A beam monitoring fake data sample to LBL

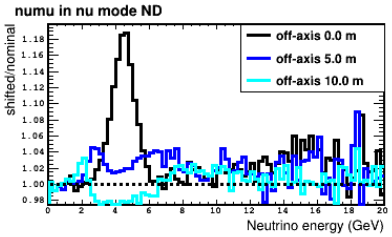
Guang Yang

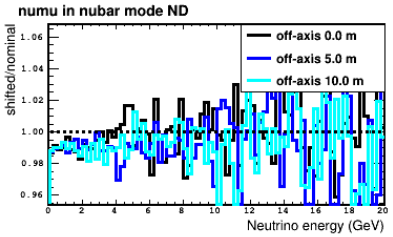
Introduction

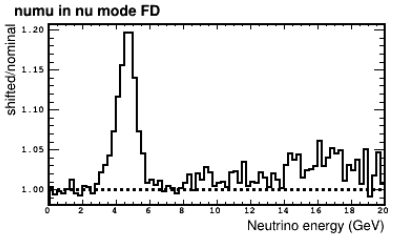
- In collaboration with LBL group, provide them a fake data sample indicating the importance of the beam monitoring
- LBL fitting framework mainly performs on-axis analysis currently
- We need assumption: when Lar on-axis (50% of time), beam does not change and when it goes off-axis, horn current has 3 sigma changes and Lar cannot detect it.
- This means we shift the FD sample but not shift the ND on-axis sample and do the fit

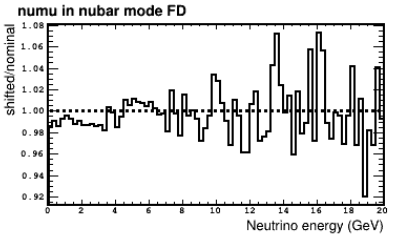
Beam change : 3 sigma HC

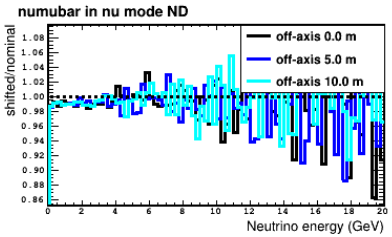
- On-axis shifts are dials in fitting framework
- We can’t see it off-axis

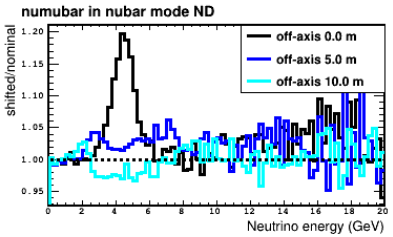


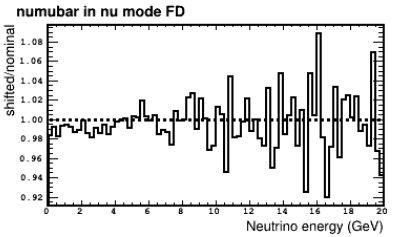


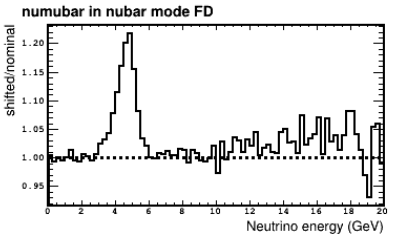


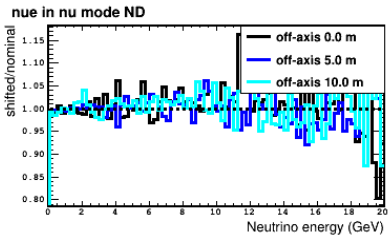


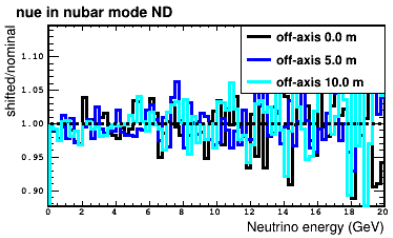


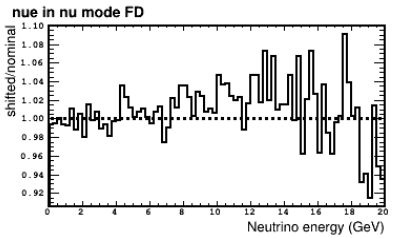


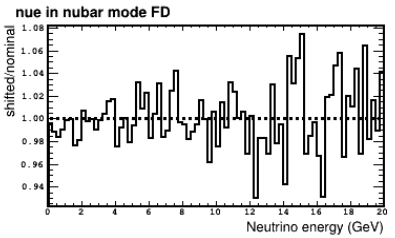


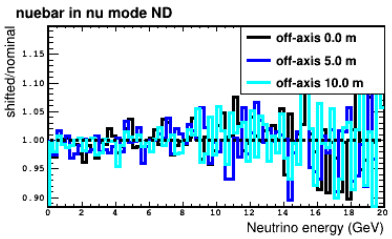


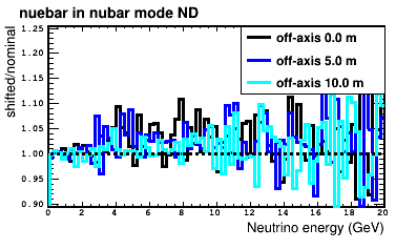


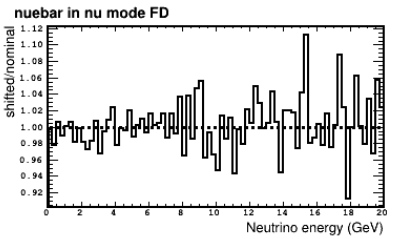


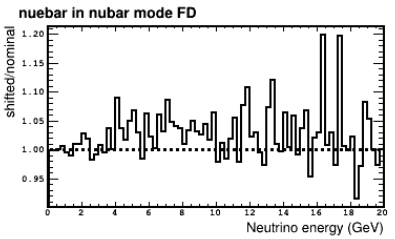










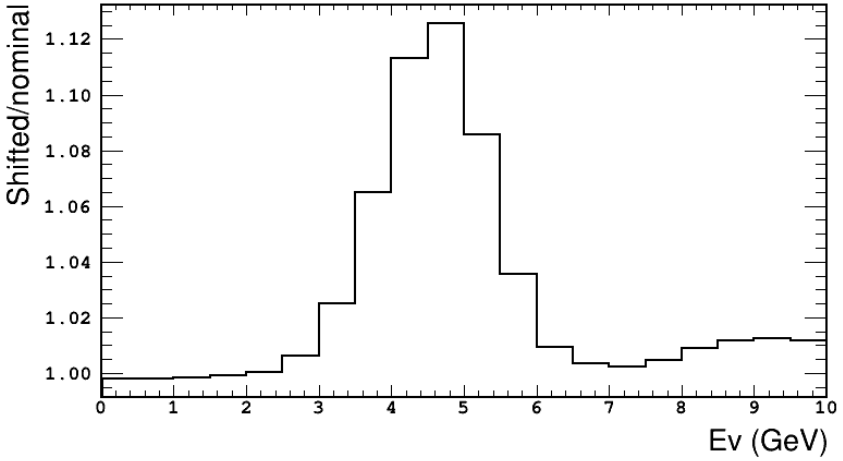


Implementation

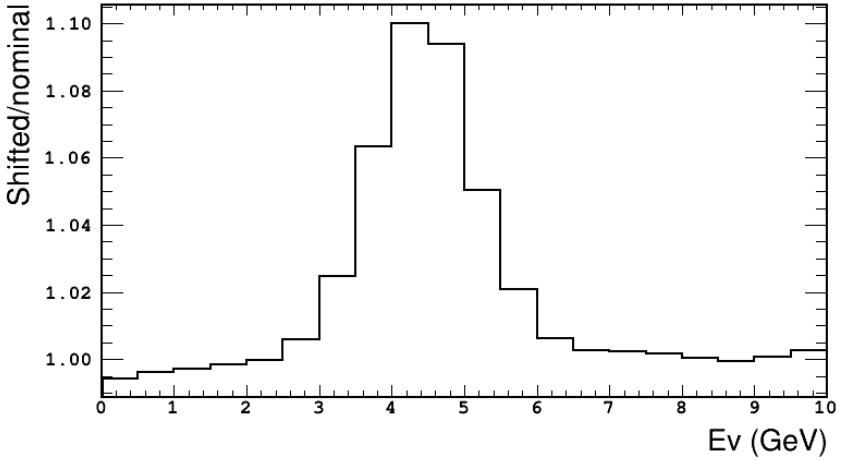
- Cafana
- Based on the spectrum distortions, Chris Marshall provided caf trees containing wights of 1 sigma change of above flux variation.
- Use the analogy of “missing proton fake data” to implement this dial: the weights can be added in the list of syst., then GetCrazyFluxFakeDataSyst() provides shift on predicted spectrum.

Caf file check

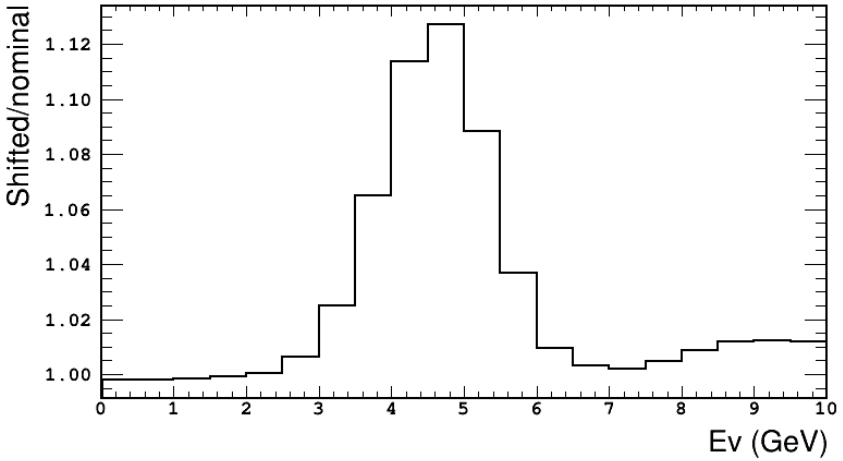
FHC nonswap



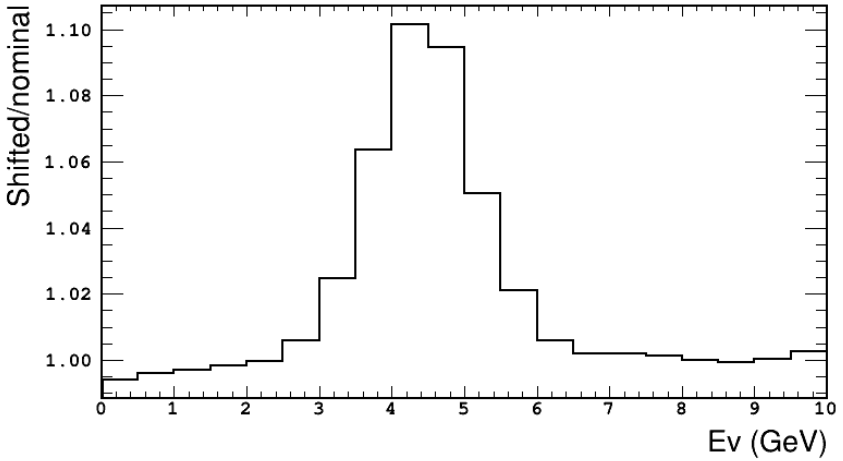
RHC nonswap



FHC nueswap



RHC nueswap



Cafana setup

- Basic setup:

  - 7 years POT (FHC + RHC)

  - fitting six samples: ND FHC RHC numu, FD FHC RHC numu, FD FHC RHC nue

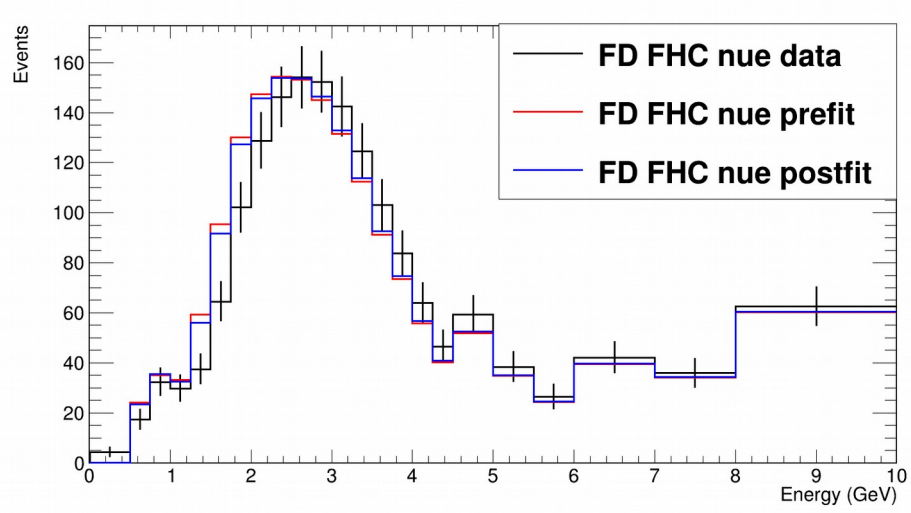
  - no sysetmatics so far: ND does nothing

  - With background but doing nothing as well because of the absence of systematics

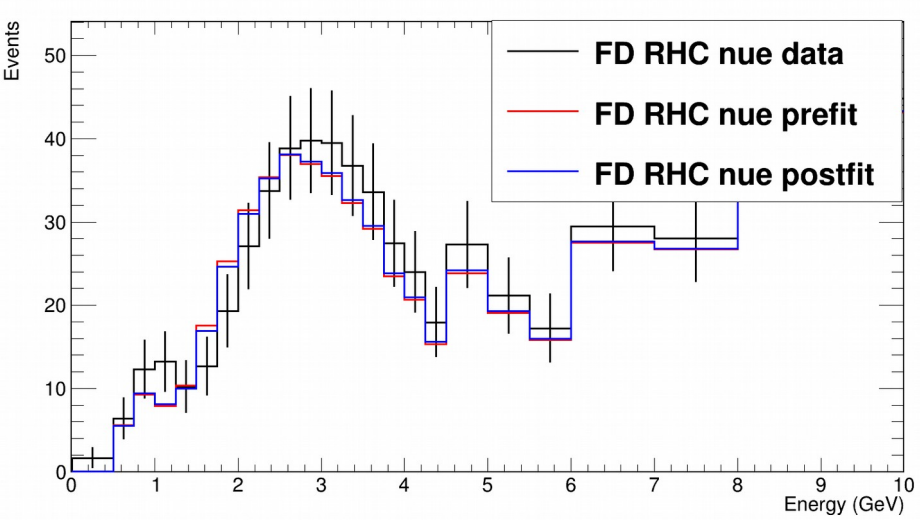
  - half of the time HC has 3 sigma shift for FD

FD Spectra

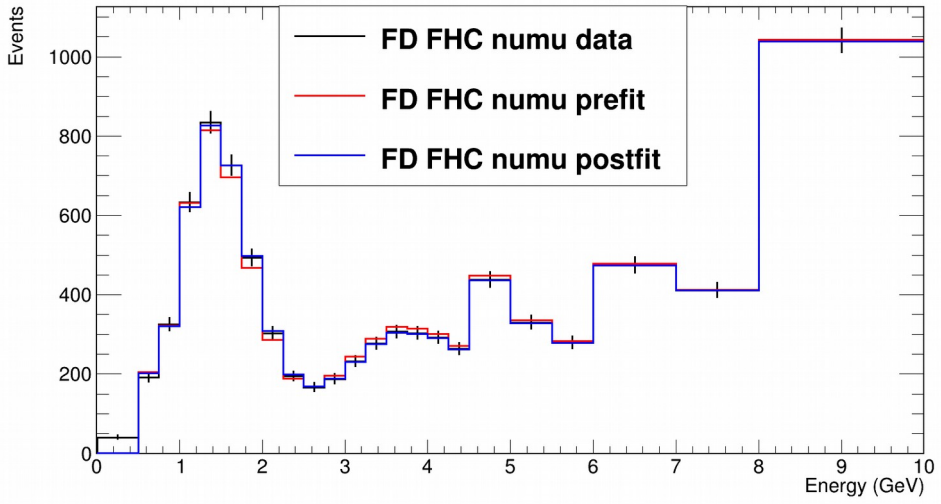
FHC nue



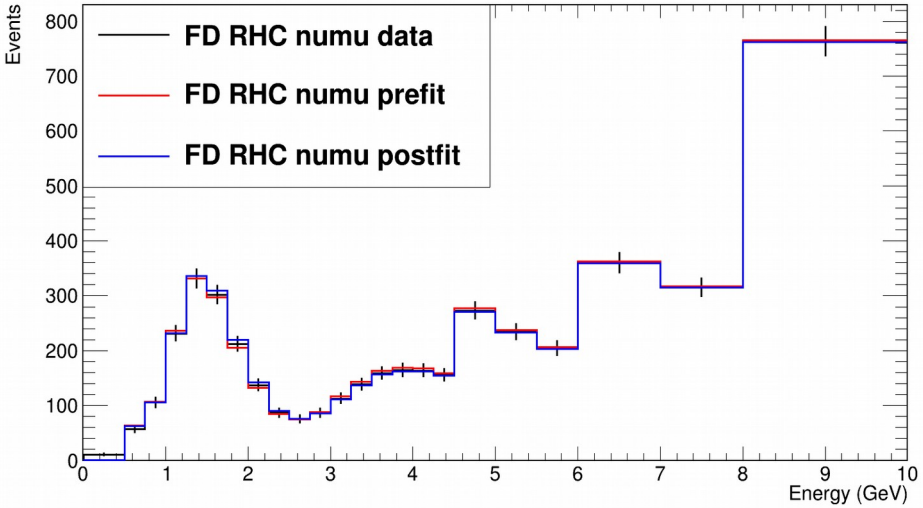
RHC nue



FHC mumu

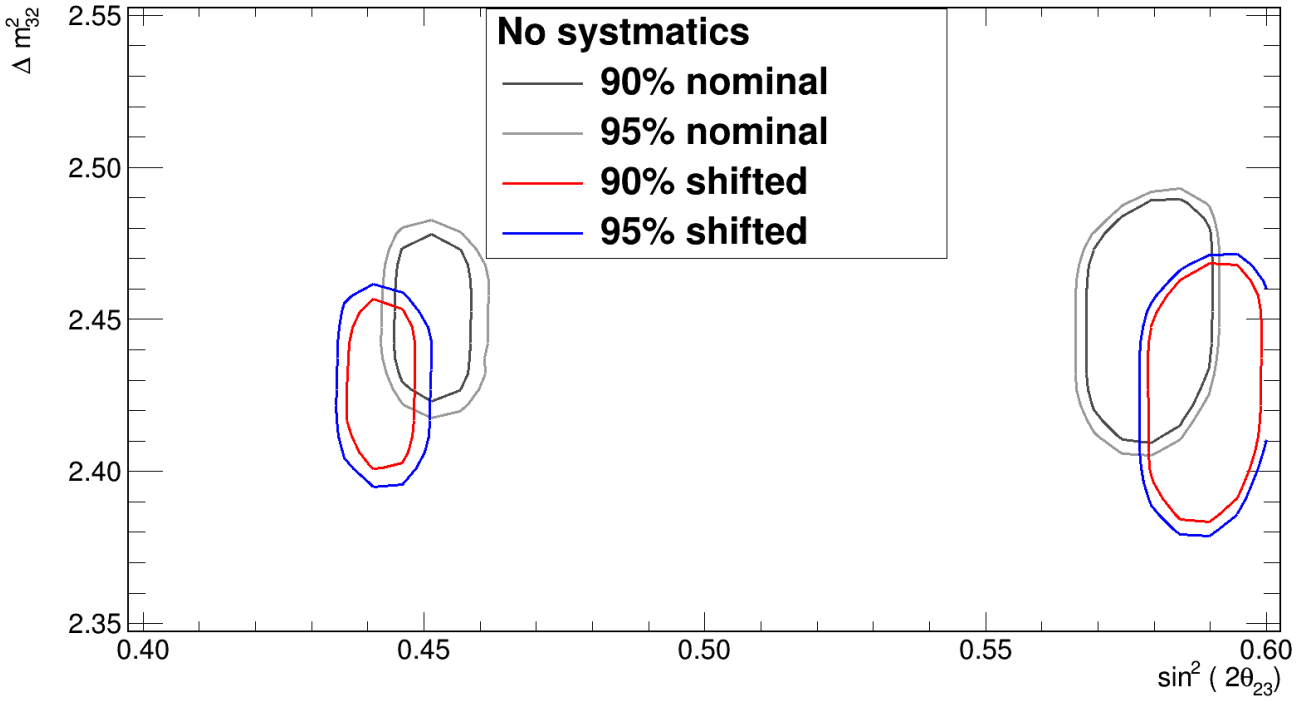


RHC numu



Fitting contour

- Oscillation parameters are all variable except the two in the contour
- dcp vs. theta13 does not have noticeable bias



Next

- Although this fitting is very slow, will try to add systematics, at least with flux uncertainties, better including xsec also.
- Try to put this in the LBL session in CDR.
- Please help.