RHC Paired Dataset Validation

Colin Weber, Alex Wilkinson
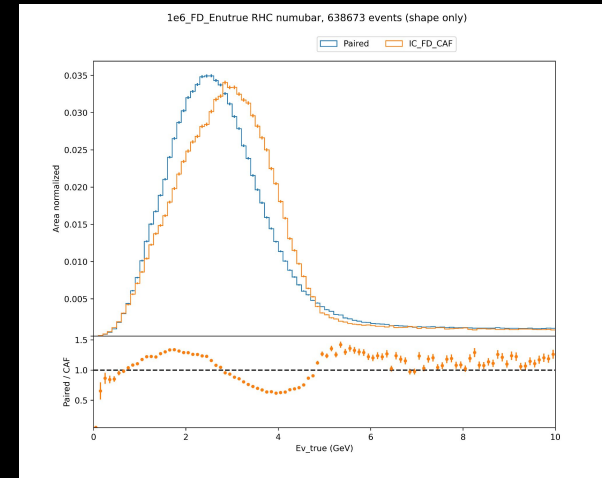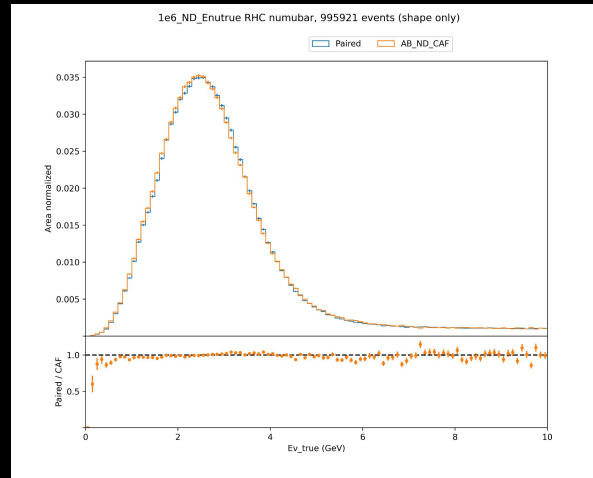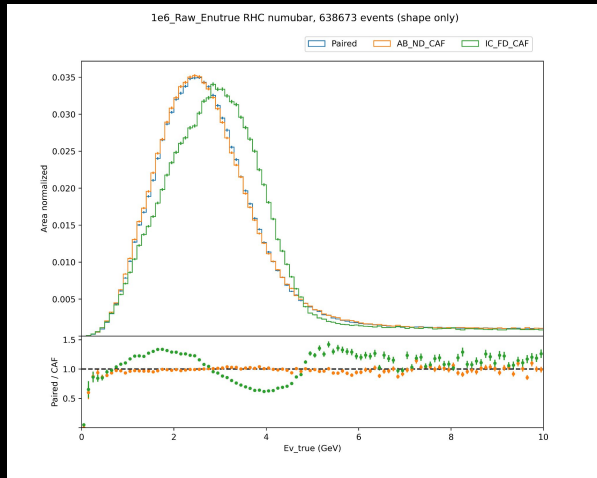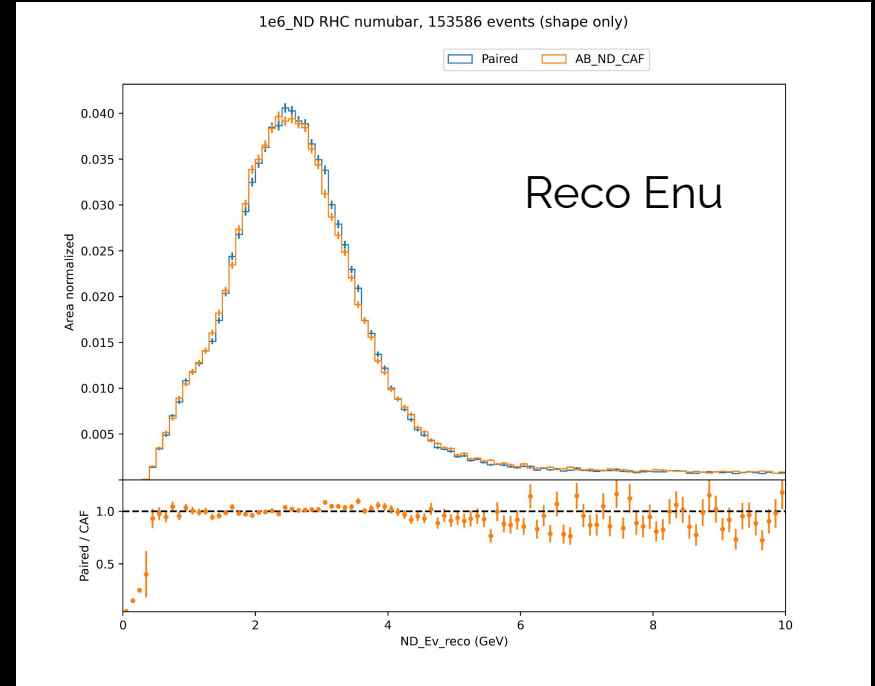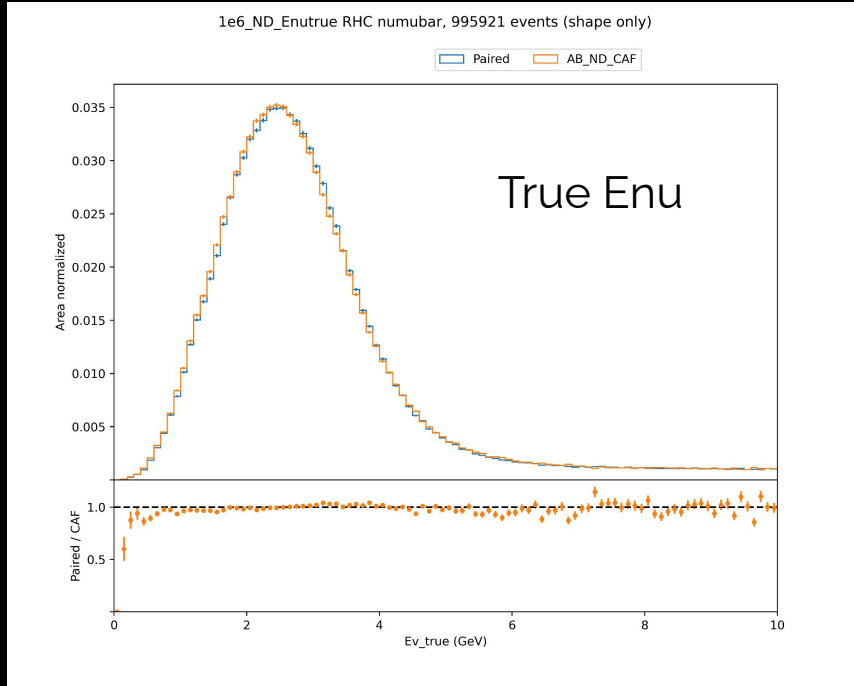
Neutrino energy

Enu_true

TrueNuPDG cut on CAF
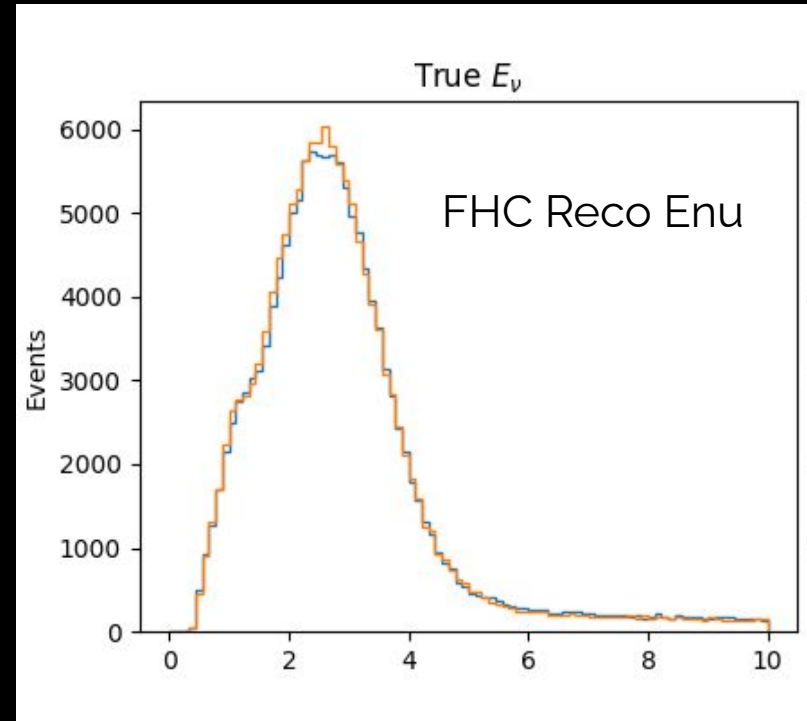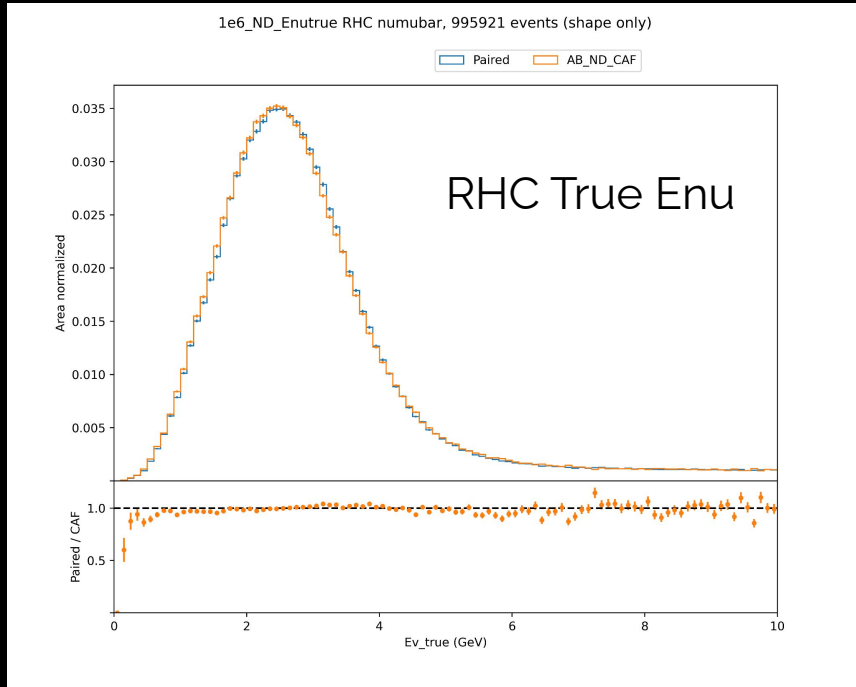
ND PRISM cuts

FD PRISM cuts

As with FHC, FD CAF spectra is at higher energies b/c it's more on-axis

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Paired Dataset Update
30 October 2024

ND Enu True and Reco

1e6_ND_Enutrue RHC numubar, 995921 events (shape only)

True Enu

1e6_ND RHC numubar, 153586 events (shape only)

Reco Enu

Both w/ ND PRISM cuts applied. See slightly less of a shoulder relative to FHC

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ND Enu True and Reco

1e6_ND_Enutrue RHC numubar, 995921 events (shape only)

RHC True Enu

FHC Reco Enu

Both w/ ND PRISM cuts applied. See slightly less of a shoulder relative to FHC

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Paired Dataset Update
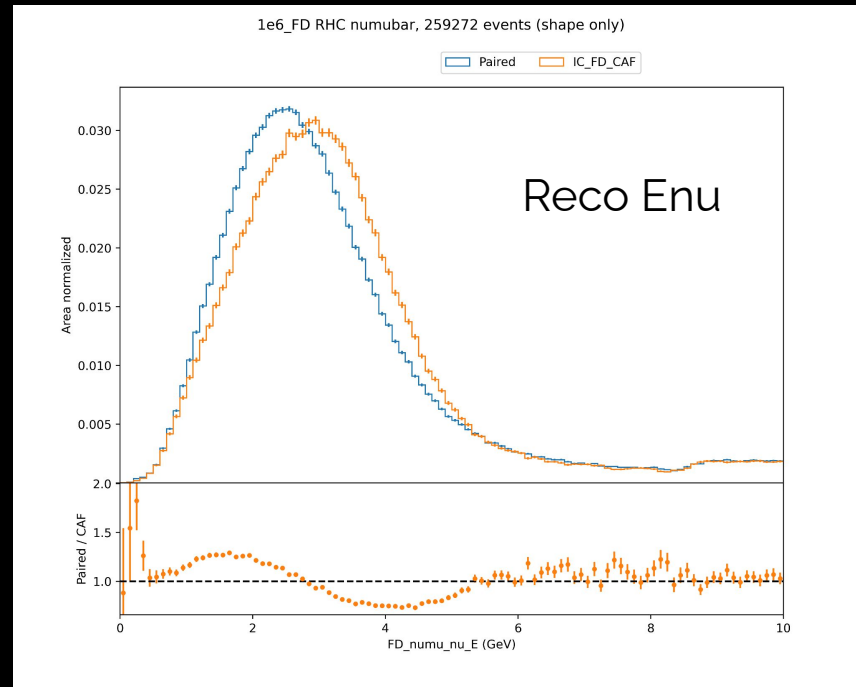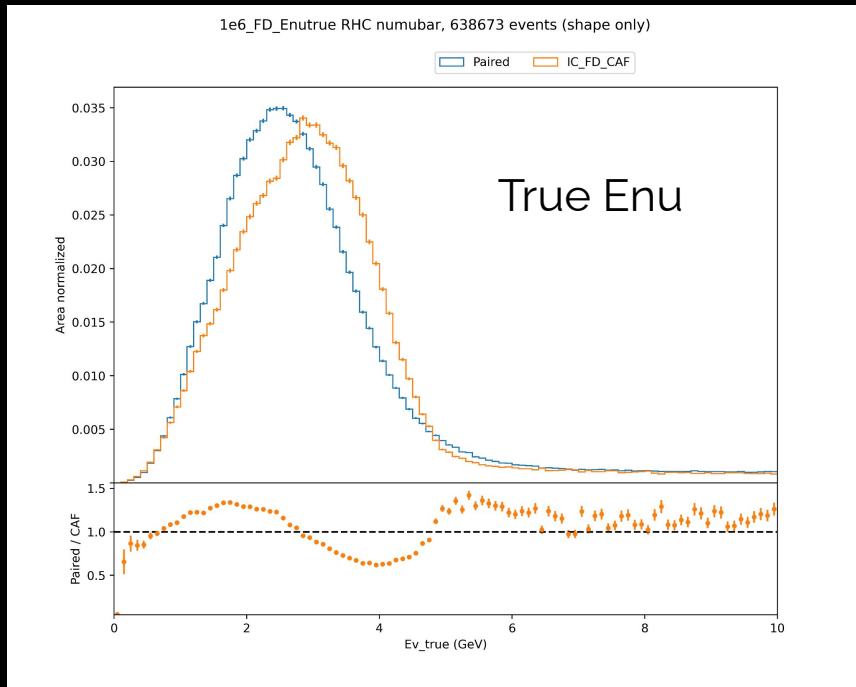30 October 2024

ND Enu True vs Reco

Column-normalized

Seem to be getting slightly better reconstruction in the paired dataset?

1e6_ND RHC numubar, 153586 events
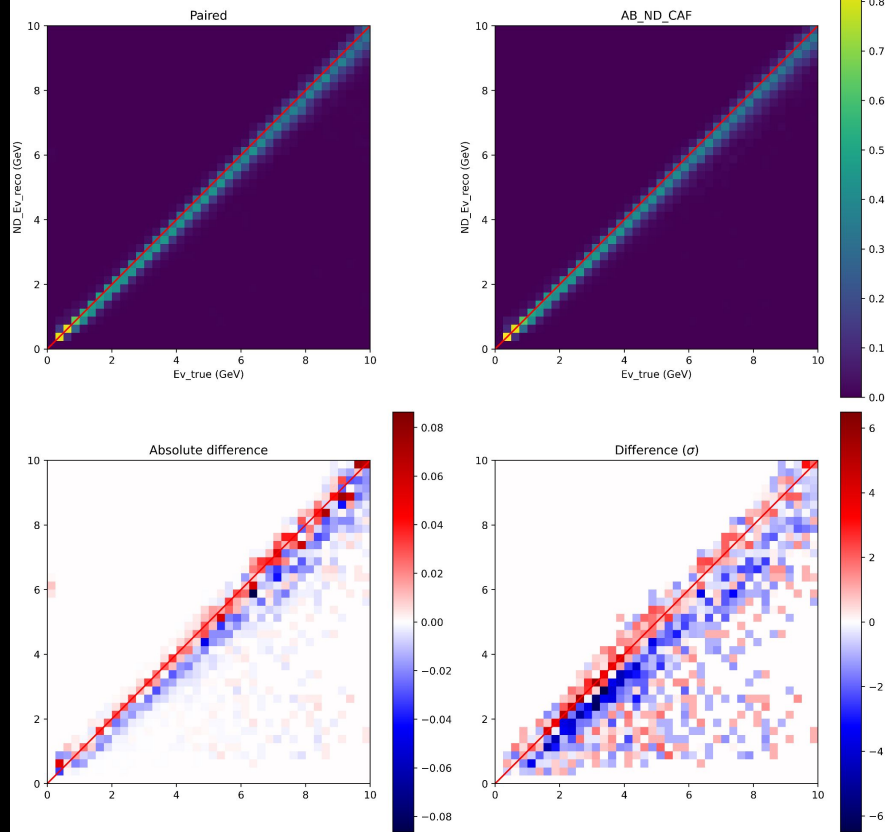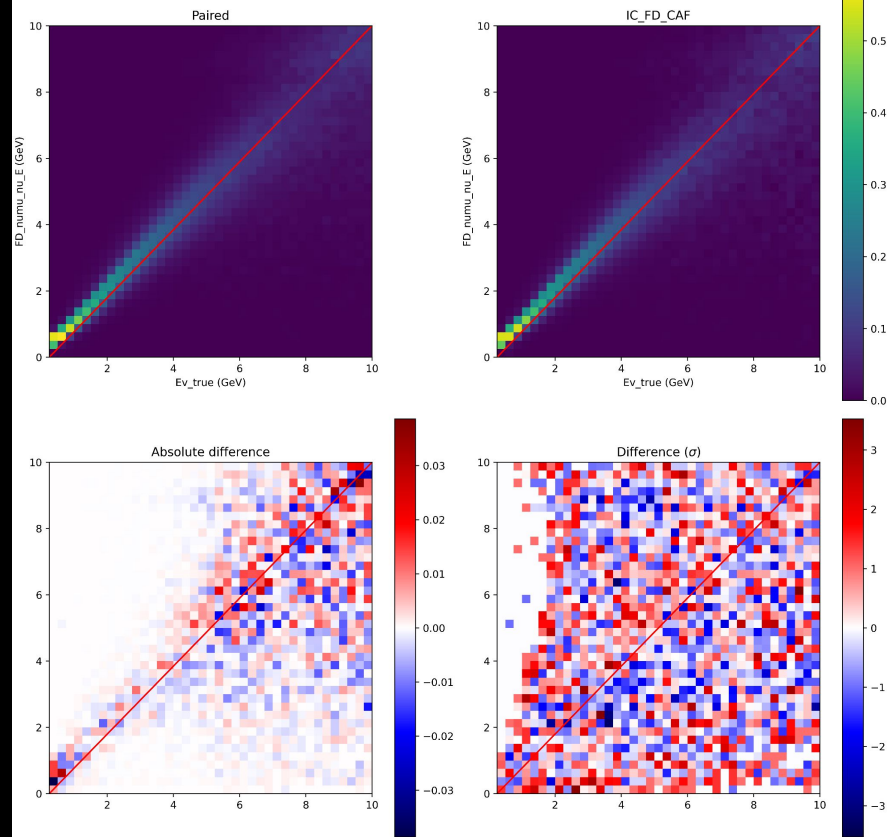
FD Enu True and Reco

True Enu

Reco Enu

Both w/ FD PRISM cuts applied. Need to check why # events are different
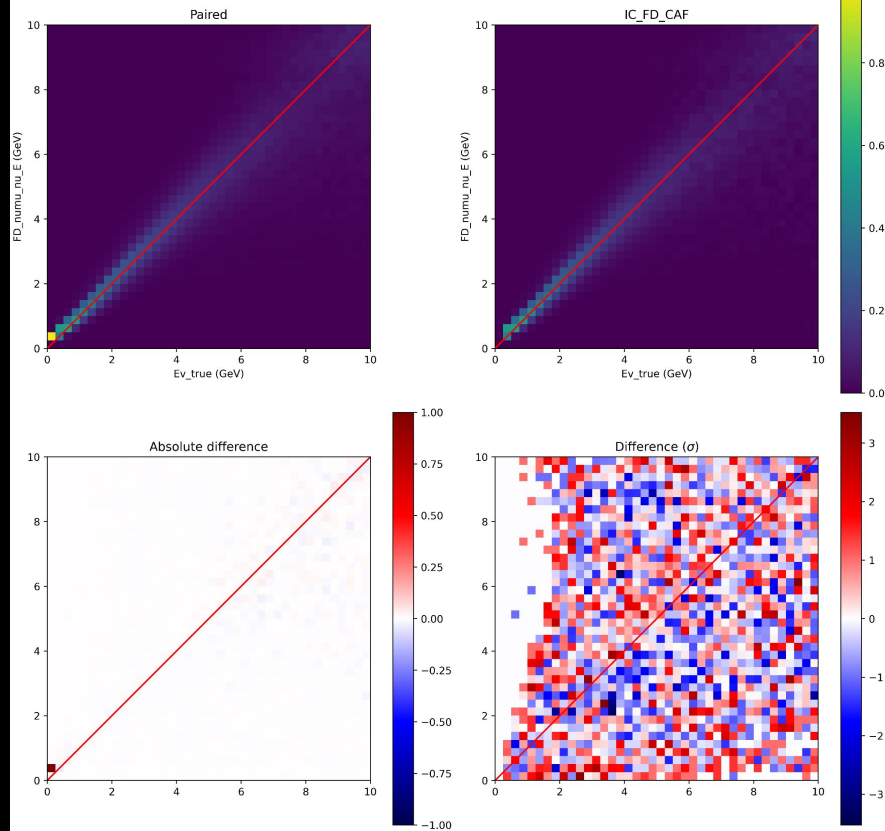
FD Enu True vs Reco

Column-normalized

Reconstruction is the same
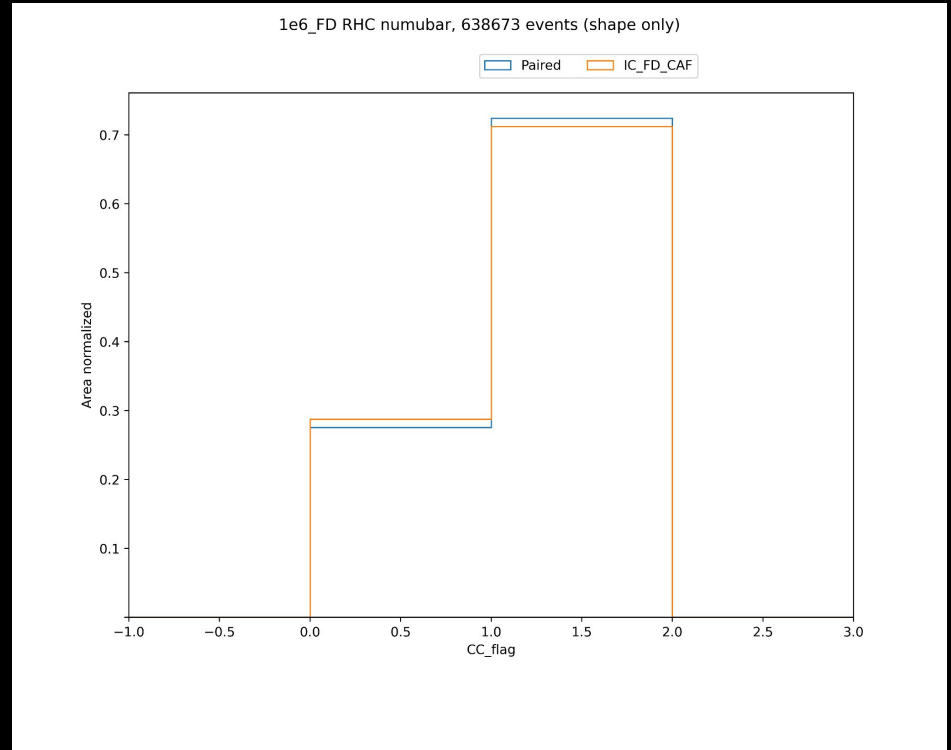within statistical differences…

FD Enu True vs Reco

Column-normalized

Reconstruction is the same within statistical differences…. except for different handling of Ev_true < 0.25 MeV
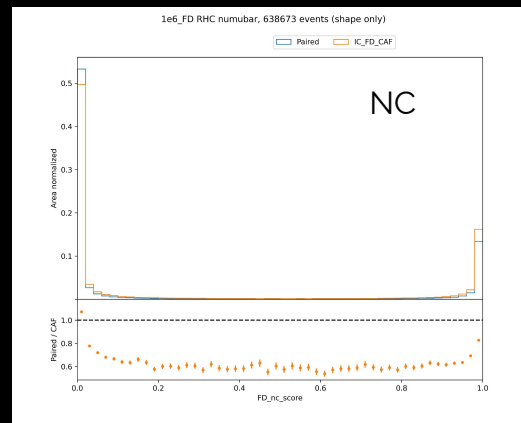

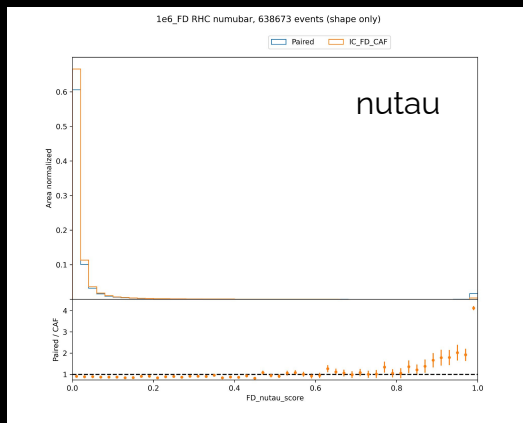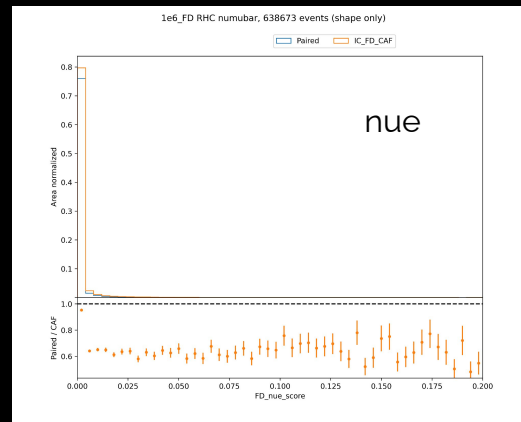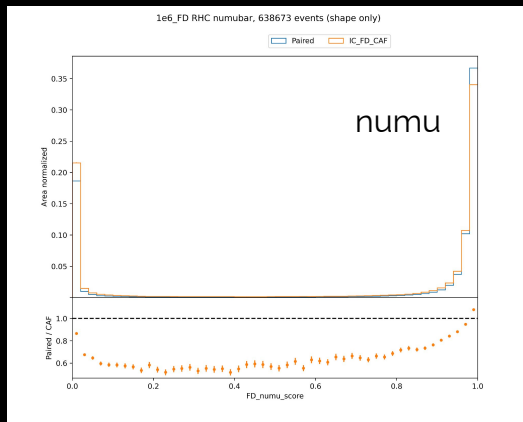1e6_FD RHC numubar, 259272 events

FD CVN event classification scores

Working with roughly the same ratio of CC to NC events

Area normalized across entire range. CVN score allowed to be in [0, 1] U -2.5, where -2.5 is the 'failure' mode.

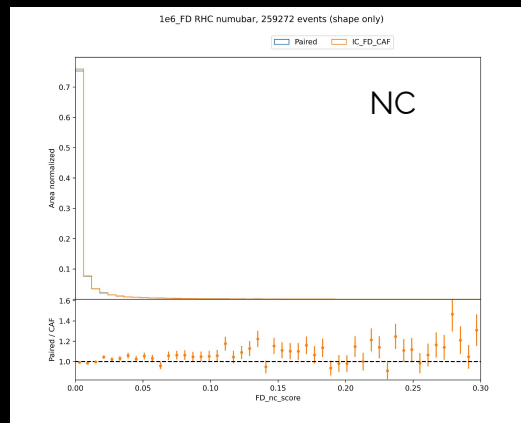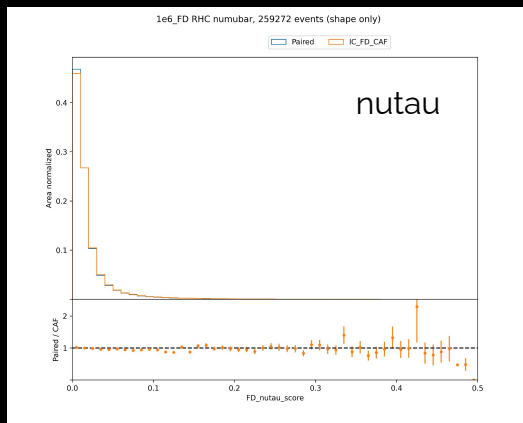Paired dataset has fewer events in [0, 1] range => more failures

No Cuts

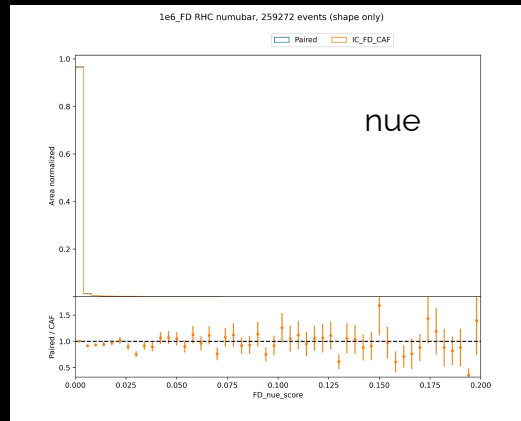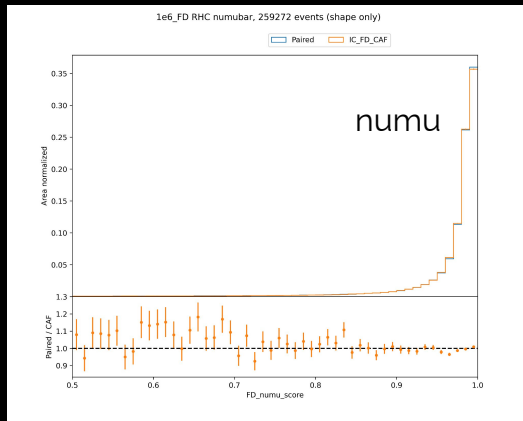(w/ FD PRISM cuts on next slide)

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Cuts get rid of CVN failures.

Only non-zero ranges shown.

Cuts include:
Numu > 0.5
Nue < 0.85

FD PRISM cuts

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Backup

Cuts

- True Flavor: TrueNuPDG == -14
- ND quality
  - Vertex in fiducial volume as defined by PRISM analysis
  - Identified as numubar (reco_numu == 1)
  - Muon contained in NDLar OR tracker-matched
- FD quality
  - Vertex in fiducial volume as defined by PRISM analysis
  - Numu score > 0.5
  - Nue score < 0.85

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