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Status of WireCell Cluster Evaluation

SBND Wirecell Meeting

Prabhjot Singh, 2 July 2026

Current Selections for Cluster Evaluation

Selections	Accepted Values	Description	Applied? Yes or No
Energy Cut	$E > 10 \text{ MeV}$	True clusters below 10 MeV are removed from evaluation	Yes
Min true point cut	$N > 200$	Removes true and reco clusters with fewer than 200 points	Yes
Wire readout sensitive yz plane cut	$-200 \text{ cm} < y < 200 \text{ cm}$ $0.15 \text{ cm} < z < 500.85 \text{ cm}$	Removes true and reco points output wirecell sensitive regions in y and z	Yes
Time window cut	$-205 \mu\text{s} < t < 1509 \mu\text{s}$	Removes true points outside time window cut. Applied at CellTree level Reco points are already within time window cuts so we apply this to true clusters	Yes
Dead Area cut		Reco points are already reconstructed within dead wire areas so we also need to remove true points within dead area for reco-true comparisons	Yes

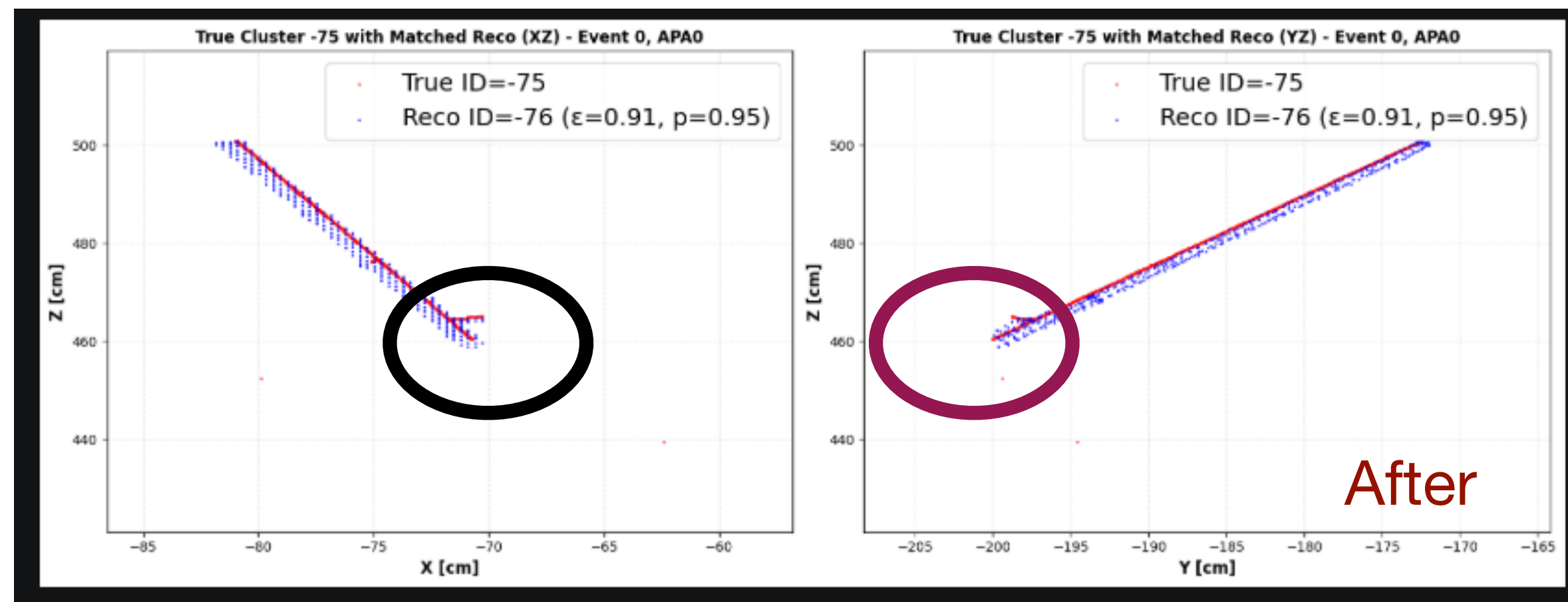
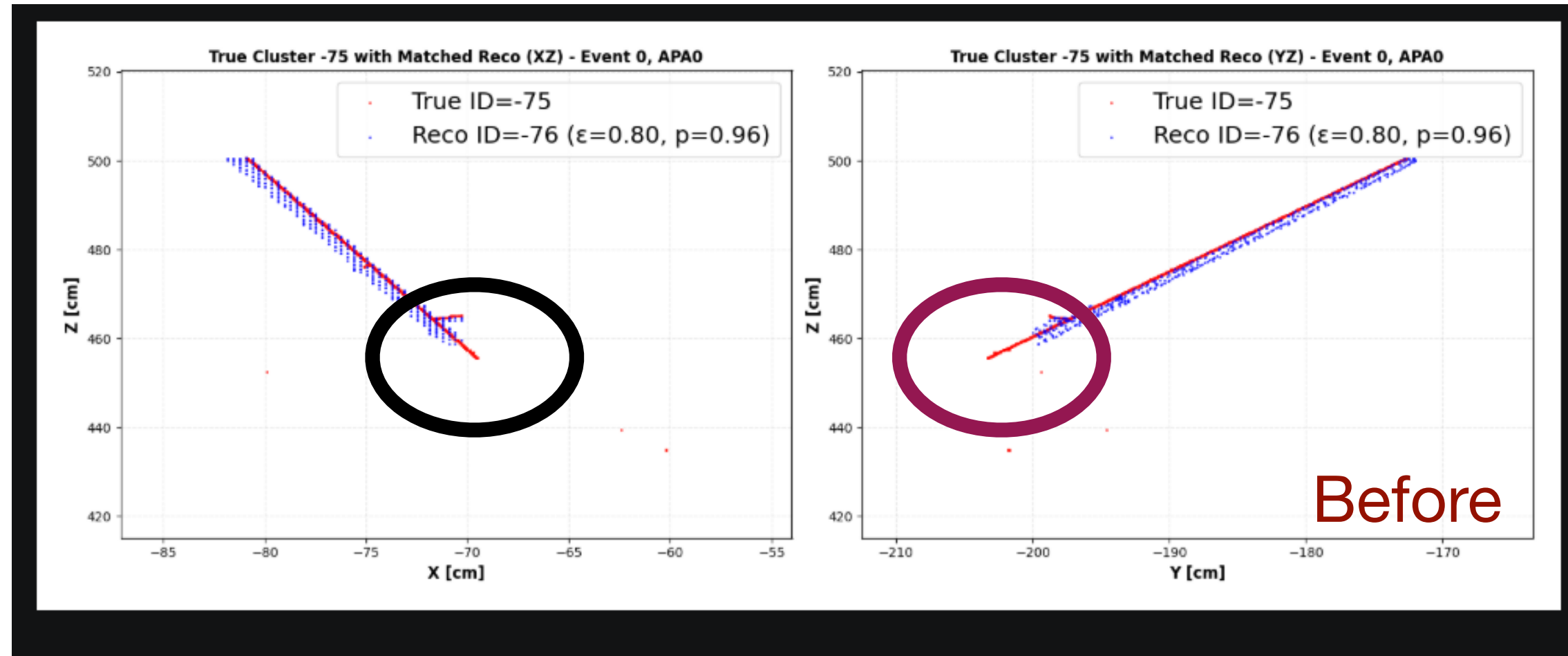
Current Selections for Cluster Evaluation

- Since our last meeting, I have tested and applied these selections
- Next slides show some examples to show effects of these

Wire readout sensitive yz plane cut	$-200 \text{ cm} < y < 200 \text{ cm}$ $0.15 \text{ cm} < y < 500.85 \text{ cm}$	Removes true and reco points output wirecell sensitive regions in y and z	Yes
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Wire readout sensitive yz plane cut

Ymin: -200 cm, Ymax: 200 cm, Zmin: 0.15 cm, Zmax: 500.85 cm (a bit smaller than detector active volume Y-Z)



	Efficiency	Purity
Before	80%	96%
After	91%	95%

Conclusion: efficiency increased by ~10%

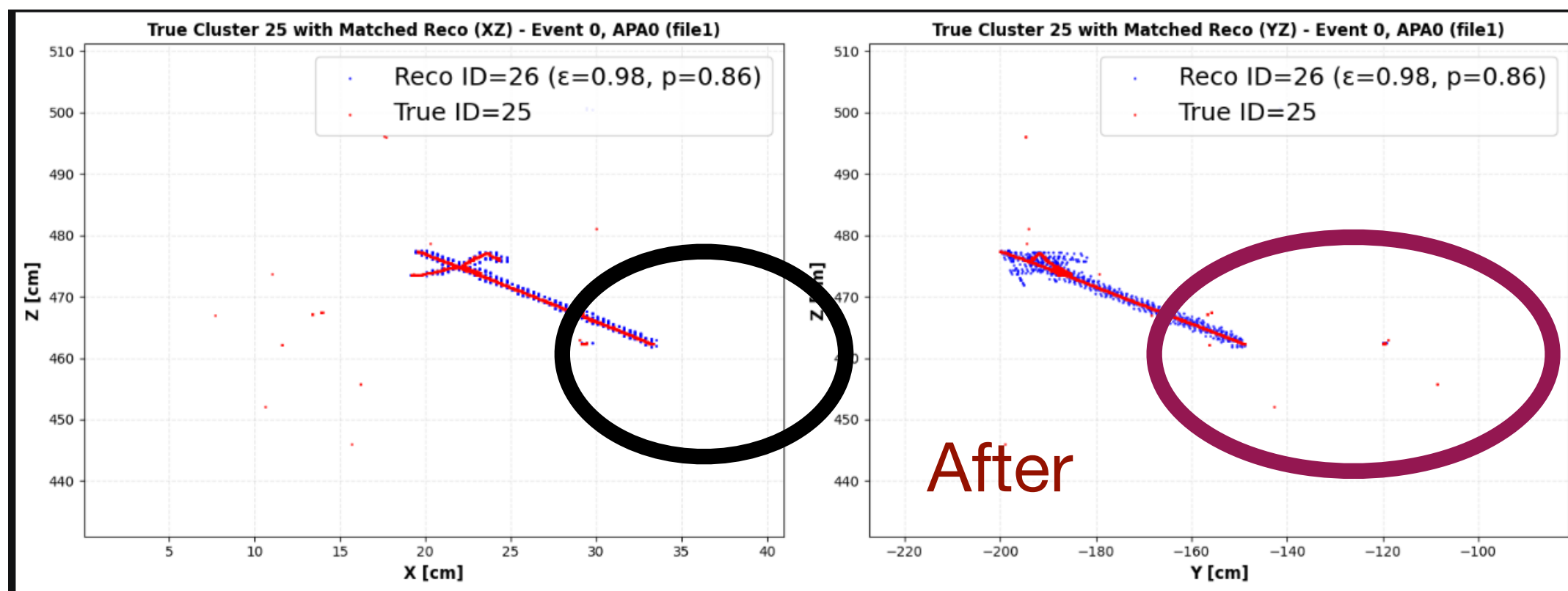
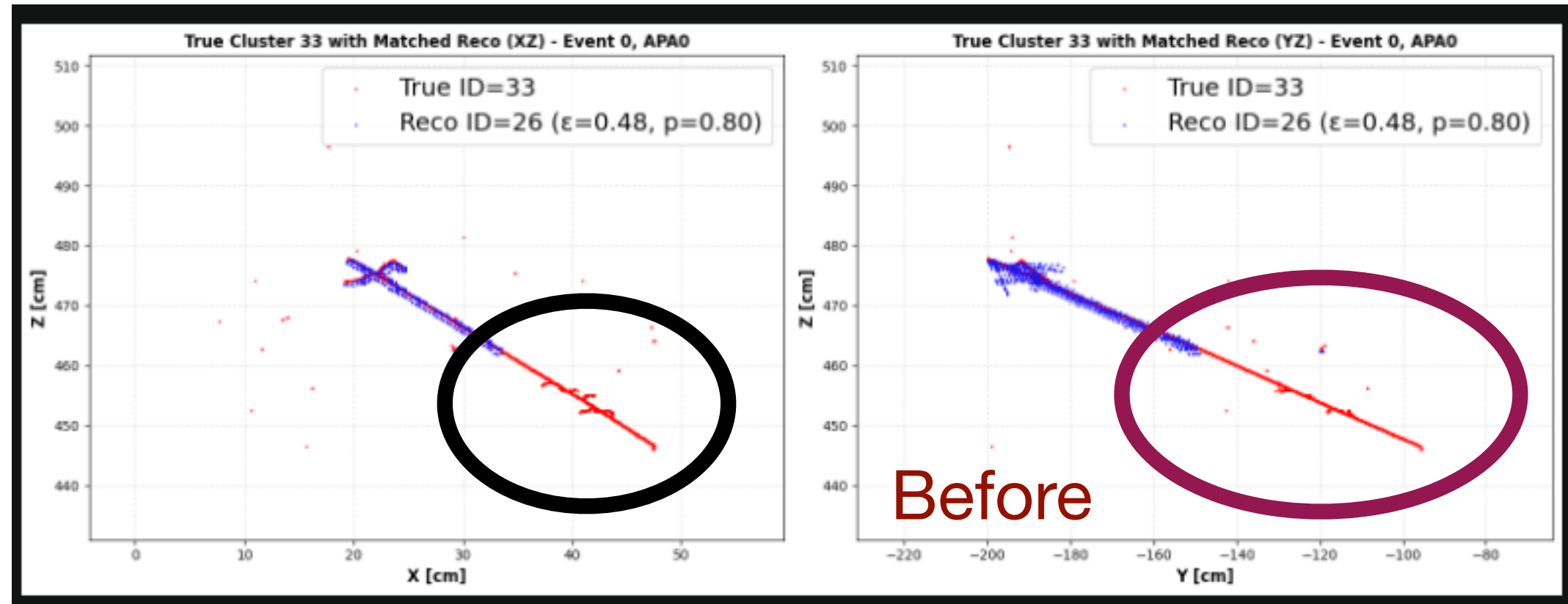
Caveat: This selection is only applied at evaluation level not at CellTree (True jobs) not at img-clustering (Reco jobs)

*More info in google-sheet for [yz-plane cut](#)

Time Window Cut

Removes true points outside time window cut

Reco points are already within time window cuts so we apply this to true clusters



	Efficiency	Purity
Before	48%	80%
After	98%	86%

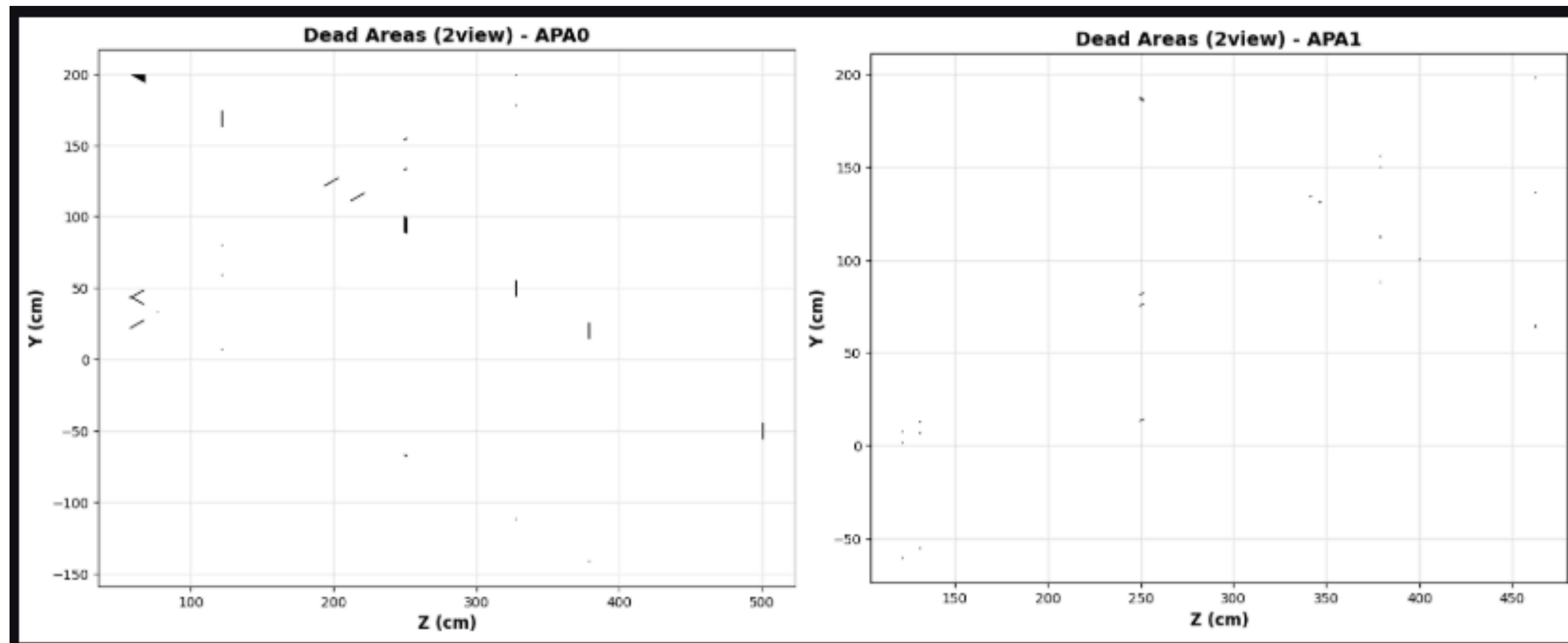
Conclusion: efficiency highly improved. Improvement depends on how much true was outside time window cut

Caveat: Fhicl level change for CellTree (true) job

*More info in google-sheet for [time window cut](#)

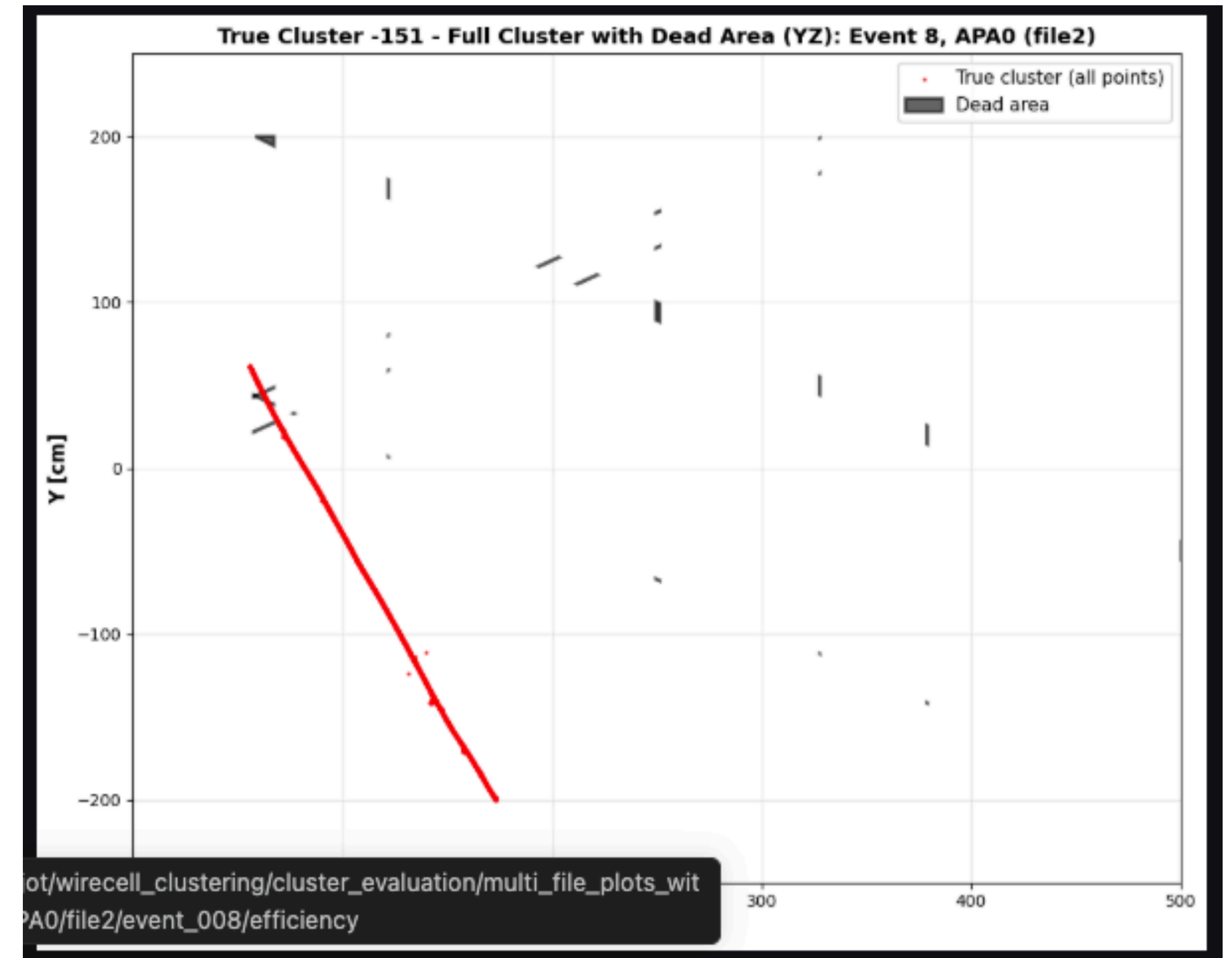
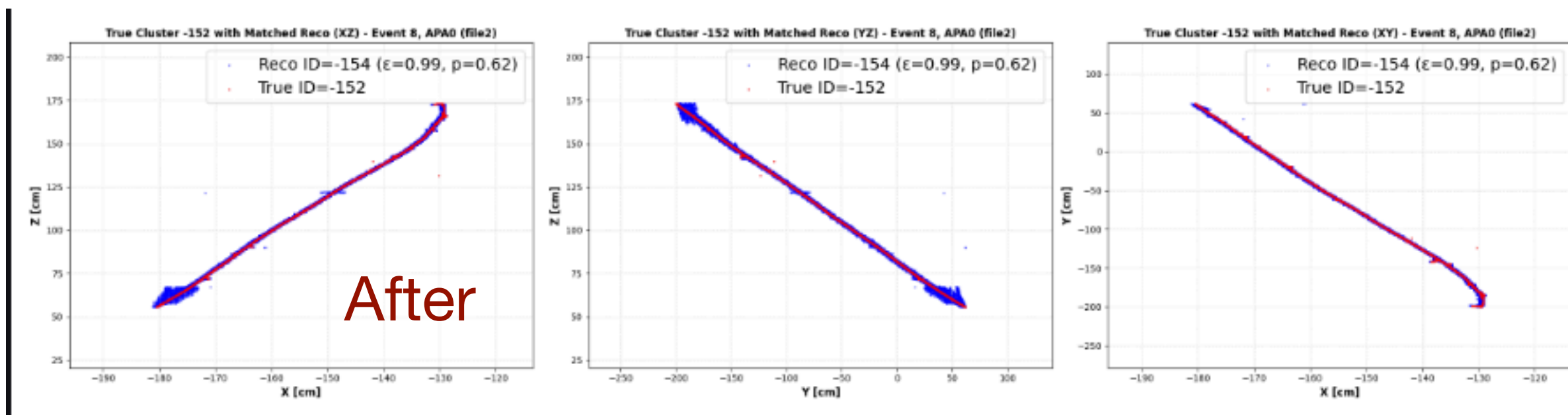
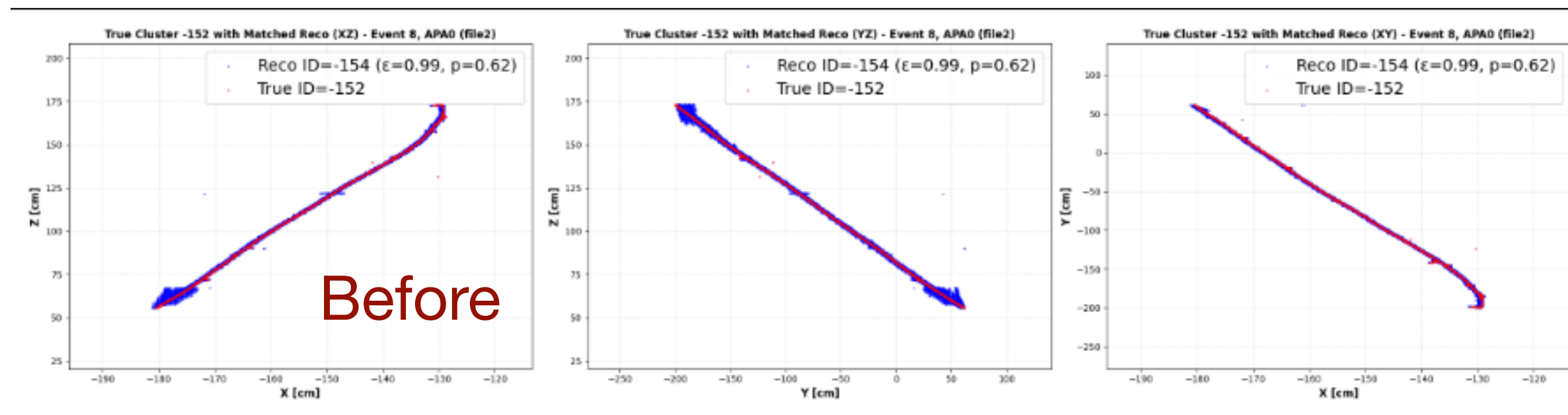
Dead Area Cut

Reco points are already reconstructed within dead wire areas so we also need to remove true points within dead area for reco-true comparisons



For 2view active, the dead area regions are very small, so the improvement on efficiency would be small but it is important to exclude true points in dead area for evaluation purpose

Dead Area Cut



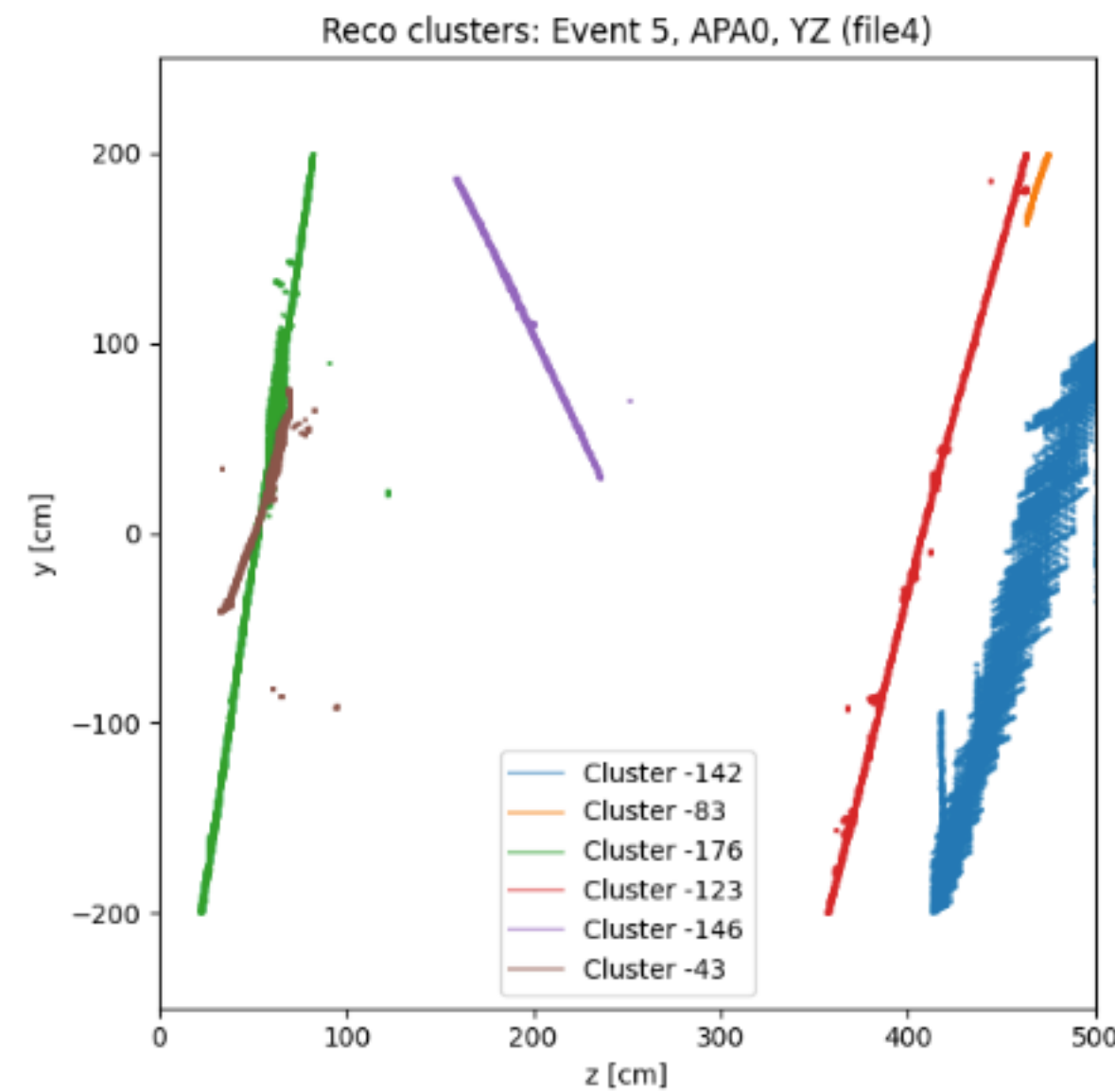
	Efficiency	Purity
Before	99%	62%
After	99%	62%

Conclusion: as expected not much effect on efficiency

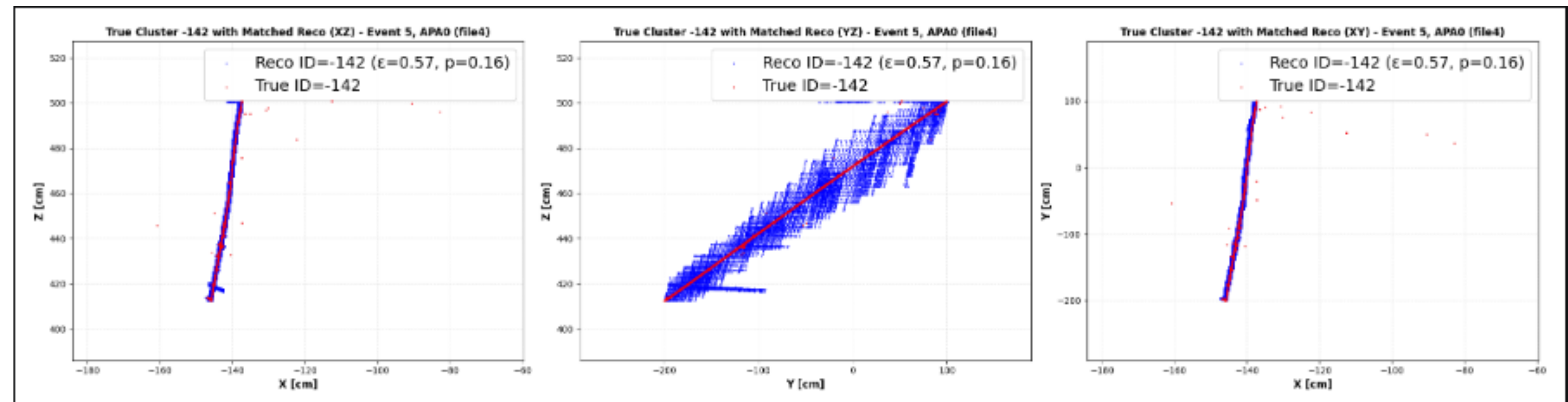
Caveat: Dead area cut does not affect 2view active cases but would be very effective for old 3 view cases

Plans for Isochronous and Prolonged Tracks

- Both isochronous and prolonged tracks affect the evaluation
- Isochronous tracks affect the purity due to their spread



[Bee link](#)



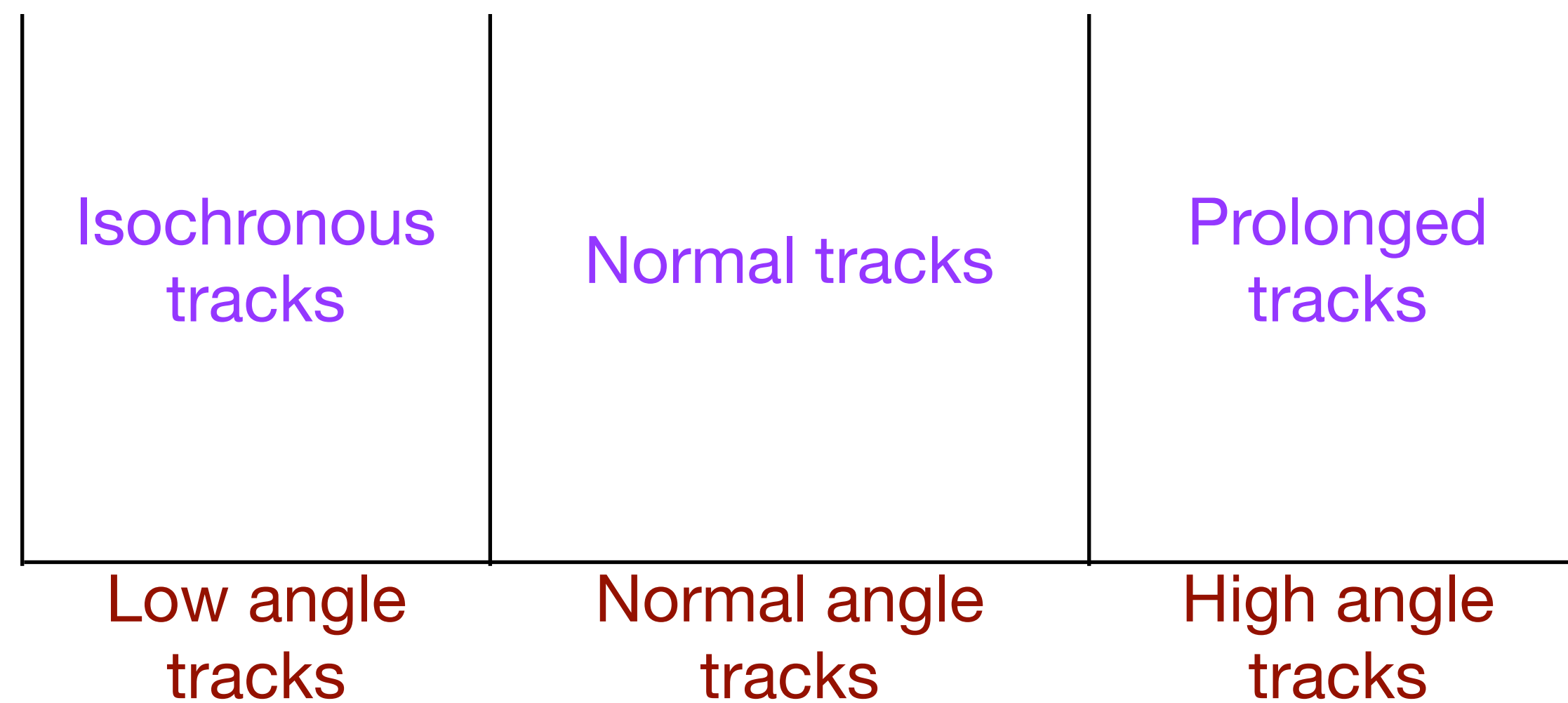
Track Type	Efficiency	Purity
Isochronous	57%	16%

Plans for Isochronous and Prolonged Tracks

- Both isochronous and prolonged tracks affect the evaluation
- Isochronous tracks affect the purity due to their spread
- Prolonged tracks affect efficiency because sometime they show gaps irrespective of dead area
- For evaluation purposes, we need to separate isochronous, and prolonged tracks from rest of the tracks

Plans for Isochronous and Prolonged Tracks

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The idea is to divide tracks into low, high and normal angle bins and then do evaluation

Initial Plans for Generic Neutrino Selections

- Currently reading uBoone's Wirecell based neutrino selection paper at <https://arxiv.org/pdf/2011.01375>
- There are several ideas some of them is to check the Data and MC Distributions of
 - Reco clusters X, Y, Z
 - Time distributions to check clusters are within the time window
 - POT correction
 - Distributions as a function of reco charge information
- In next few meetings, I will show/discuss more on this topic

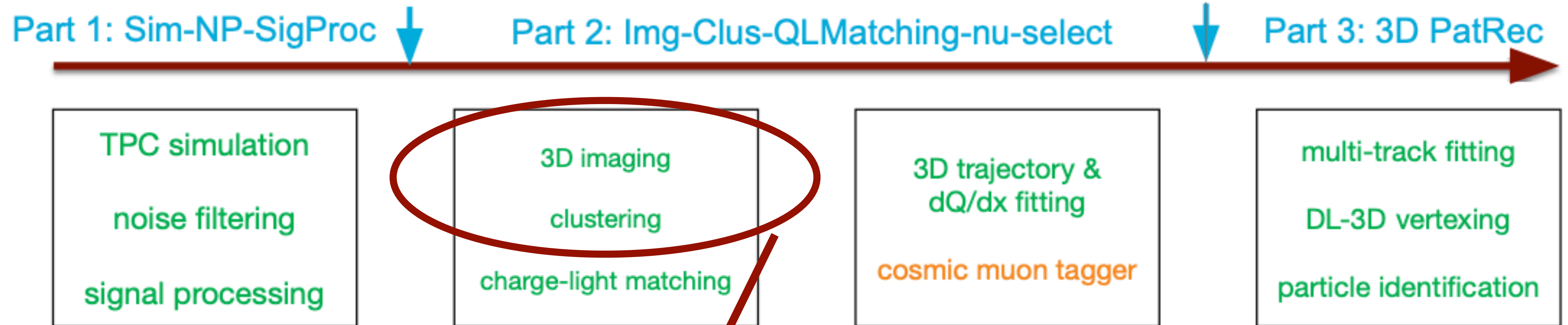
Backup

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- We have already seen examples of these before

Structure of Overall Progress



[Haiwang's CM Talk](#)

- Currently focussed on the imaging+clustering evaluation (scanning and numerical evaluation)
- Evaluation of charge-light matching after this