

# Status of ND+FD fits in CAFAna

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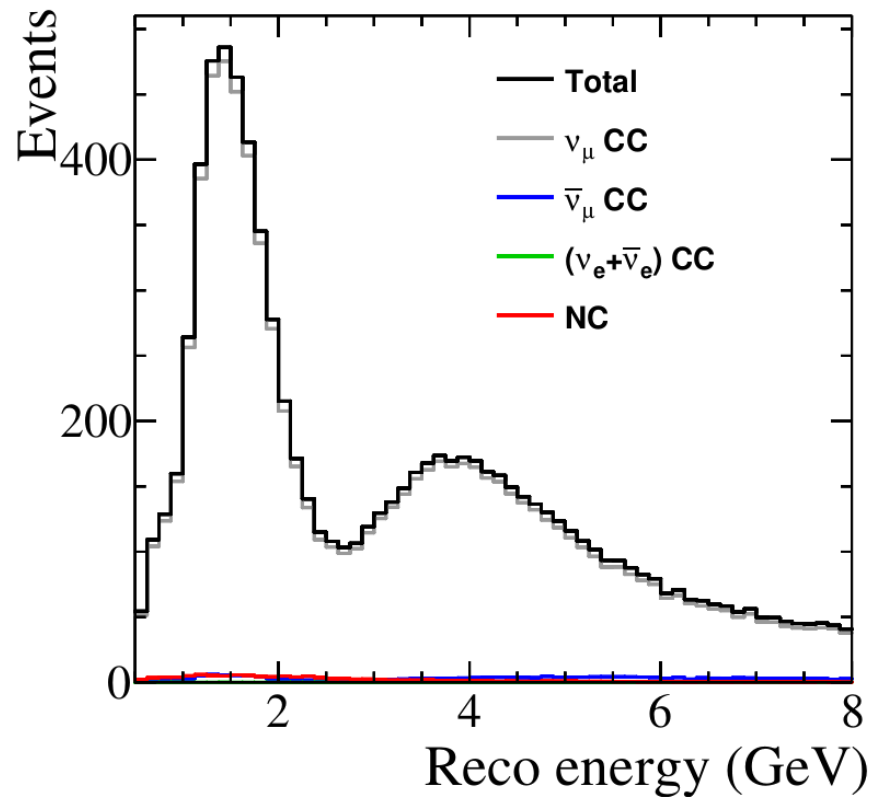
## General status of the fits

- ▶ Have initial ND (on-axis) and FD fits working with current version of CAFAna and the latest input files from Chris M
- ▶ Only basic flux uncertainties included for initial tests
- ▶ Still need to produce some other plotting scripts and scripts to properly parallelize jobs (this week), to produce TDR placeholders
- ▶ Then I should be ready to add more systematics etc

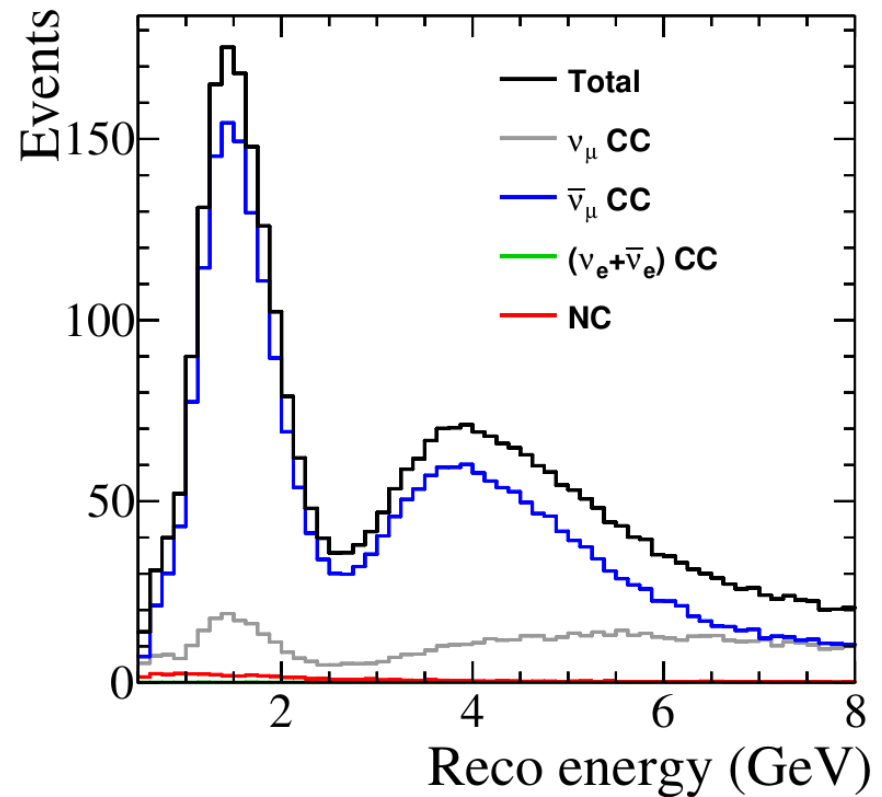
## Input samples

- ▶ Include 6 samples in the fits (rates for NH and  $\delta_{CP} = \pi/2$ , 3.5 years nominal FV):
  - ▶ FD FHC Nue (1336)
  - ▶ FD FHC Numu (8705)
  - ▶ FD RHC Nue (478)
  - ▶ FD RHC Numu (3393)
  - ▶ ND FHC (56.93M)
  - ▶ ND RHC (22.70M)
- ▶ Breakdown etc on the following slides.
- ▶ Note that for these numbers and the sample plots, Elizabeth's FV fix is in for the FD. But **not** for the example fits because of the time to re-run them

## FD numu samples



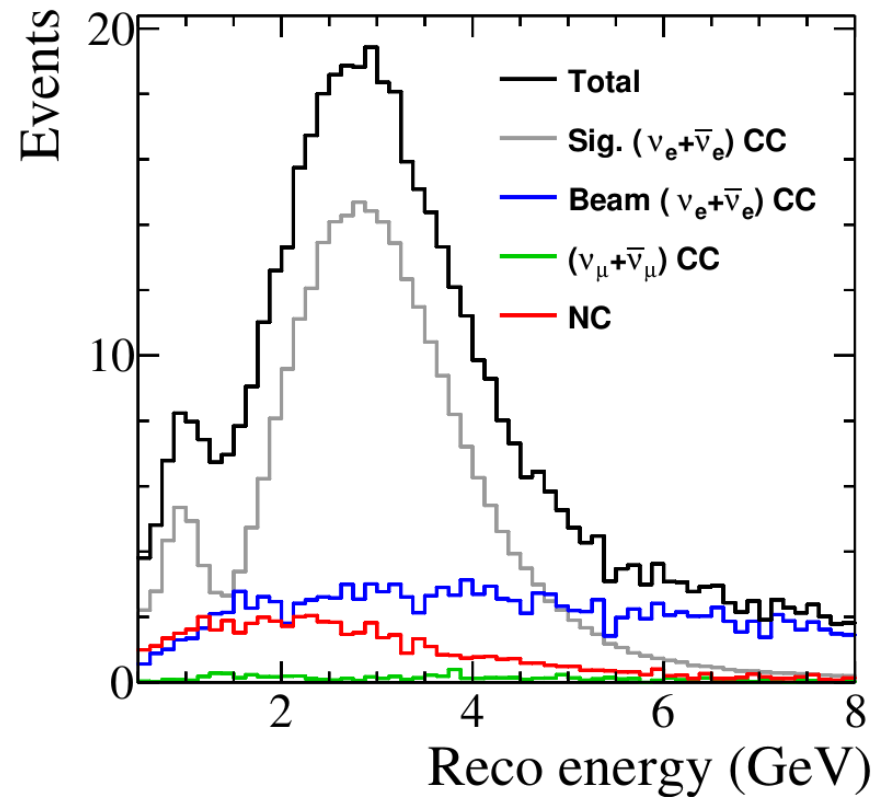
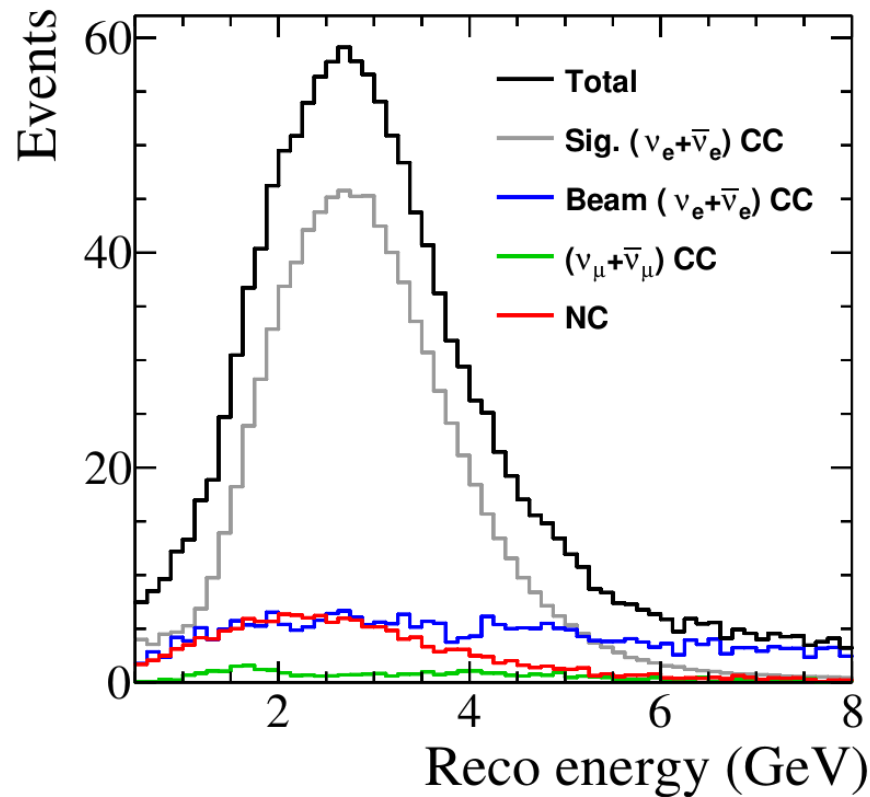
FHC



RHC

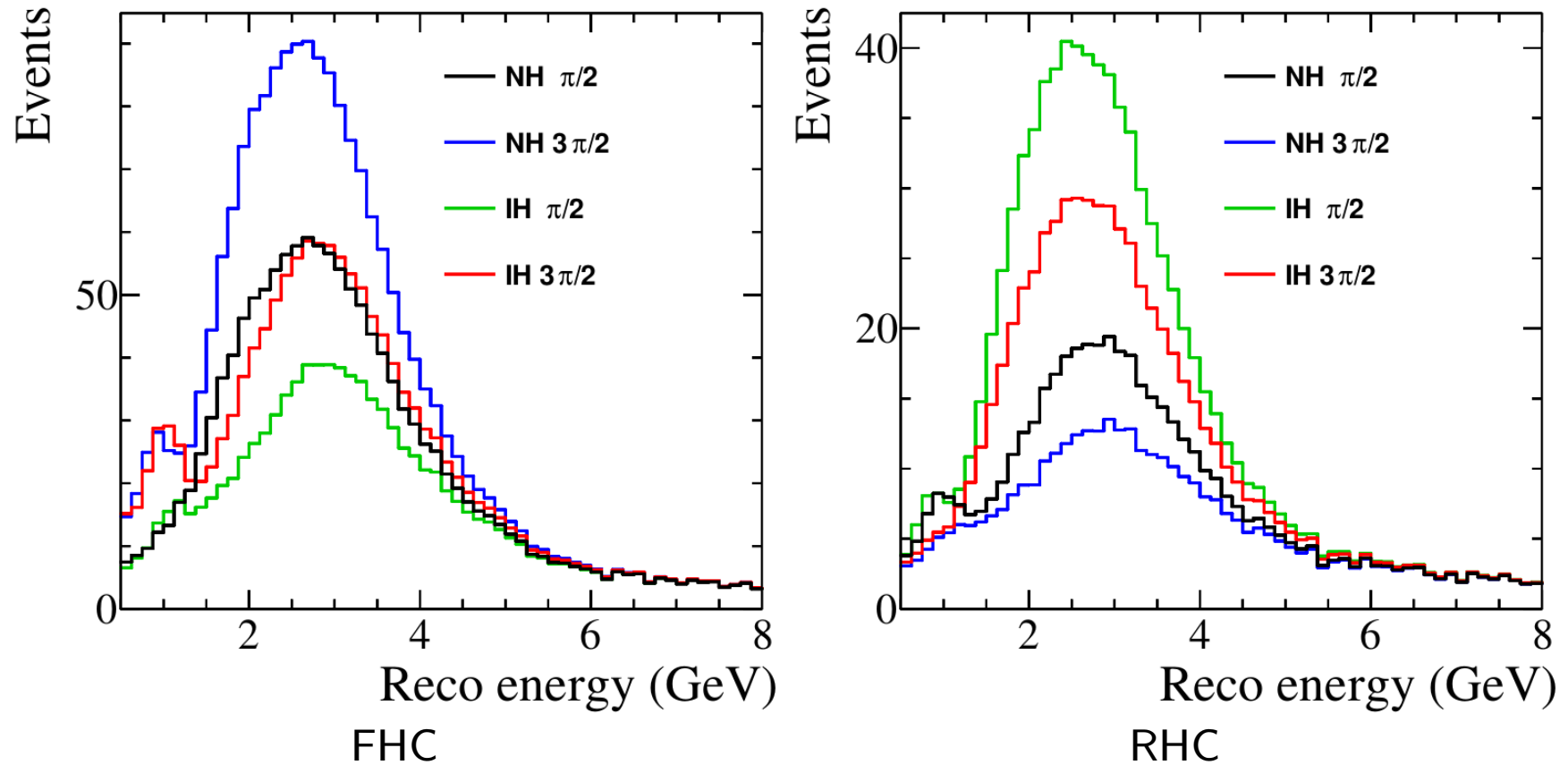
- ▶ Cuts:
  - ▶ Numu CVN  $\geq 0.7$
  - ▶ Numu MVA  $\geq -2$  (mock up FV cut)
- ▶ Note that all components are not stacked

## FD nue samples



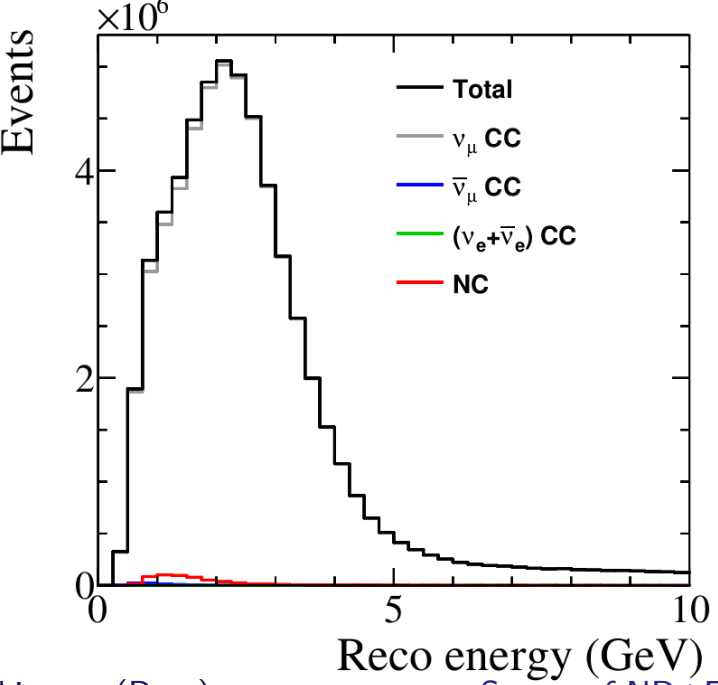
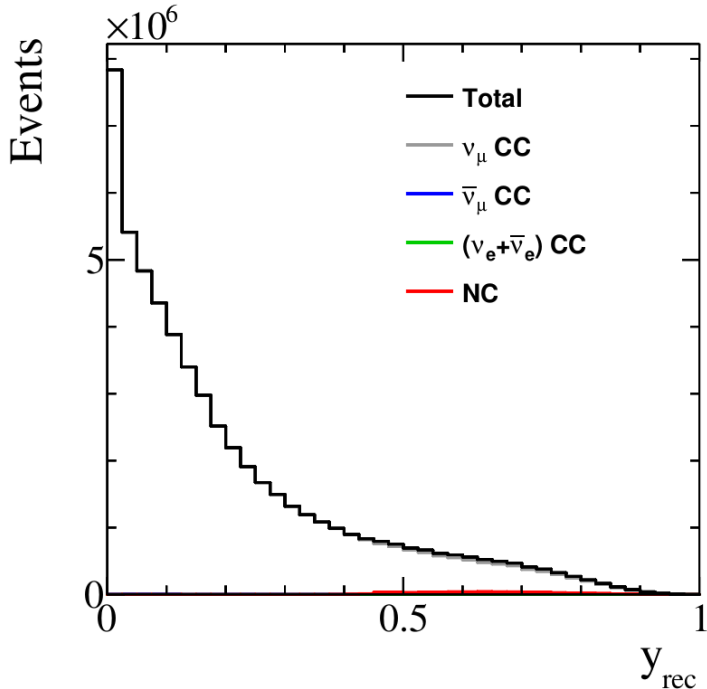
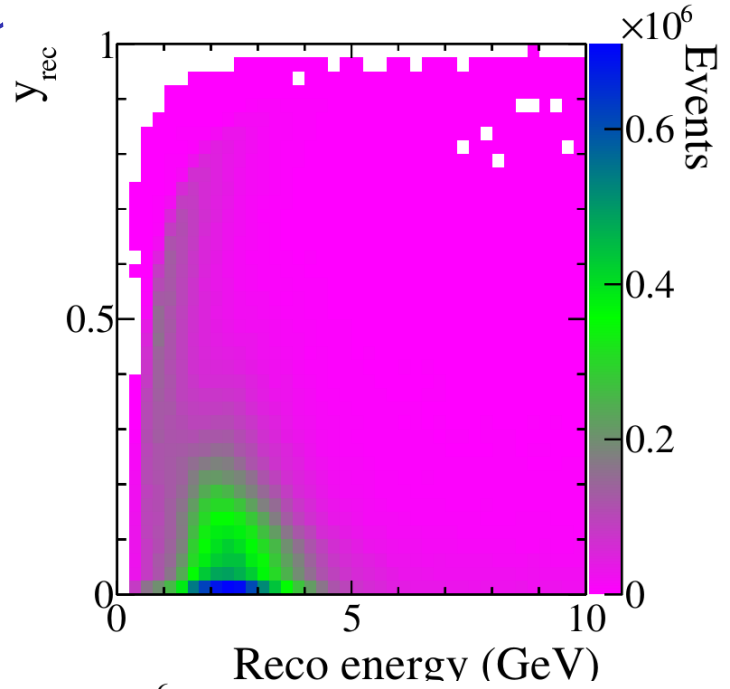
- ▶ Cuts:
  - ▶  $N_{ue} CVN \geq 0.7$
  - ▶  $N_{umu} MVA \geq -2$  (mock up FV cut – Elizabeth, is this correct???)
- ▶ Note that all components are not stacked

# FD nue samples



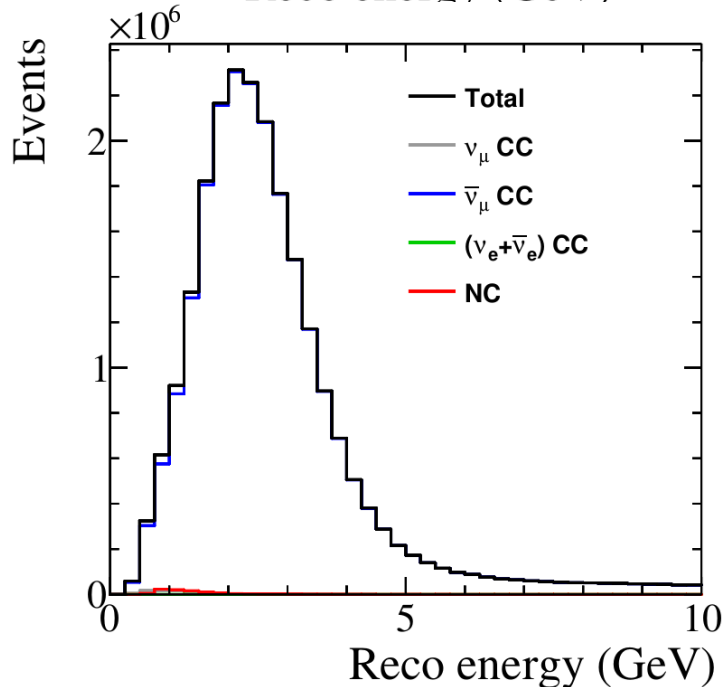
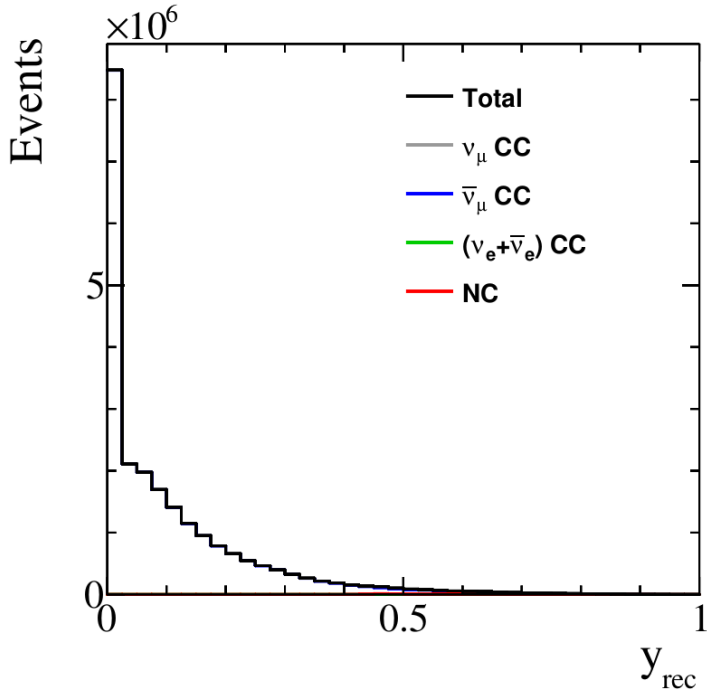
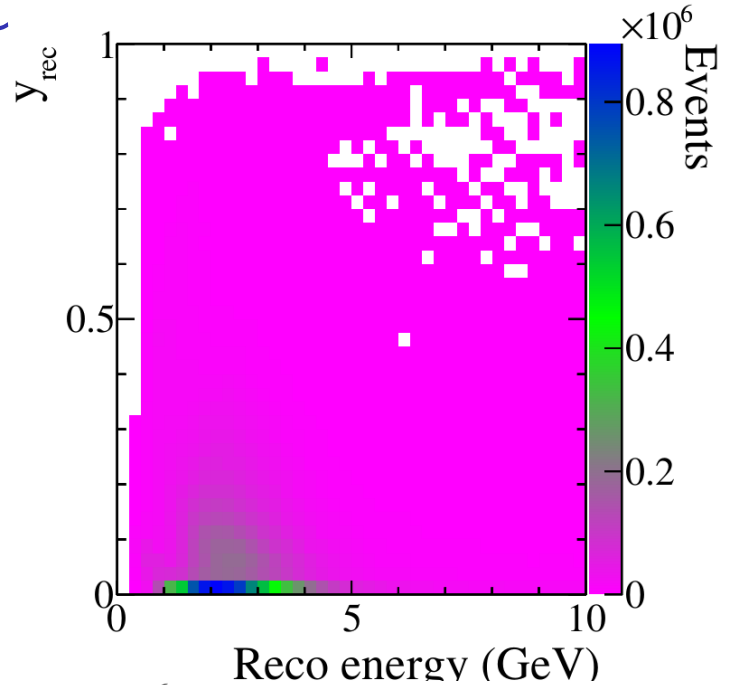
- ▶ Same cuts as before, but with different oscillation parameters

# ND FHC



- ▶ Cuts from Chris M
- ▶ Well reconstructed, correct sign muon (`reco_numu == 1 && reco_q == ± 1 && muon_exit == 0`)
- ▶ Well reconstructed hadronic system (`Ehad_veto < 30`)

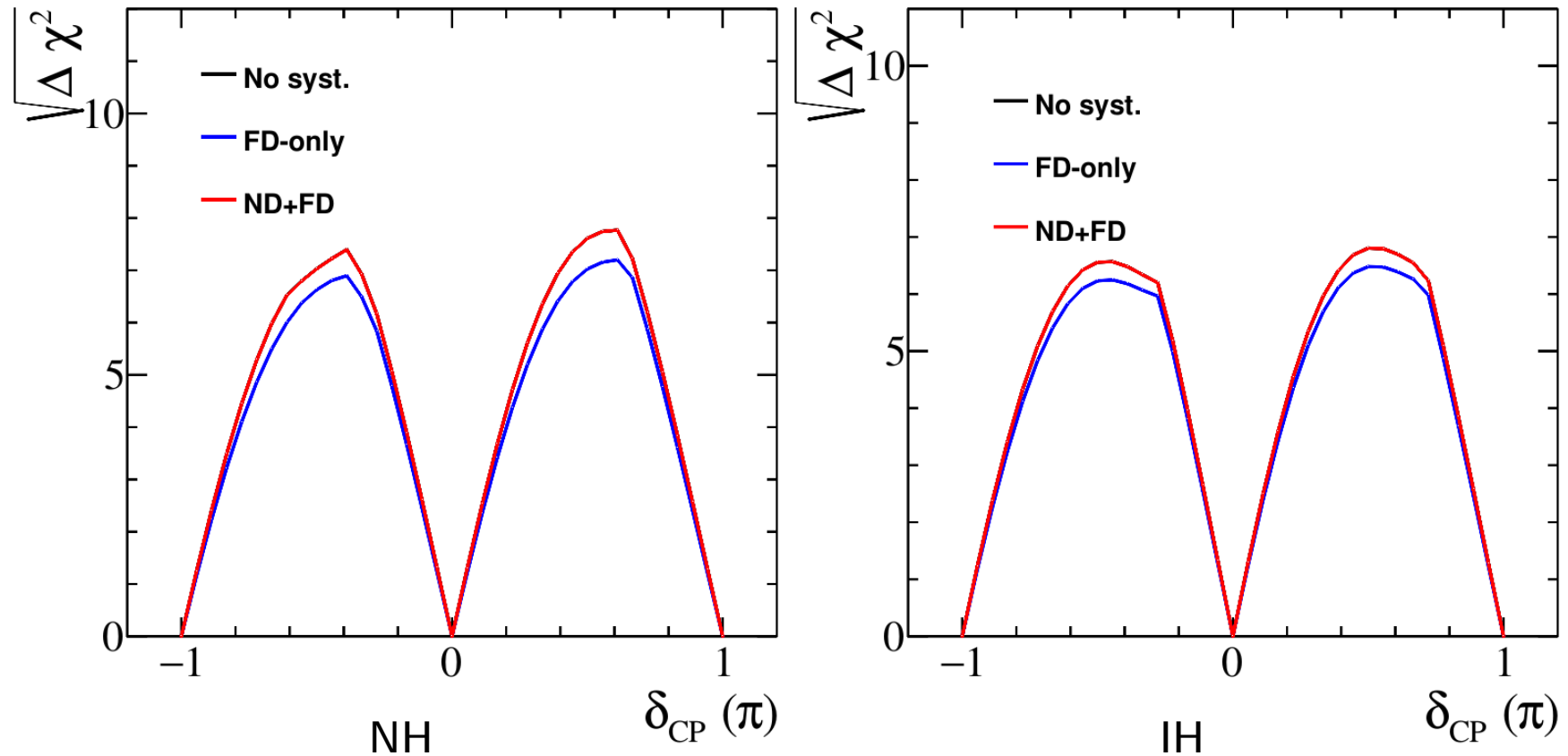
# ND RHC



- ▶ Cuts from Chris M
- ▶ Well reconstructed, correct sign muon (`reco_numu == 1 && reco_q == ± 1 && muon_exit == 0`)
- ▶ Well reconstructed hadronic system (`Ehad_veto < 30`)

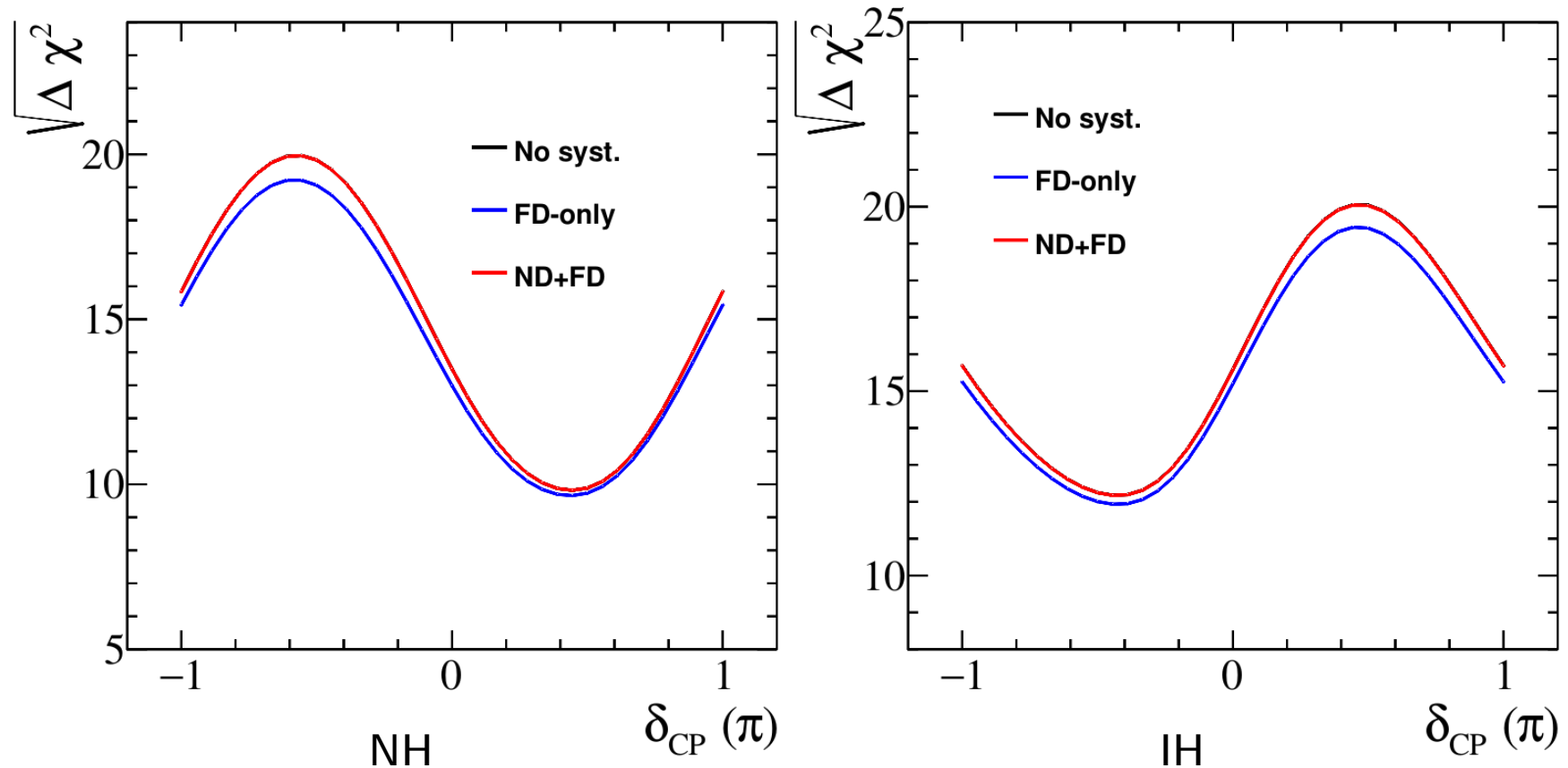


## Quick fits with the new CAFs



- ▶  $\delta_{CP}$  discovery potential for both hierarchies
- ▶ Use OA parameters given by “NuFitOscCalc” (same as CDR?), and apply penalty based on best fit world values using “Penalizer\_GlbLike” (also same as TDR?)
- ▶ Black line is basically under the red line, unsurprising given the limited systematics

## Quick fits with the new CAFs



- ▶ Hierarchy discovery potential, shown as a function of  $\delta_{CP}$  for both hierarchies
- ▶ Seems very strong... but maybe unsurprising given the penalty on OA parameters in the fit?
- ▶ I'm not too concerned about anything so far...

## Potentially stupid questions I have

- ▶ What's the DUNE<sub>Erw</sub> status? What uncertainties should be possible to include with the current files?
- ▶ What additional samples should I think about adding for the on-axis ND? (Probably directed at Chris M)
- ▶ Any obvious mistakes?

# Backup