & Clustering

Performance Evaluation with simple tracks

Wire-Cell Standalone Track Sim

- Time offset in BlobDepoFill : 314.5us
- Track angles : 10, 20, 30, 40, 50, 60, 70, 80, 85
- Track length : 50cm
- Track start position : (x, 300cm, 10cm) with x = 10, 150, 270cm
- With traditional SP results

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

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

Reco blobs

BlobDepoFill



ex) 60deg, x = 10cm

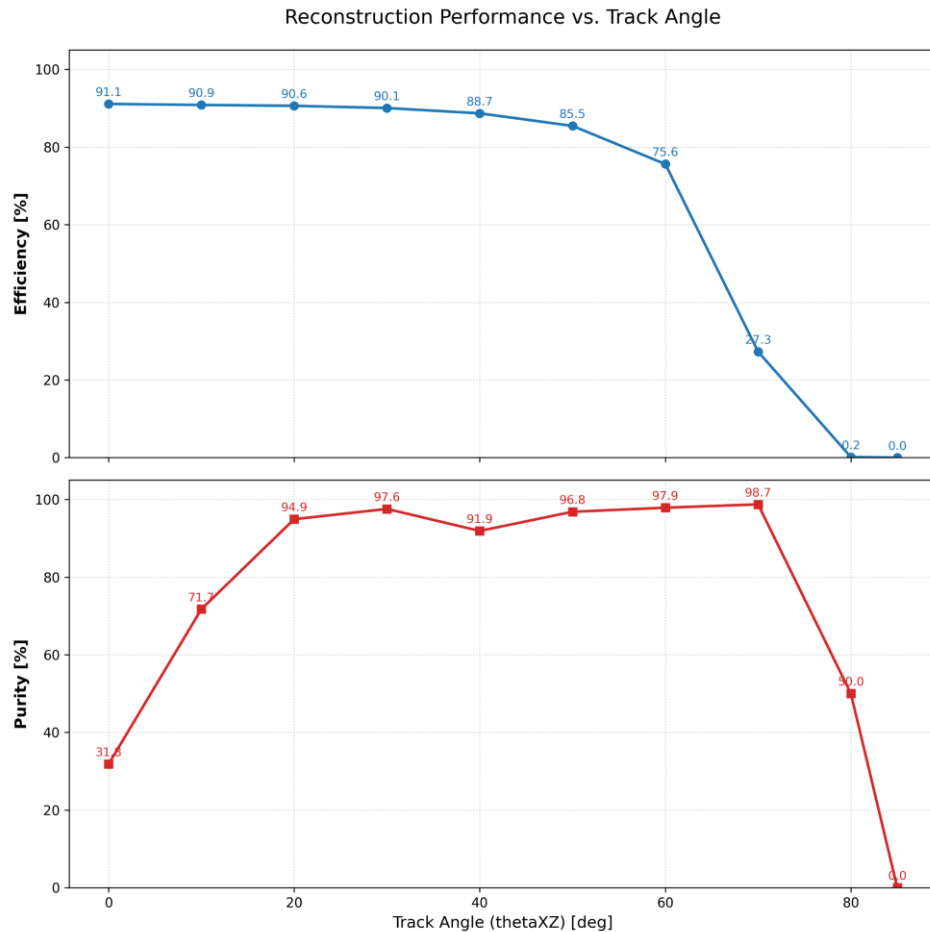
Category	# of Blobs
Total Reco Blobs	141
Blobs w/ True Charge(> 50.0)	138
FINAL PURITY	97.872340%

Total True Charge (Depos)	1.96e+06
True Charge in Blobs	1.48e+06
Lost True Charge	4.78e+05
FINAL EFFICIENCY	75.62%

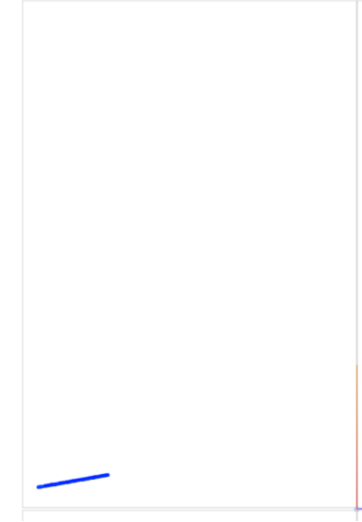
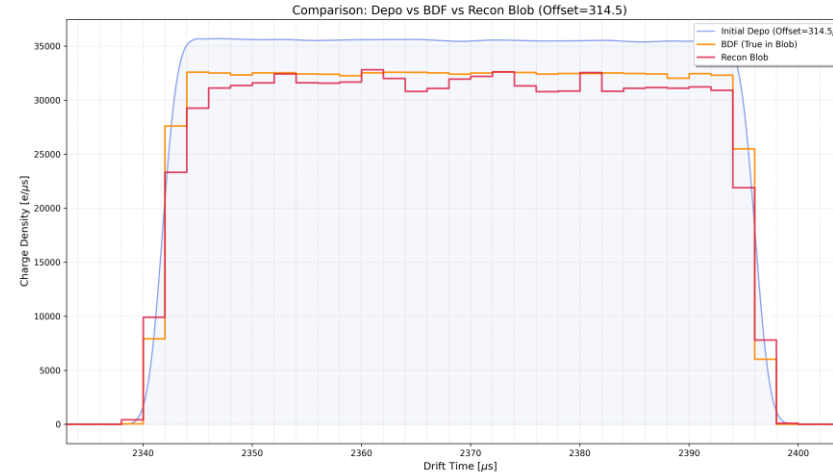
Wire-Cell 3D Imaging & Clustering

Performance Evaluation with simple tracks

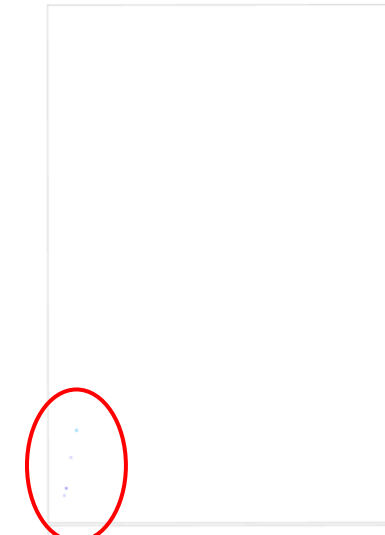
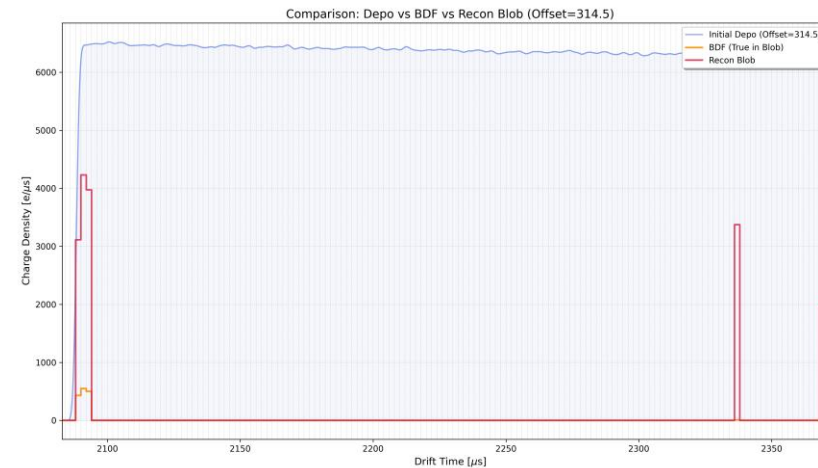
- Track angles : 10, 20, 30, 40, 50, 60, 70, 80, 85
- Track length : 50cm
- Track start position : (**10cm**, 300cm, 10cm)



thetaXZ=10



thetaXZ=80

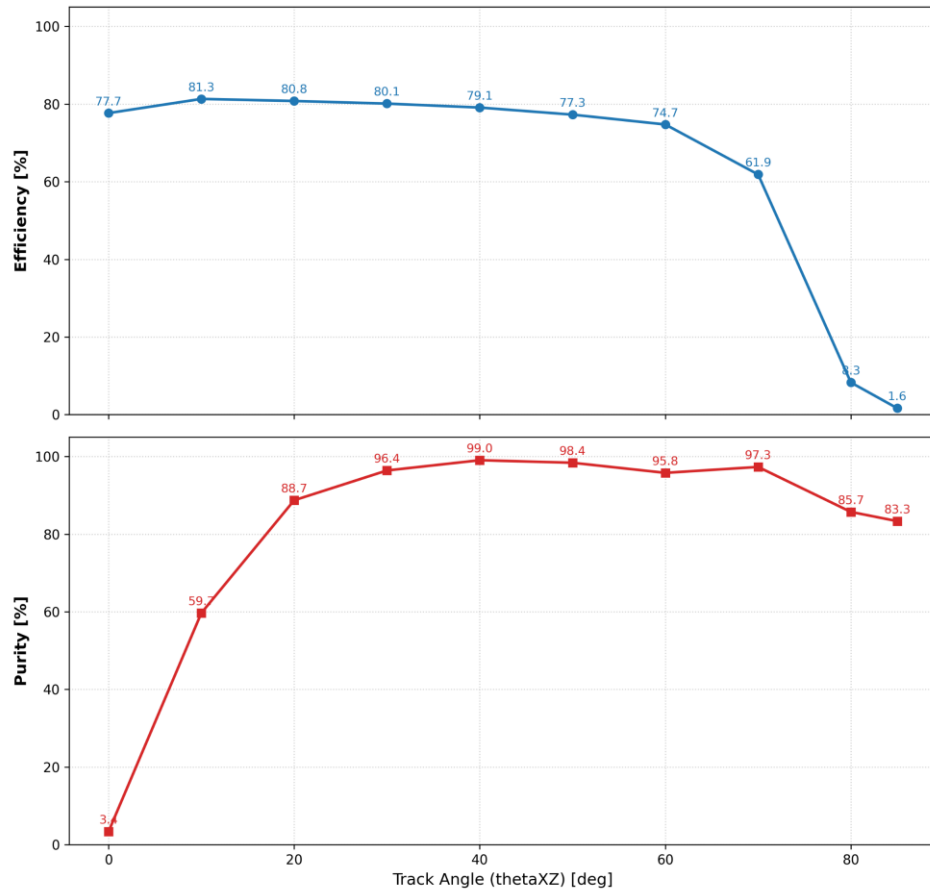


Wire-Cell 3D Imaging & Clustering

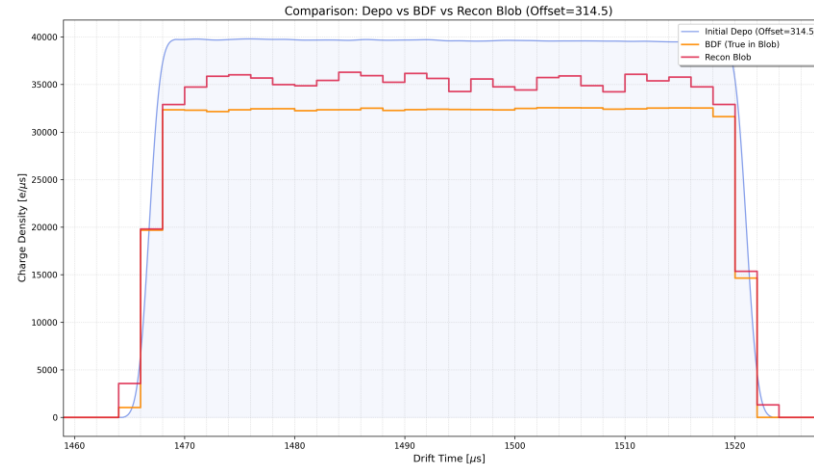
Performance Evaluation with simple tracks

- Track angles : 10, 20, 30, 40, 50, 60, 70, 80, 85
- Track length : 50cm
- Track start position : (**150cm**, 300cm, 10cm)

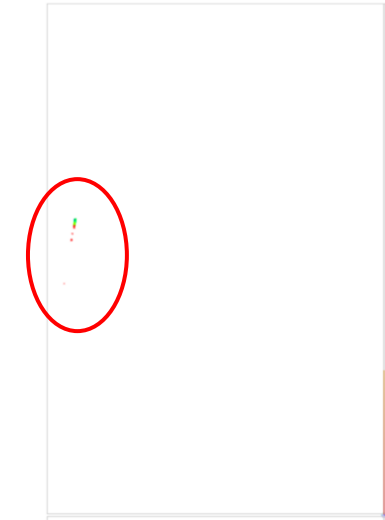
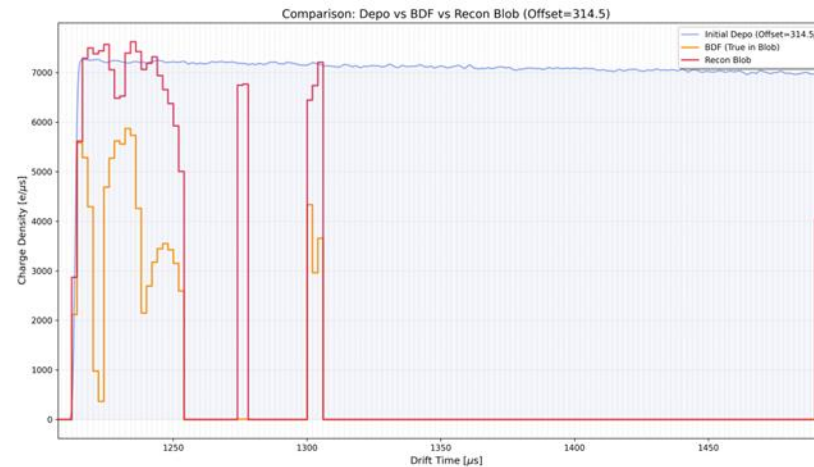
Reconstruction Performance vs. Track Angle



thetaXZ=10



thetaXZ=80

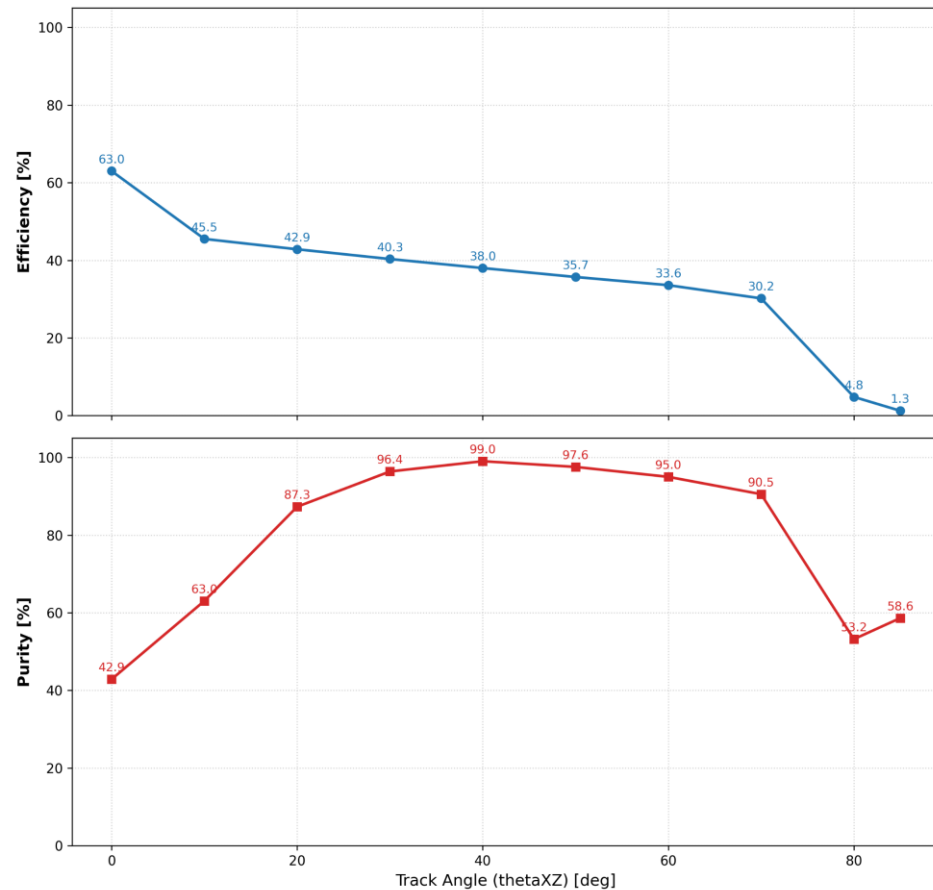


Wire-Cell 3D Imaging & Clustering

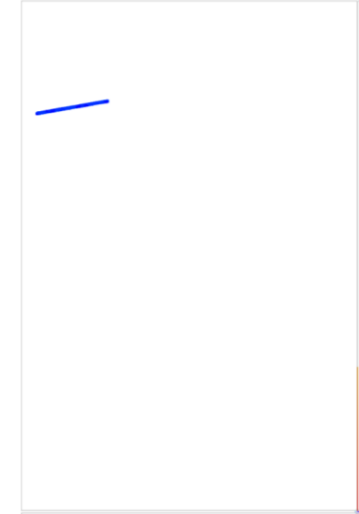
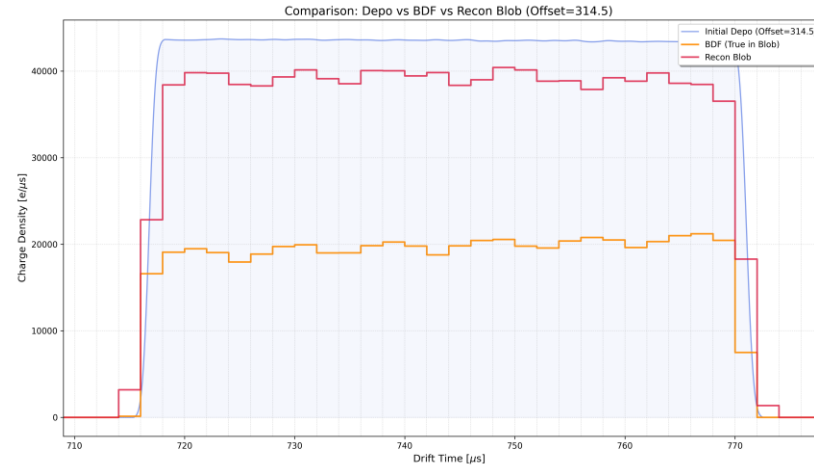
Performance Evaluation with simple tracks

- **Track angles** : 10, 20, 30, 40, 50, 60, 70, 80, 85
- **Track length** : 50cm
- **Track start position** : (270cm, 300cm, 10cm)

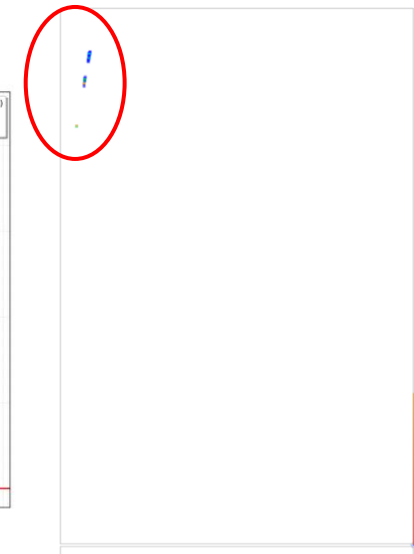
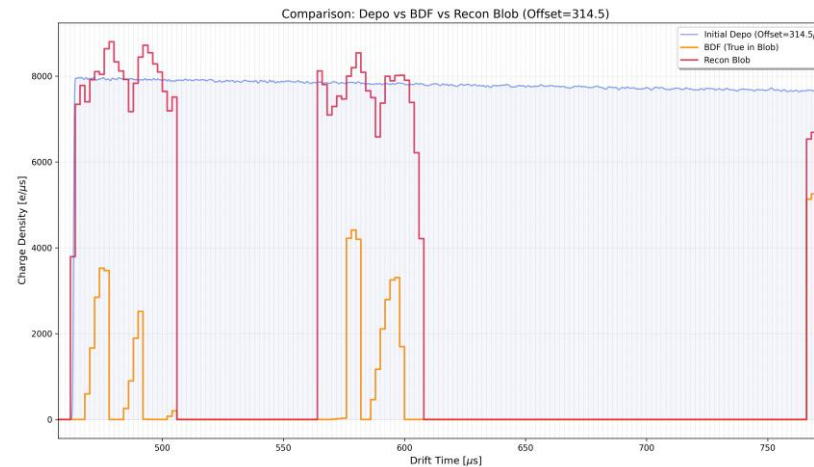
Reconstruction Performance vs. Track Angle



thetaXZ=10



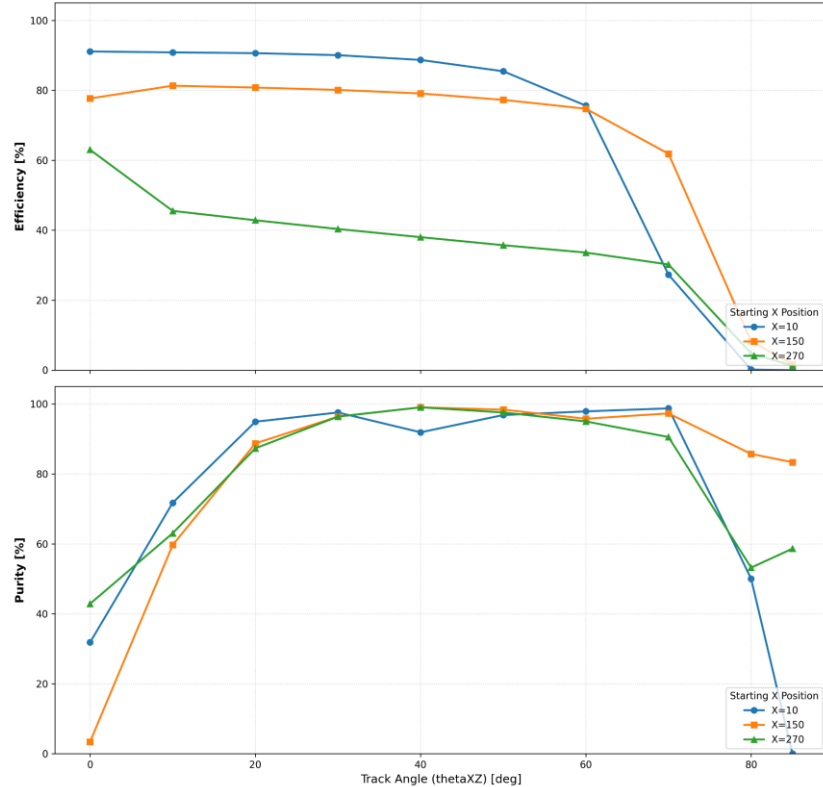
thetaXZ=80



Wire-Cell 3D Imaging & Clustering

Performance Evaluation with simple tracks

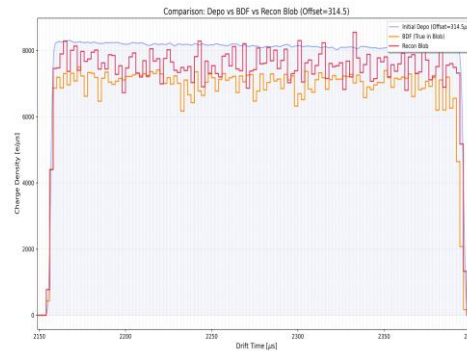
Multi-Set Performance Comparison



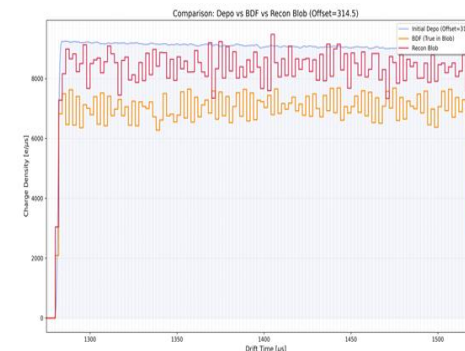
- Bad purity at low angle. ($<20\text{deg}$)
- Both purity and efficiency are flat. ($20 \sim 60\text{deg}$)
- Both purity and efficiency are bad at large angle. ($>60\text{deg}$)
- Efficiency decreases as x increases (near anode).
- Tendencies are similar for all x values.

thetaXZ=50deg

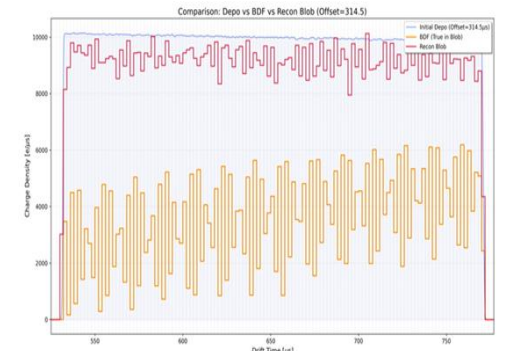
start x=10



start x=150



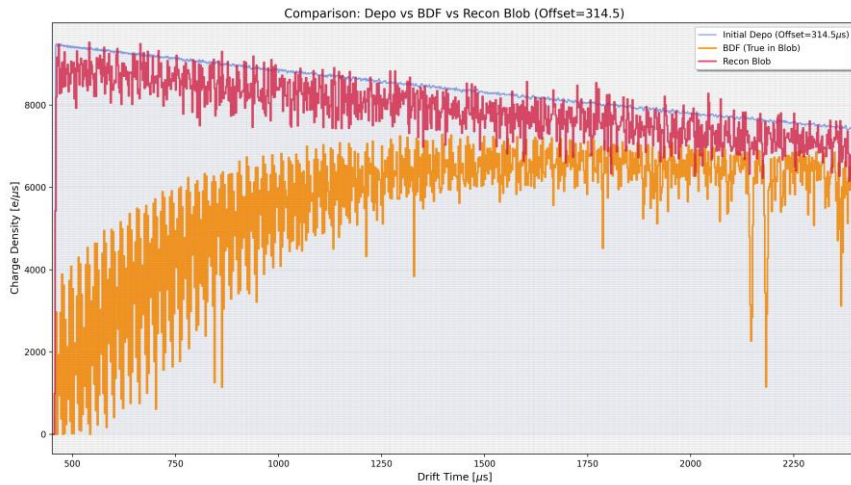
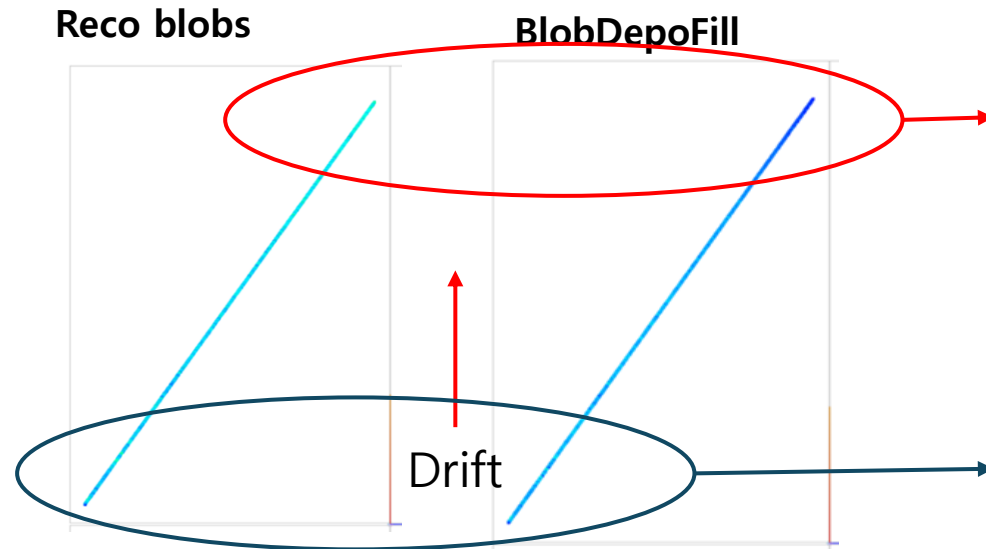
start x=270



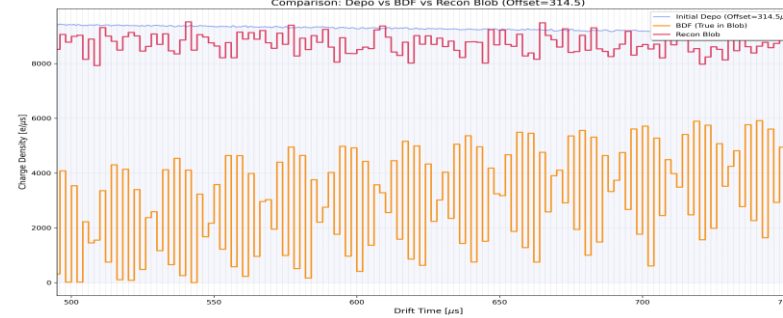
Wire-Cell 3D Imaging & Clustering

Performance Evaluation with a simple track

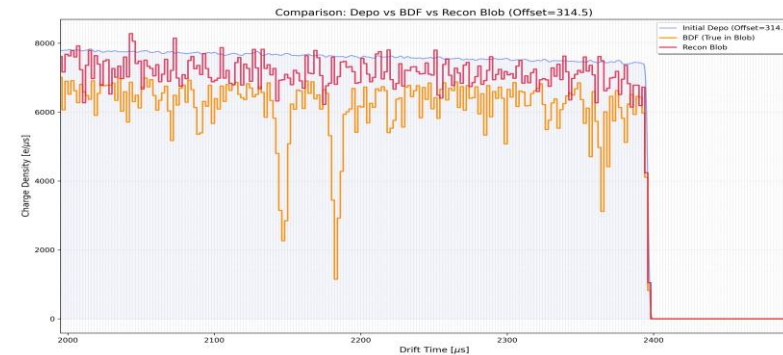
For a single long track (x : 10cm – 320cn) • Near anode



• Near anode



• Far from anode



- **Purity** = 99.49% , **Efficiency** = 66.41%
- Also, charge difference increases as drift time decreases

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

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

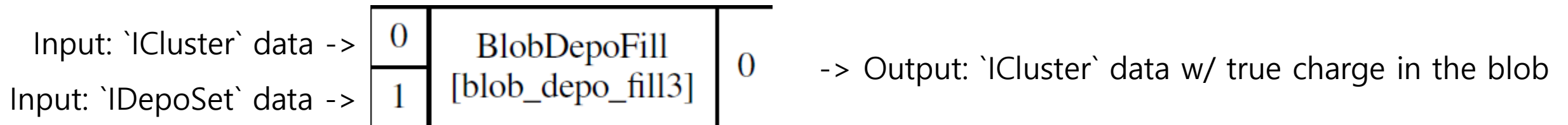
$$\text{Efficiency} = \frac{\text{Total true charge in blob}}{\text{Total true charge}}$$

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

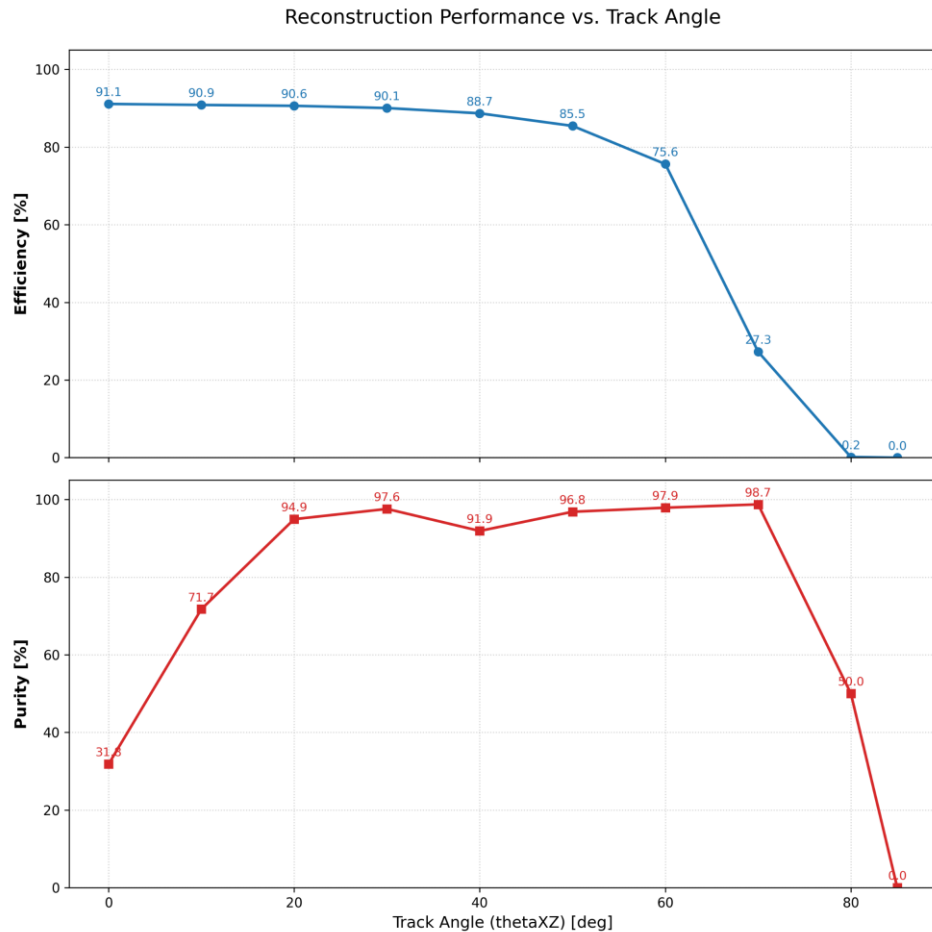
—> BlobDepoFill approach can be used for only evaluating about charge



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thetaXZ=0

