



LOUISIANA STATE UNIVERSITY



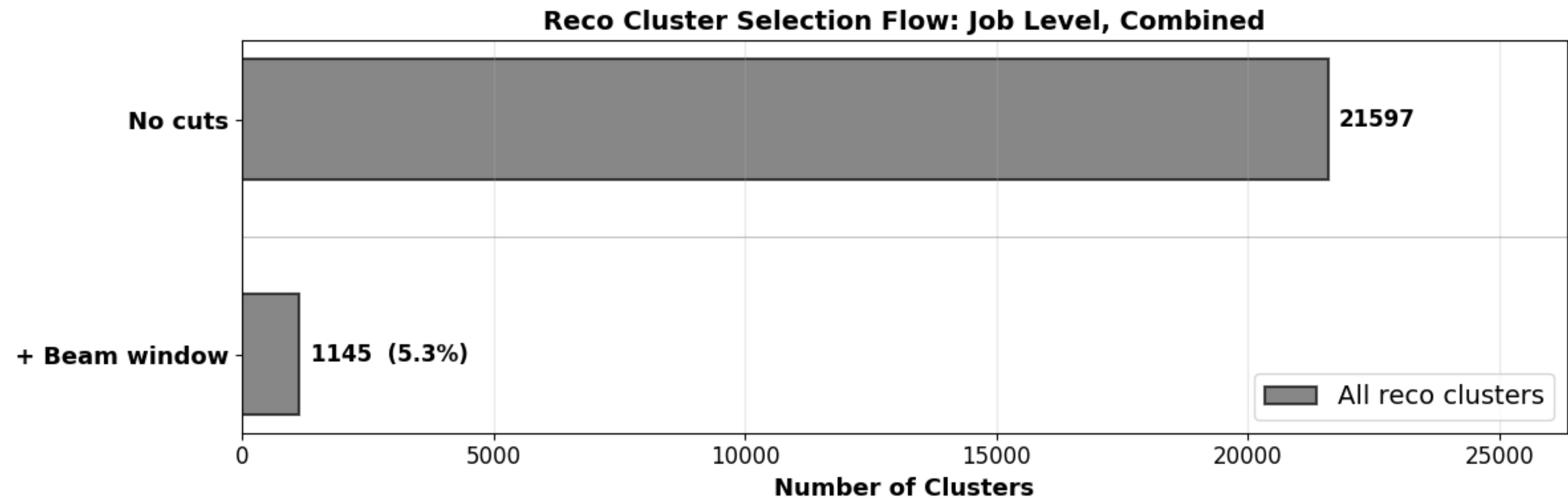
Generic Neutrino Selections

SBND Wirecell Meeting

Prabhjot Singh, 13 Aug 2026

Generic Selections

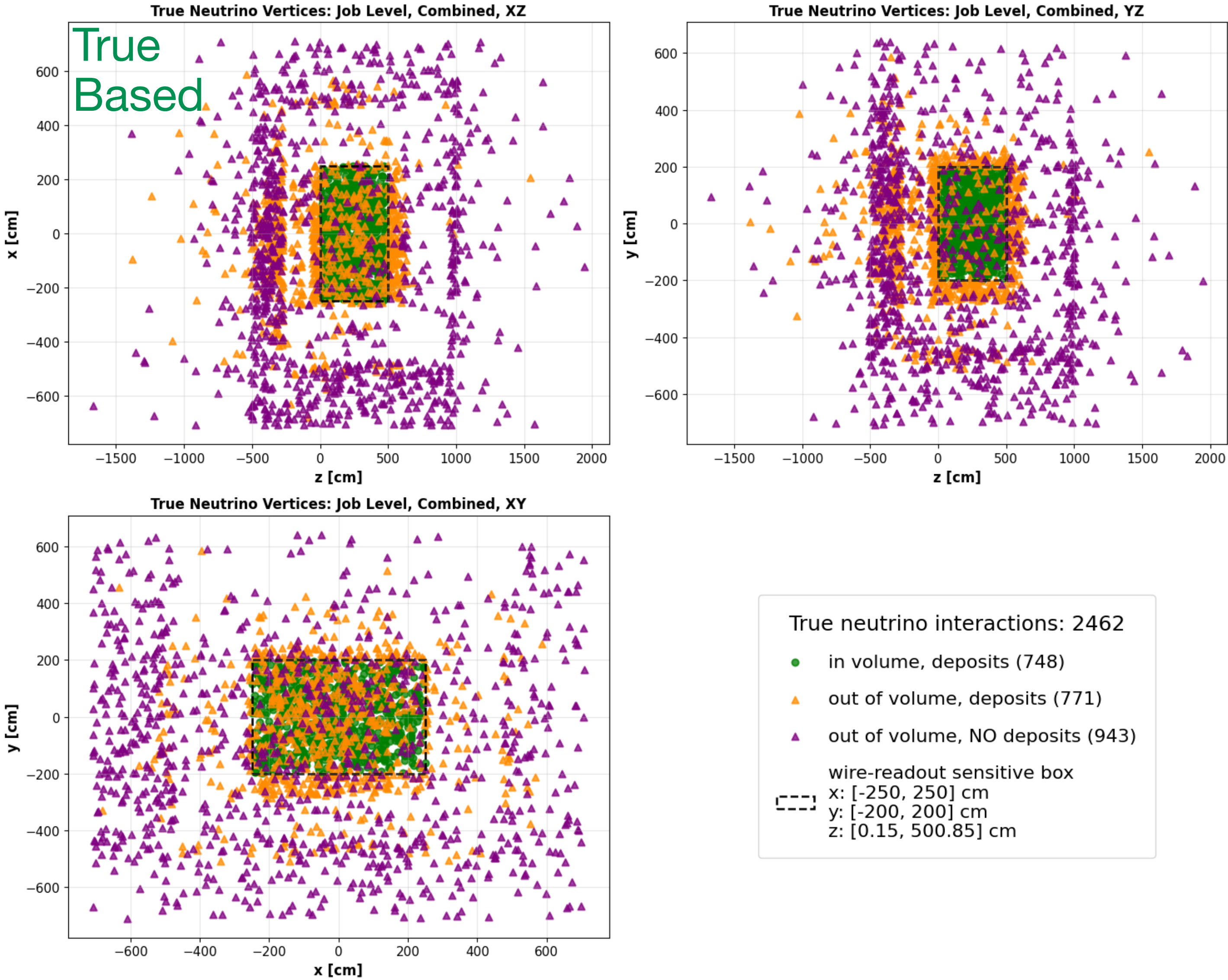
	Previously	Now
Number of Files	10	100
Events	118	1363



- I have moved to slightly bigger dataset of 100 files which now contains 1000+ events
- Currently I am looking at selected reco clusters after beam window selection (0.20 - 2.20 μ s)
- In next step I will include cosmic taggers which will help to further remove in-beam cosmic tracks

In- and Out-Volume True Neutrinos

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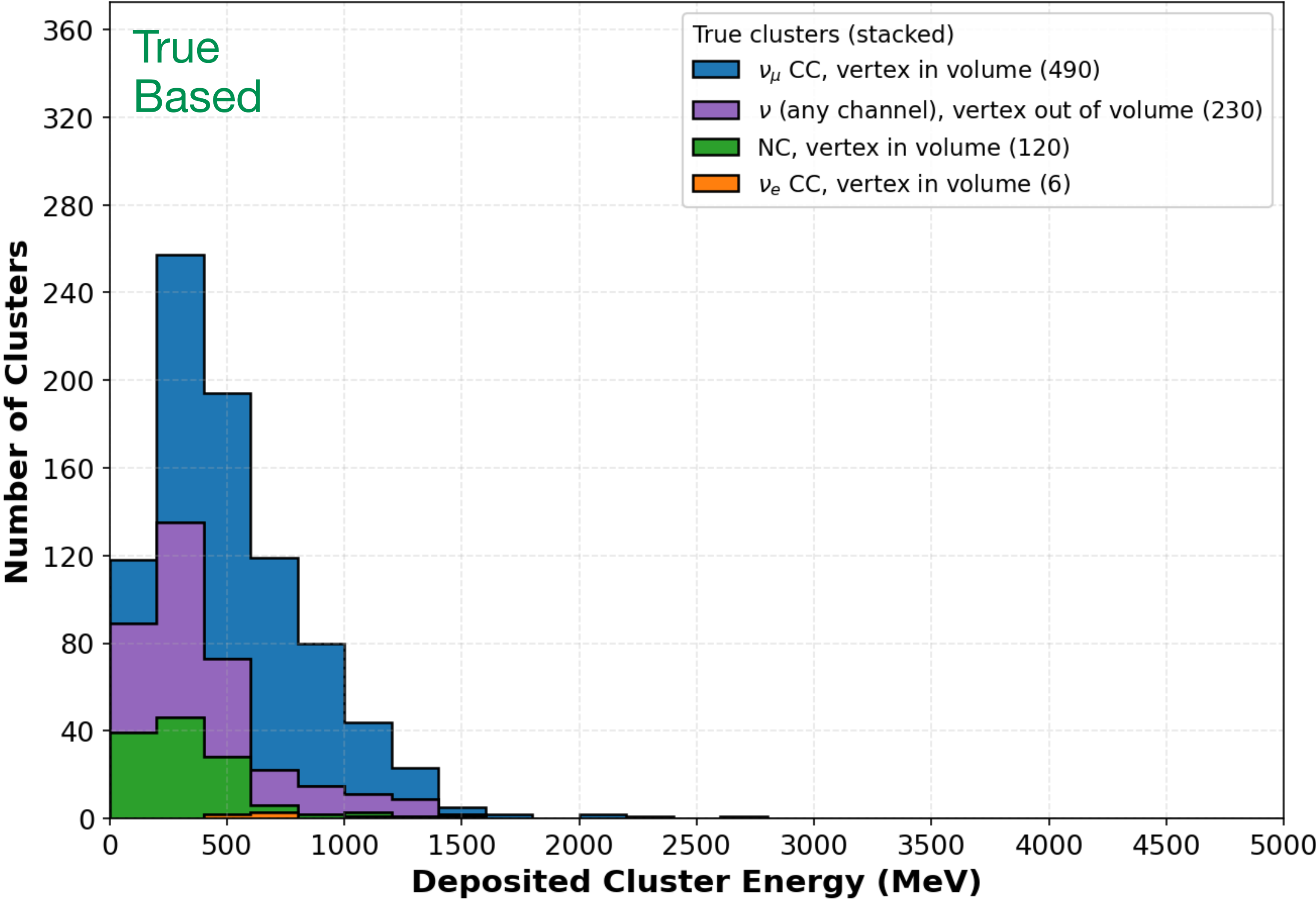


- This larger dataset gives us a slightly better statistics of in-volume and out-volume neutrinos

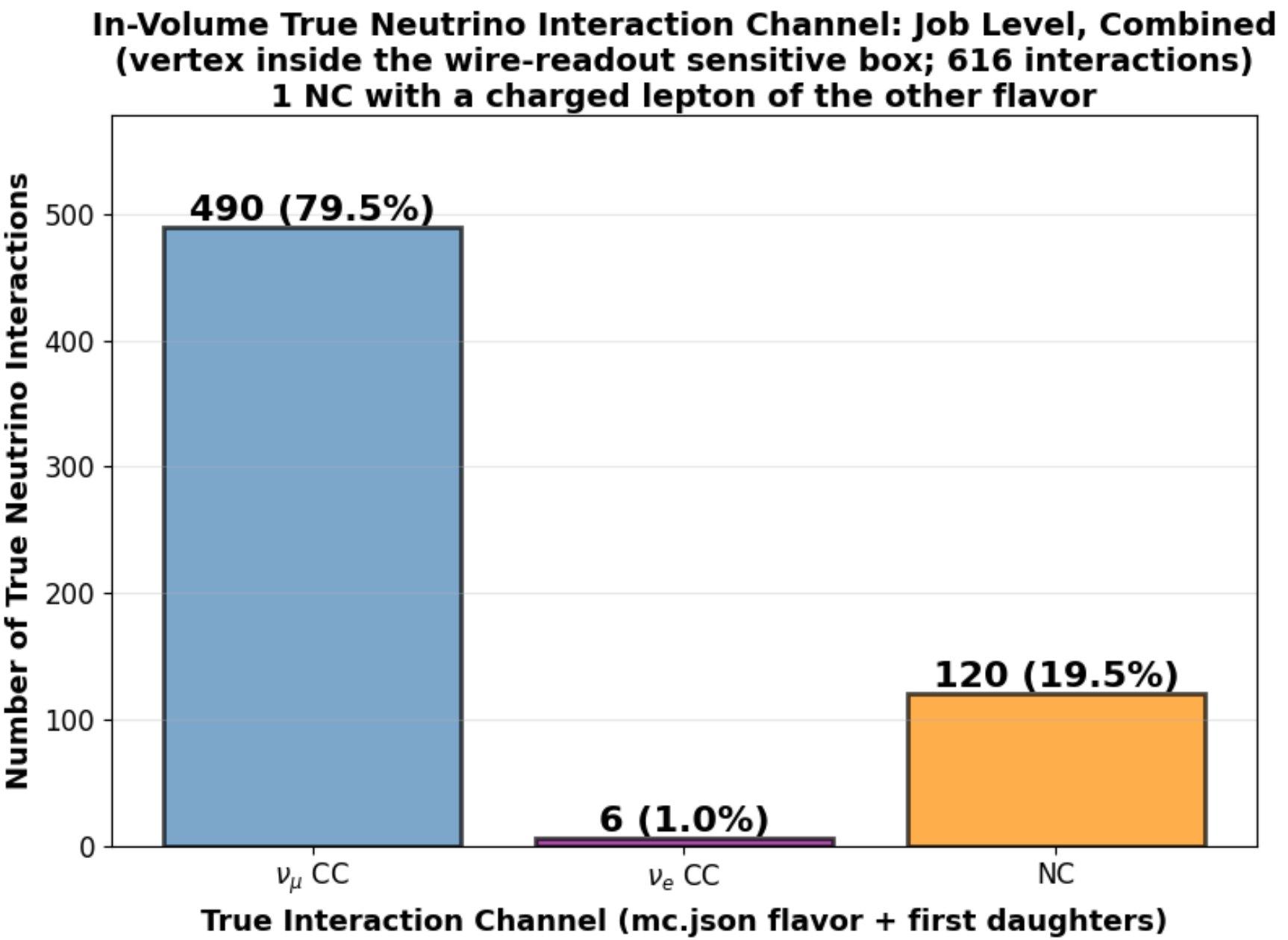
In-Volume True Neutrinos Composition

Signal & Background

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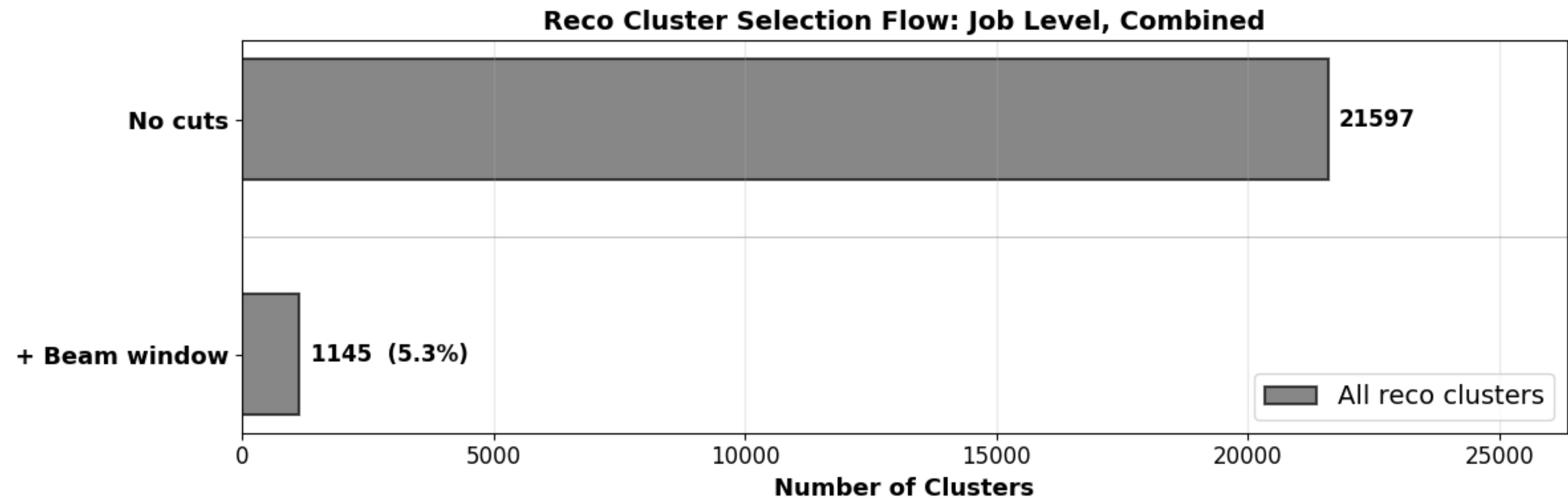


- This input dataset has a mixture of ν_μ CC, ν_e CC, and NC interaction
- Dominated by ν_μ CC



Generic Selected Reco Clusters

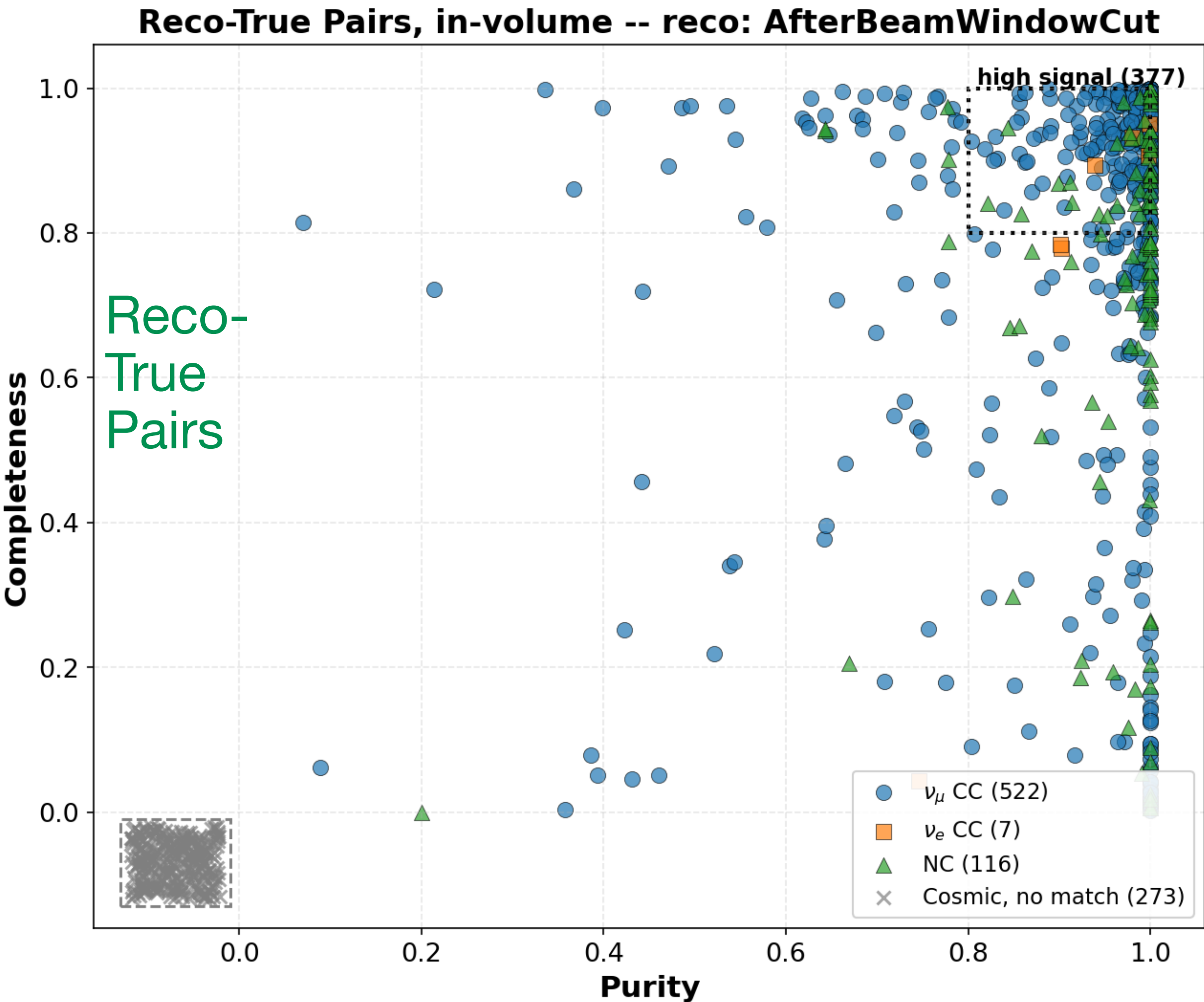
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- What we are actually interested is in knowing the composition of our selected reco clusters

Reco to True Matching

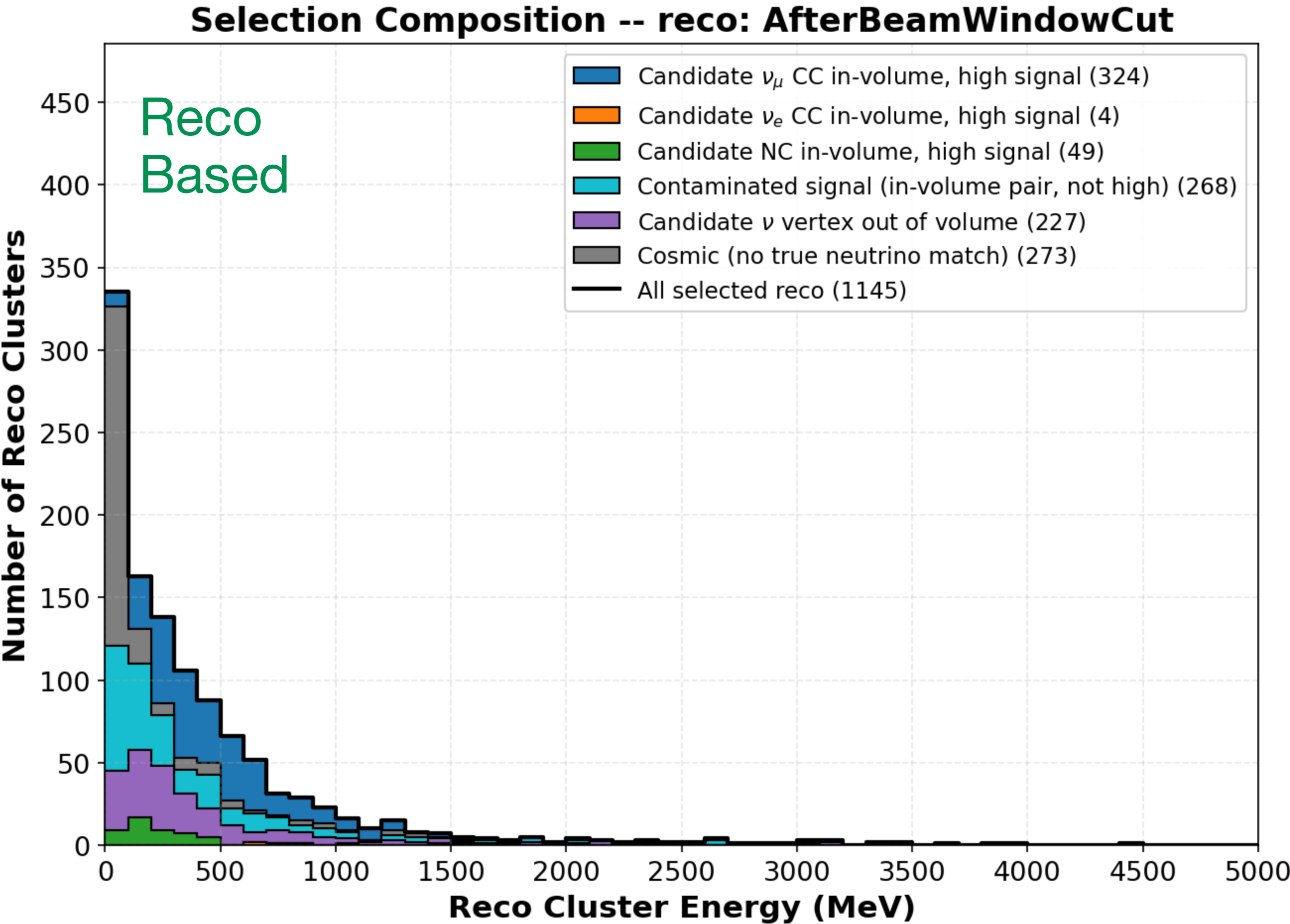
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- To know composition of selected reco clusters we make use of their matching to true clusters
- If a reco is not matched to any true neutrino we classify it as cosmic
- If one reco matches to one true neutrino, we pair them and then using true information, we can know if reco cluster is in-volume or out-volume and of which flavor ν_μ CC, ν_e CC, and NC
- If one reco matches to more than one true then we pair reco-true clusters based on maximum purity
- Then we define >80% completeness and >80% purity region as high signal region
- The rest of the region is declared as contaminated + incomplete signal region

Selected Reco Clusters

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- This procedure helps as to classify each selected reco cluster
- We are most interested in in-volume high-signal region which will be our selected signal
- Other categories are background
 - contaminated + incomplete clusters
 - Out-of-volume
 - Cosmic
- Top line of selected reco clusters shows that no reco cluster was left behind and all reco clusters were categorized

Selection Efficiency

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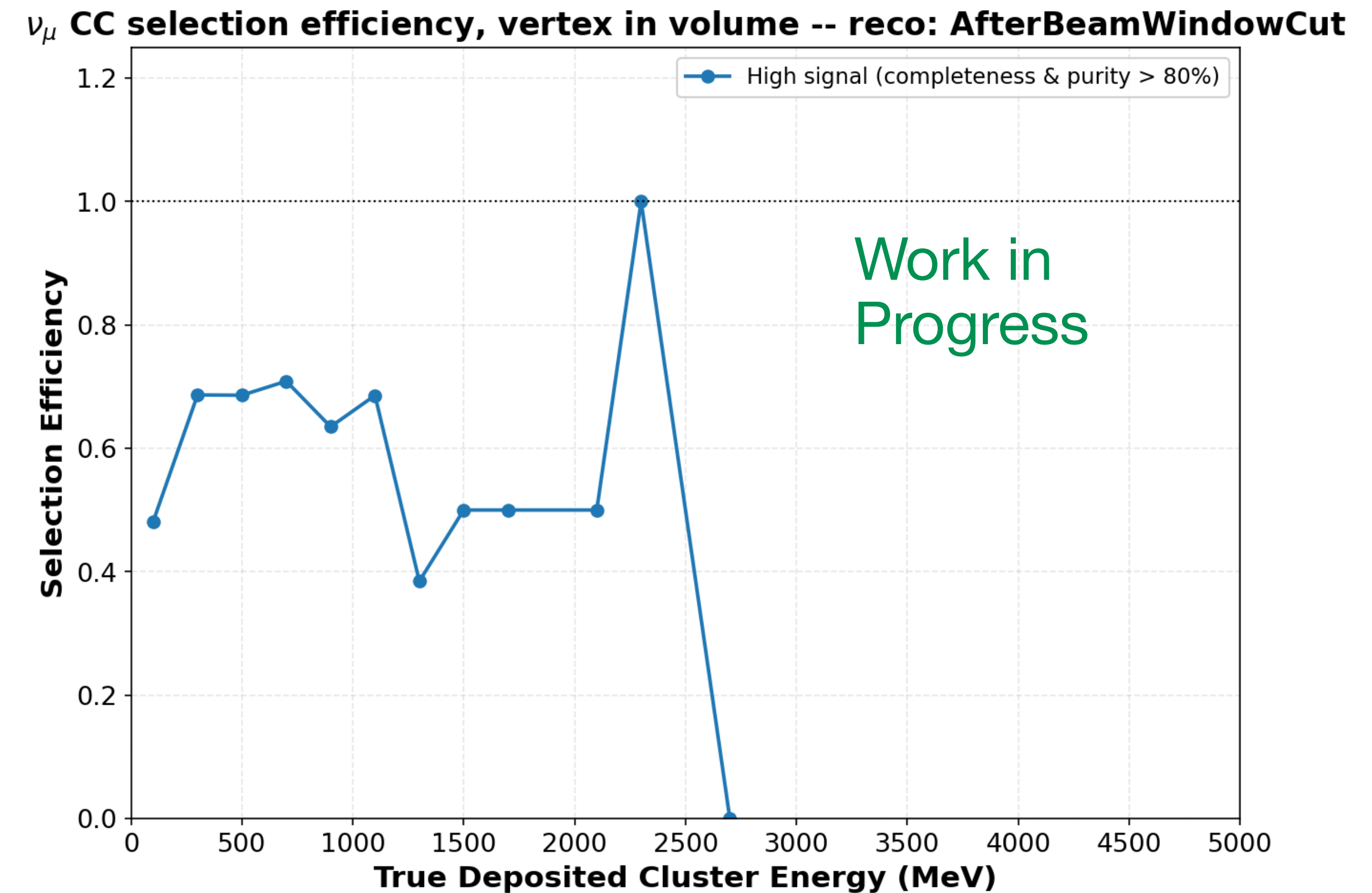
- Next step is to understand the selection efficiency
 - For signal ν_{μ} CC we want to answer; How many ν_{μ} CC interactions are selected in good reconstruction region

$$\epsilon = \frac{\nu_{\mu} CC \text{ in-vol in good reconstruction area (>80\% completeness and >80\% purity)}}{\text{true } \nu_{\mu} CC \text{ in-volume neutrinos}}$$

Selection Efficiency

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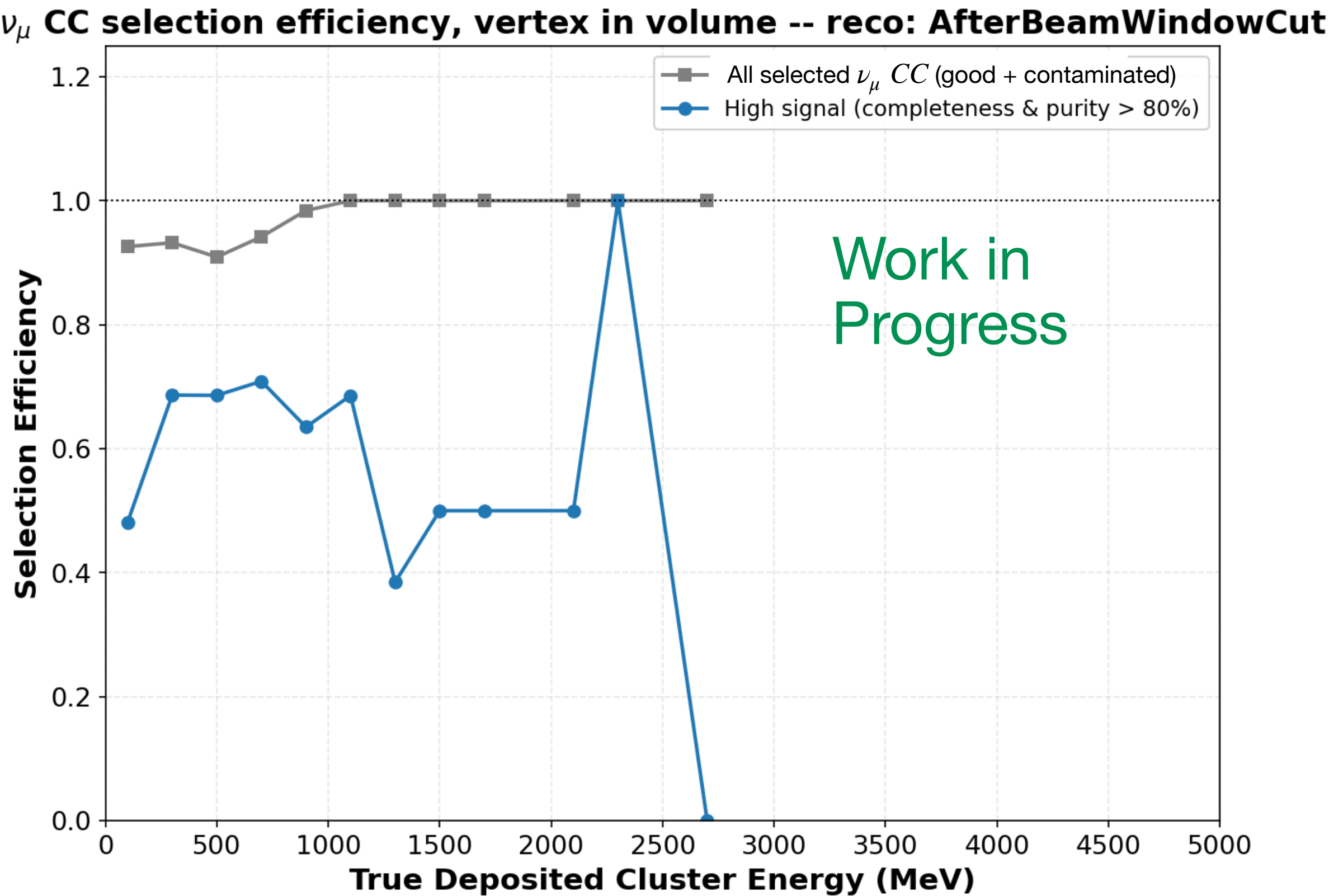


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Selection Efficiency

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- It is a work in progress to understand our selection efficiency for selecting ν_μ CC



$$\epsilon = \frac{\nu_\mu \text{ CC in-vol in good reconstruction area } (>80\% \text{ completeness and } >80\% \text{ purity})}{\text{true } \nu_\mu \text{ CC in-volume neutrinos}}$$

Conclusions

- We are in a very good stage now to understand what we select as reconstructed clusters
- This takes us a step forward to physics analysis, and higher production
- It is a work in progress to understand our selection efficiencies for ν_μ CC , ν_e CC , and NC interaction

Backup