BCKG studies for Sterile Analysis in NuPRISM

NUPRISM WORKSHOP (16-20 MARCH)

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Outline

- Introduction
- More detailed BCKG studies for two different $(\sin^2(2\theta_{41}), \Delta m^2)$ points:
  1. Detailed binning and new classification
  2. BCKG depending on the OAA
  3. BCKG components and Significance with OAA
- Future plans

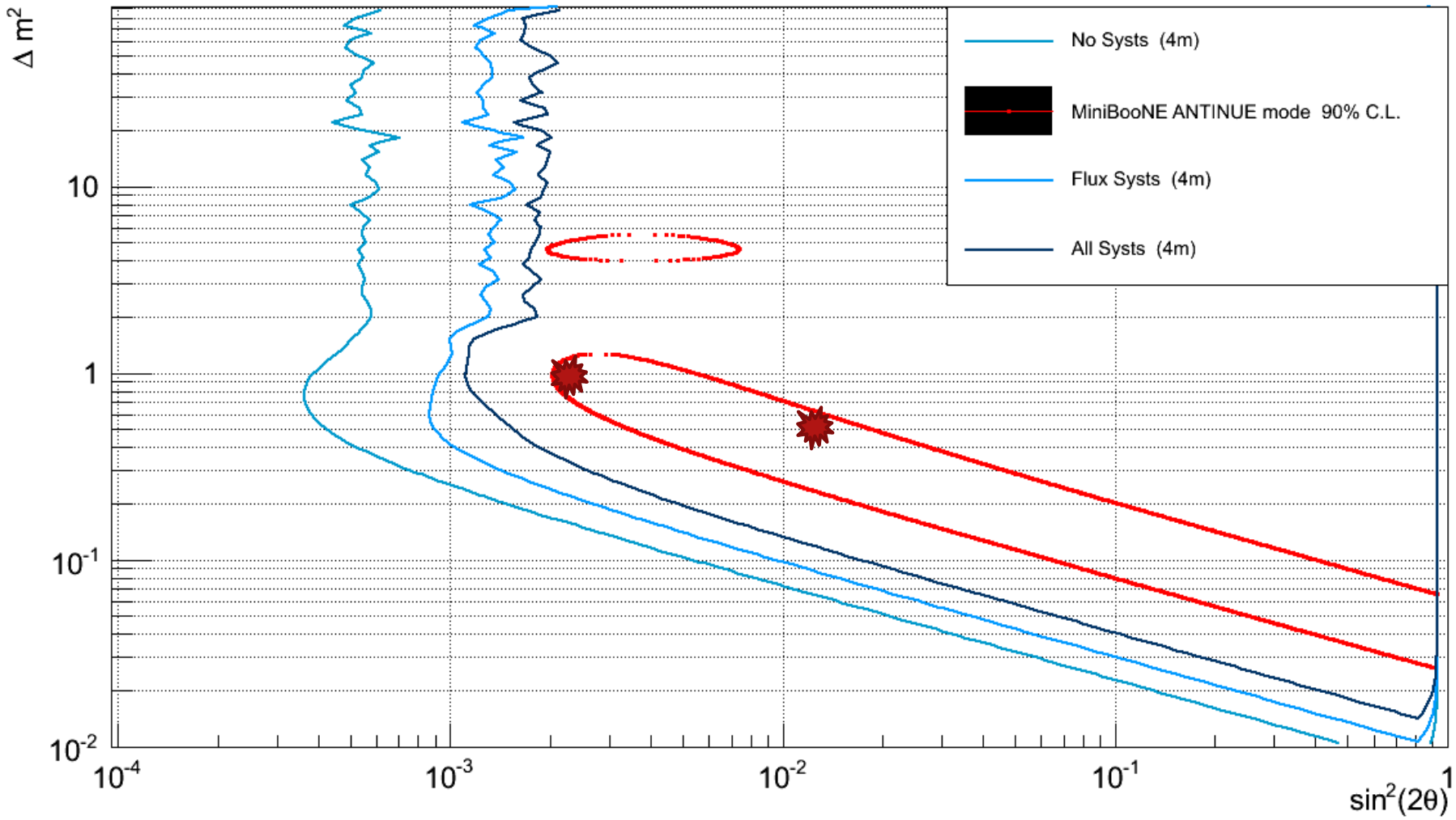
Introduction

- We pointed out that it would be important to deeply understand our BCKG composition for going further in our sterile analysis (ν_e-Only analysis).

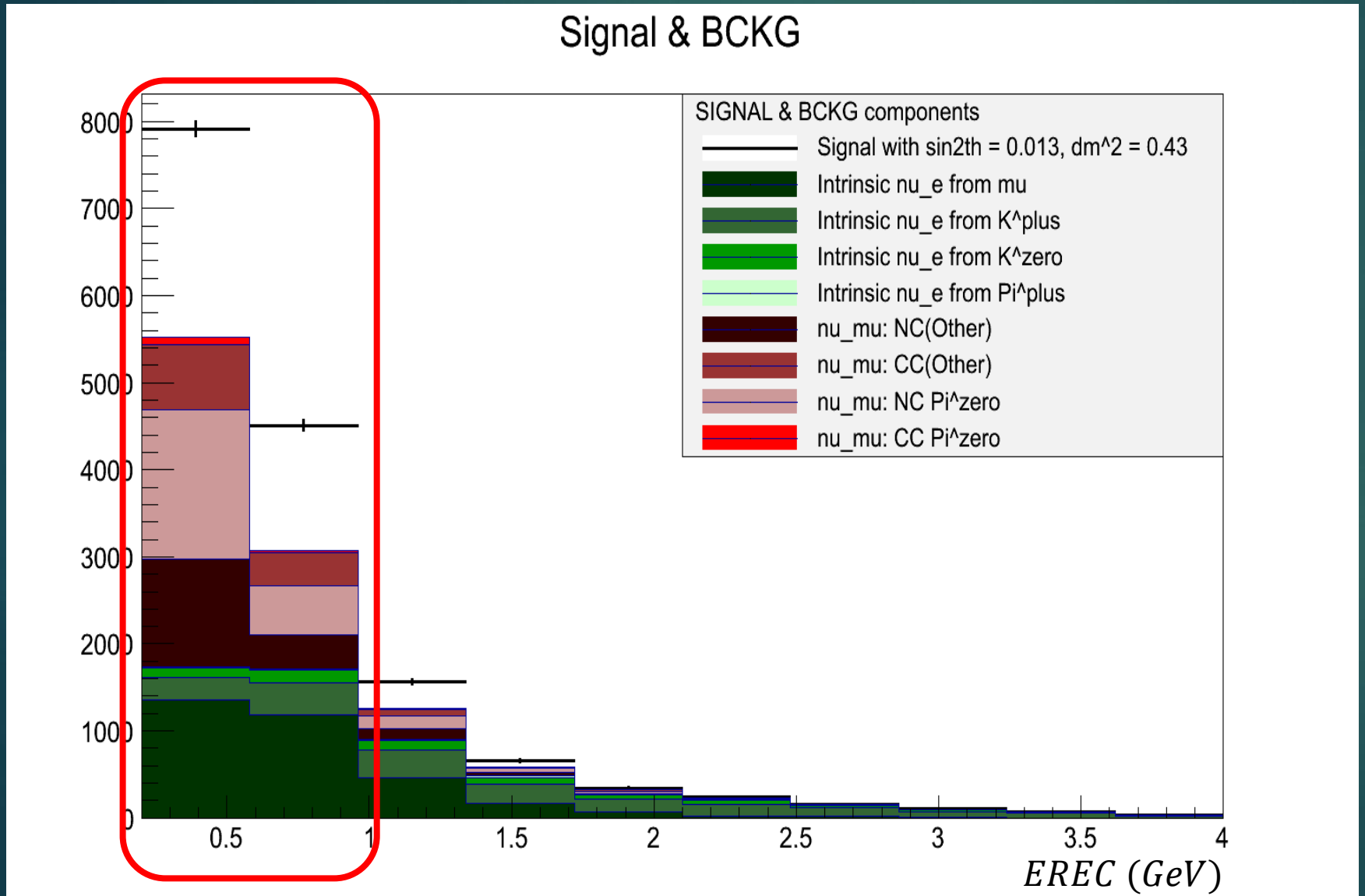
- For our BCKG, we are applying the next cut:

1. 2 m (at least) between vertex reconstruction point and nuPRISM Wall
2. 200 MeV (at least) of visible Energy
3. 3.2 m (at least) from nuPRISM Wall in the lepton direction

The points we chose

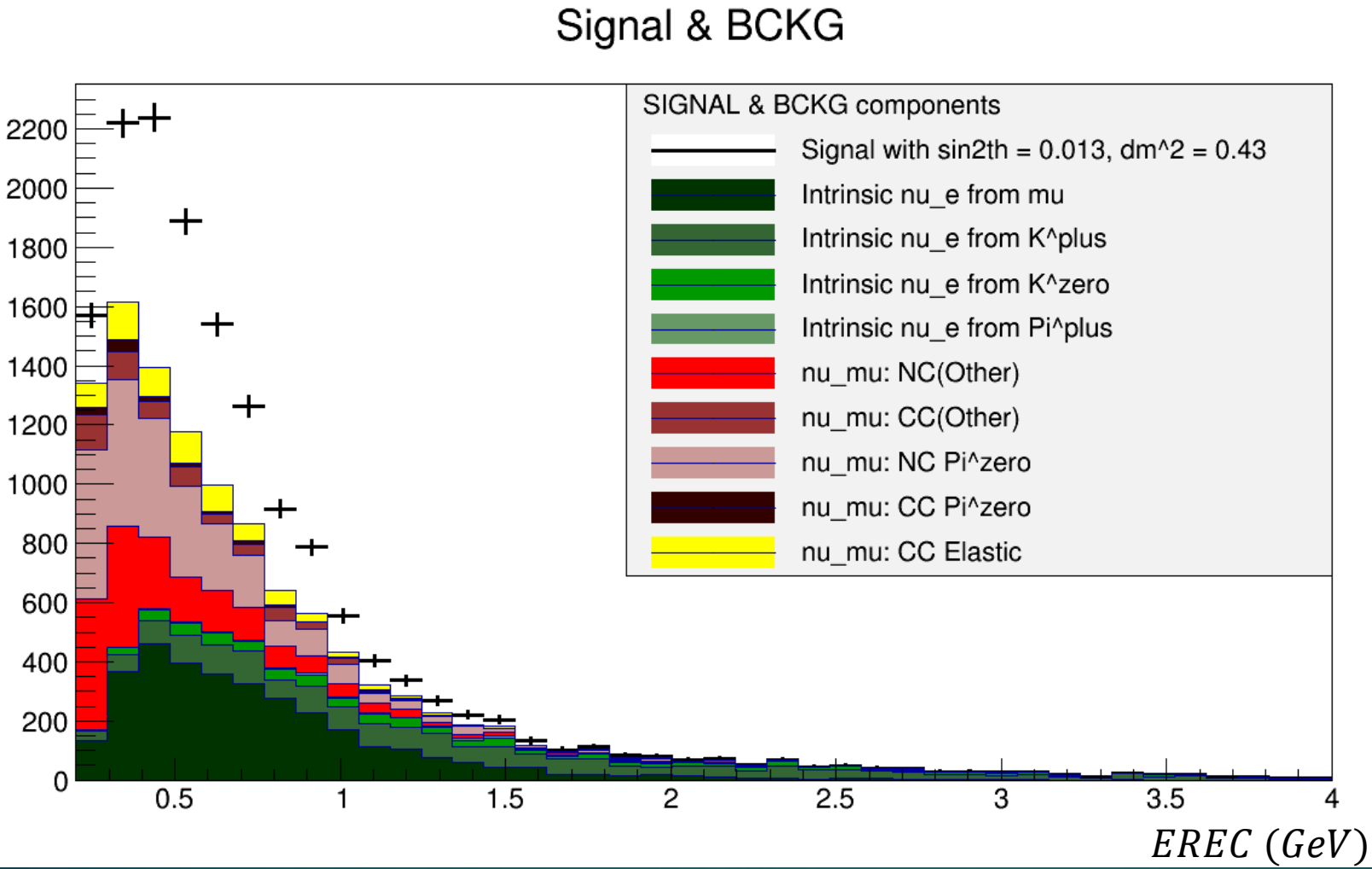


Signal & BCKG Composition (4m)



- The biggest component of the Not Intrinsic BCKG (ν_μ) is due to $NC\pi^0$ events
- Nevertheless, the CC(Other) and NC(Other) components are also big for first 2 bins in EREC.
- In order to compare with other experiments results, a more detailed study has been done

Signal & BCKG Composition (4m)

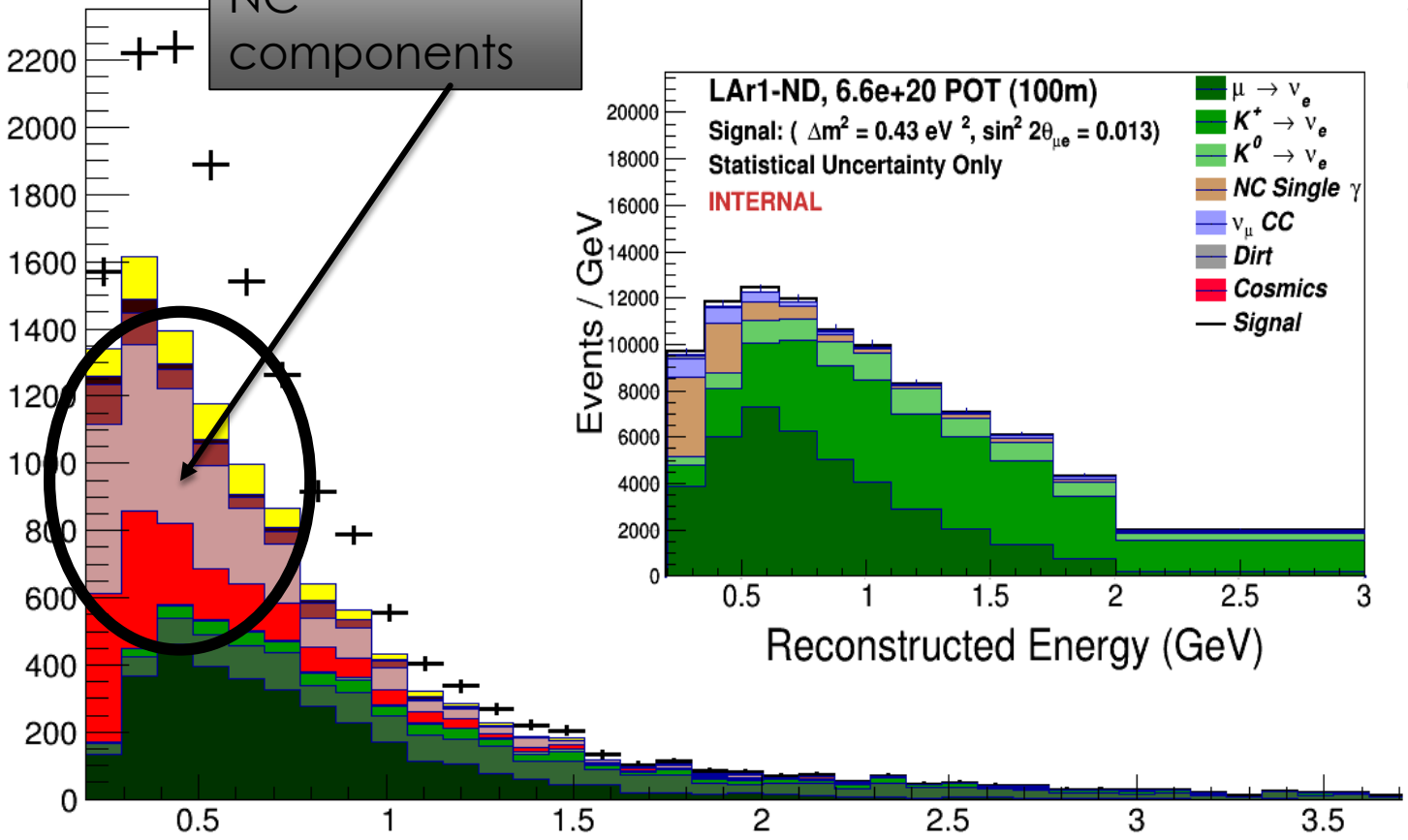


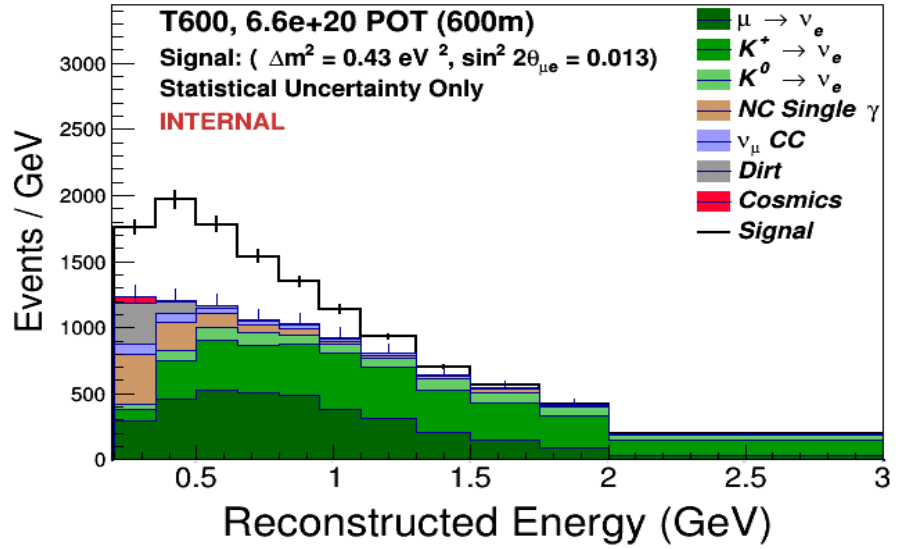
- $\sin^2(2\theta_{41}) = 0.013$
- $\Delta m^2_{41} = 0.43$

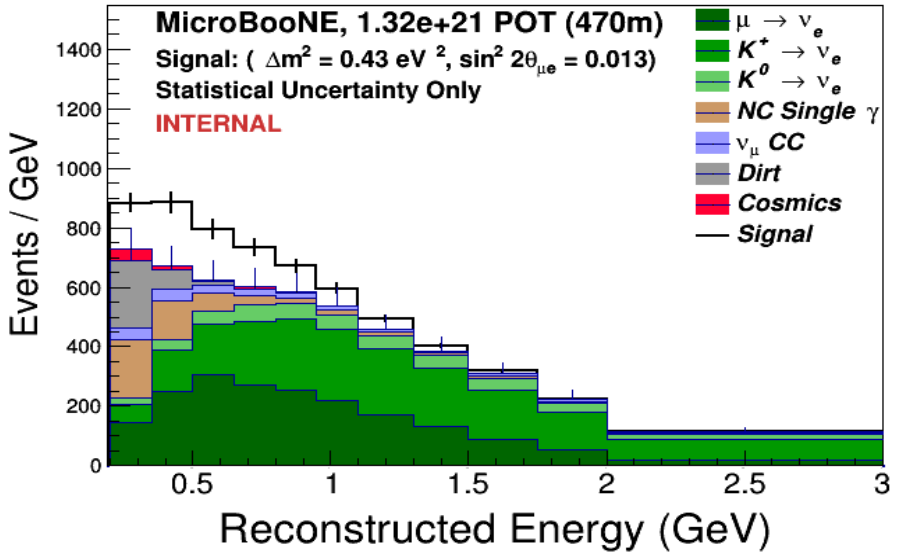
- The binning has been changed. More detailed shape
- As was suggested in the last meeting, we introduced the $\nu_\mu CCElastic$
- For low energies, the larger components are due to NC, as we expected

Signal & BCKG Composition (4m)

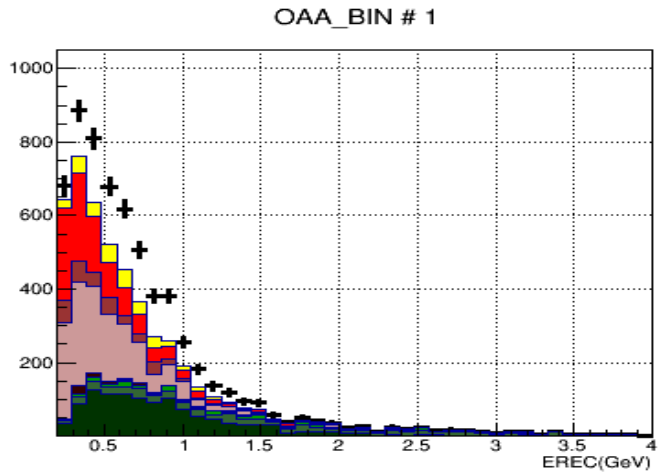
Dominated by NC components

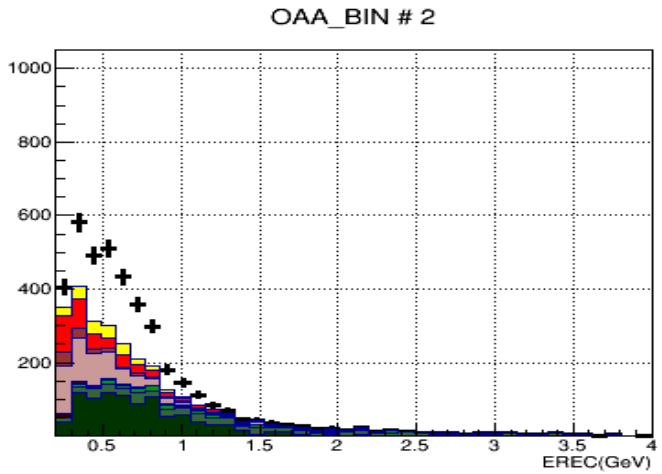


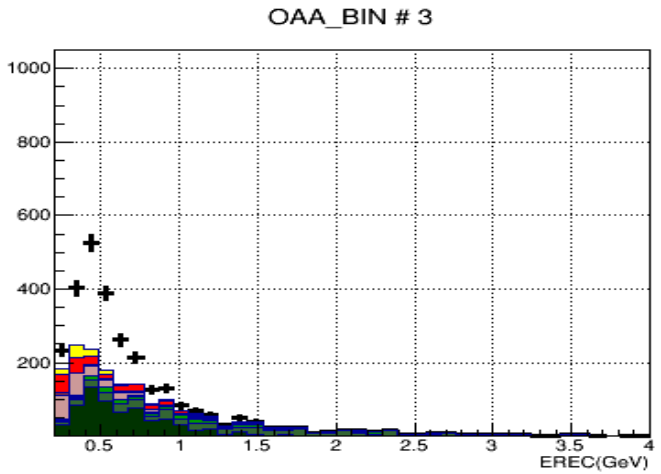


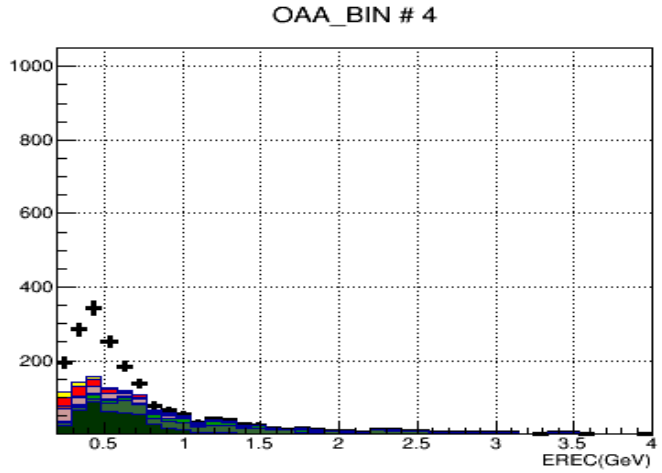


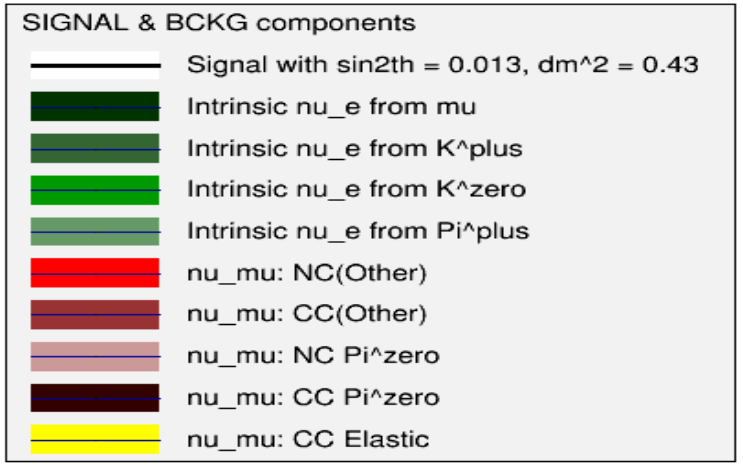
Signal & BCKG Composition (4m) in terms of the OAA





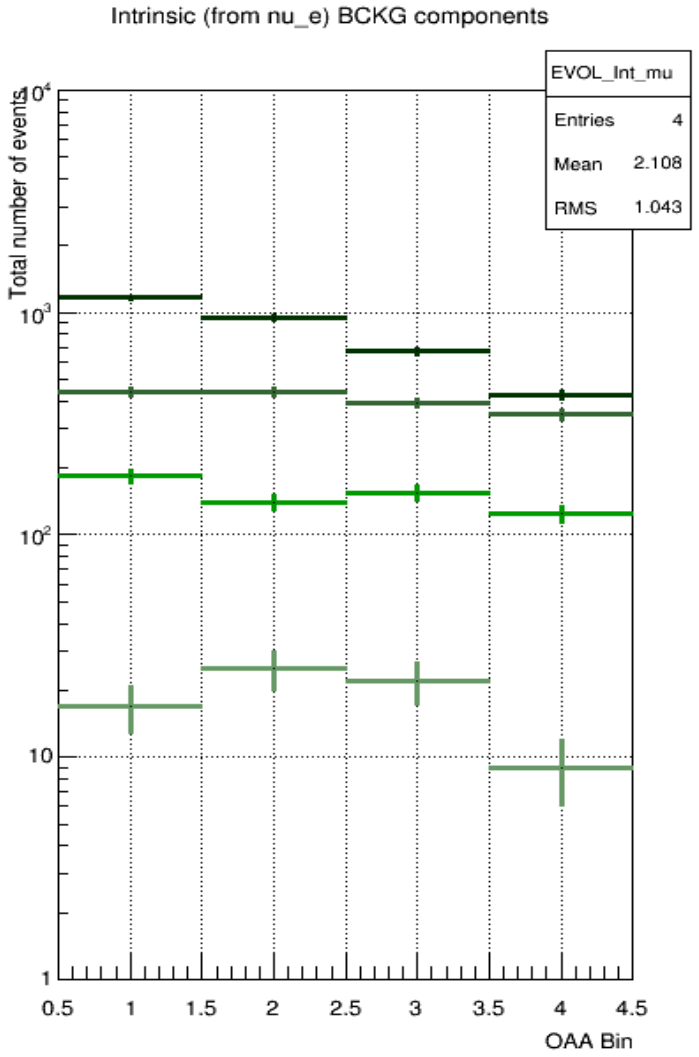


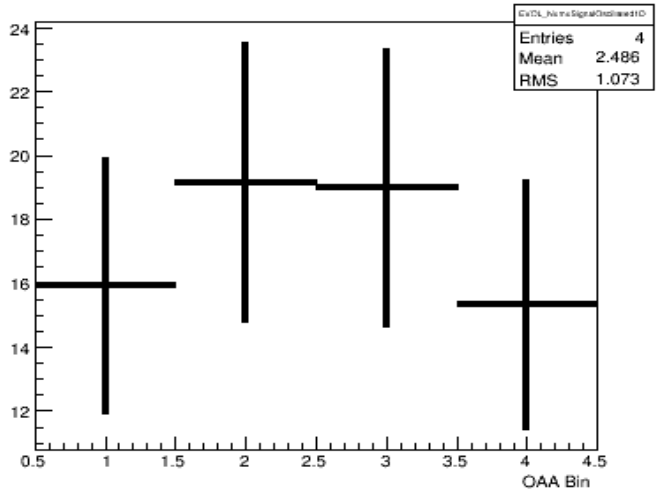


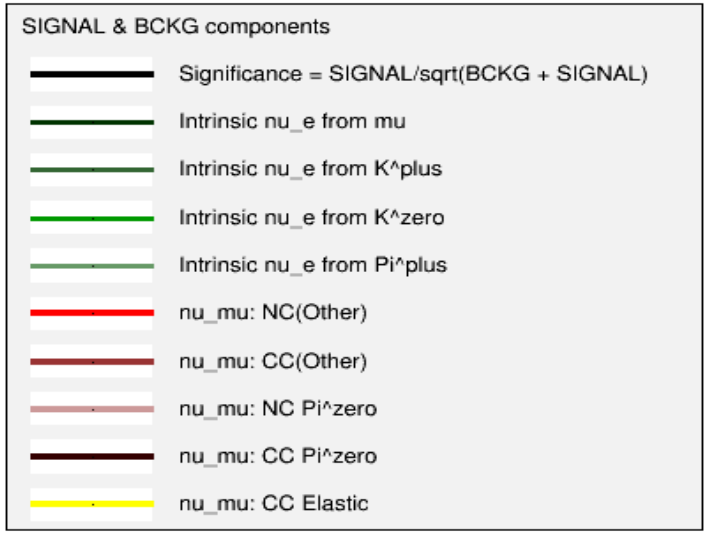


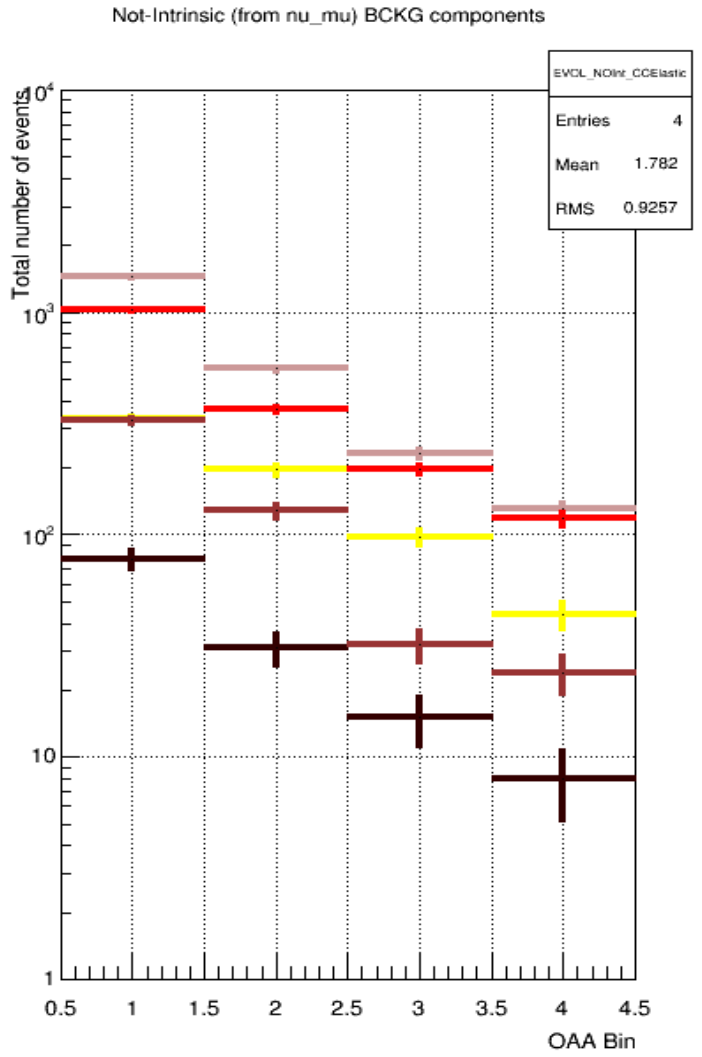
The intrinsic component (ν_e) remains almost constant with OAA, while the ν_μ components (specially the NC) decrease with OAA

BCKG & Significance (4m) in terms of the OAA

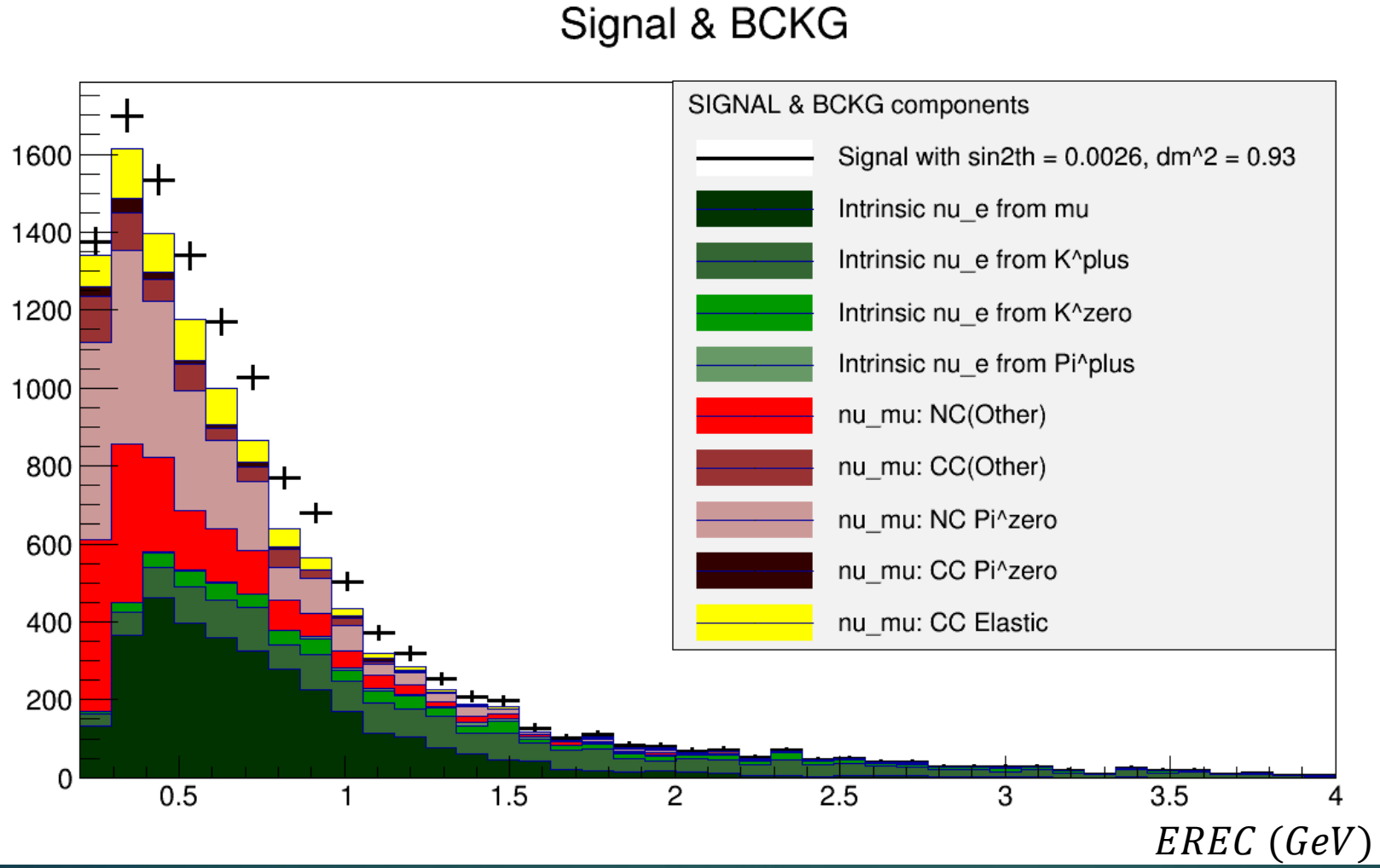








Signal & BCKG Composition II (4m)



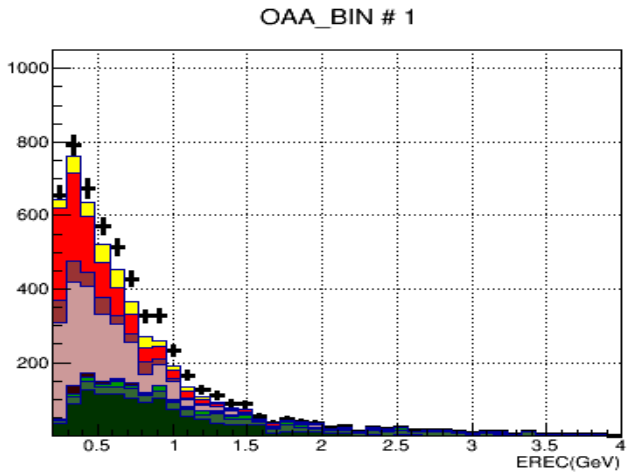
- We computed the same but with another oscillation hypotheses. We chose the Global Fit Parameters for the 3+1 Model of ***Sterile Neutrino Oscillations: The Global Picture***

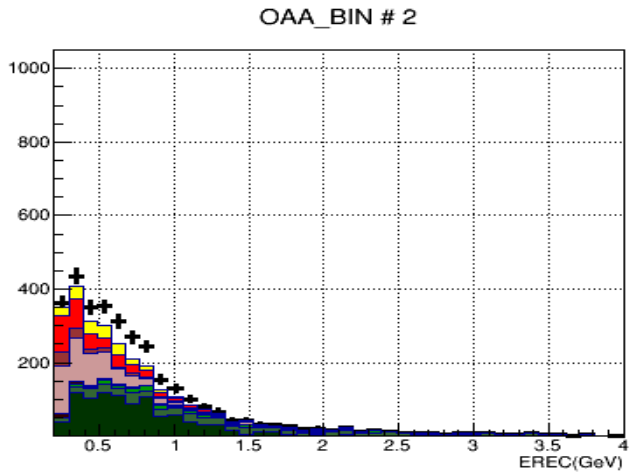
- http://arxiv.org/abs/1303.3011

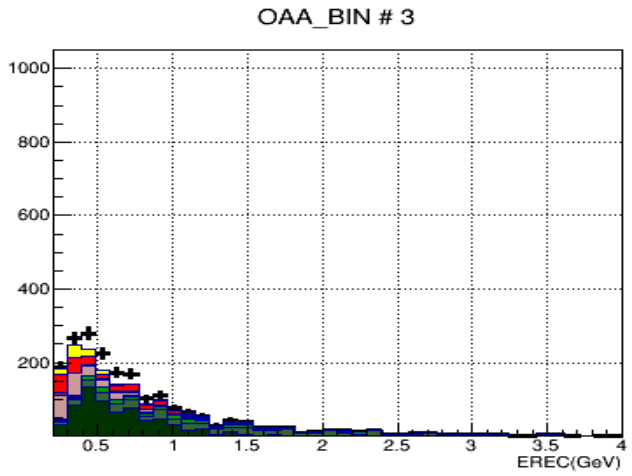
- $\sin^2(2\theta_{41}) = 0.0026$
- $\Delta m^2_{41} = 0.93$

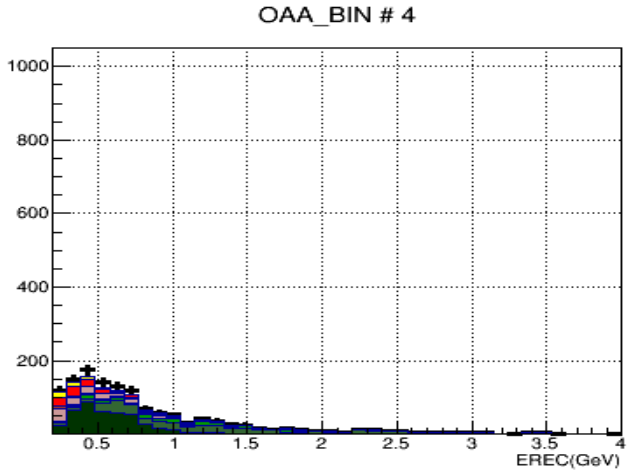
- Signal is lower

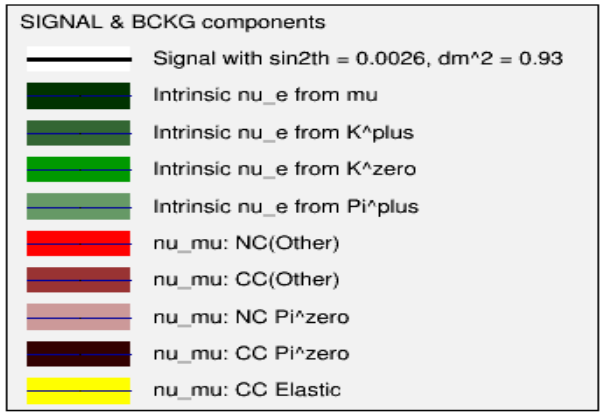
Signal & BCKG Composition II (4m) in terms of the OAA



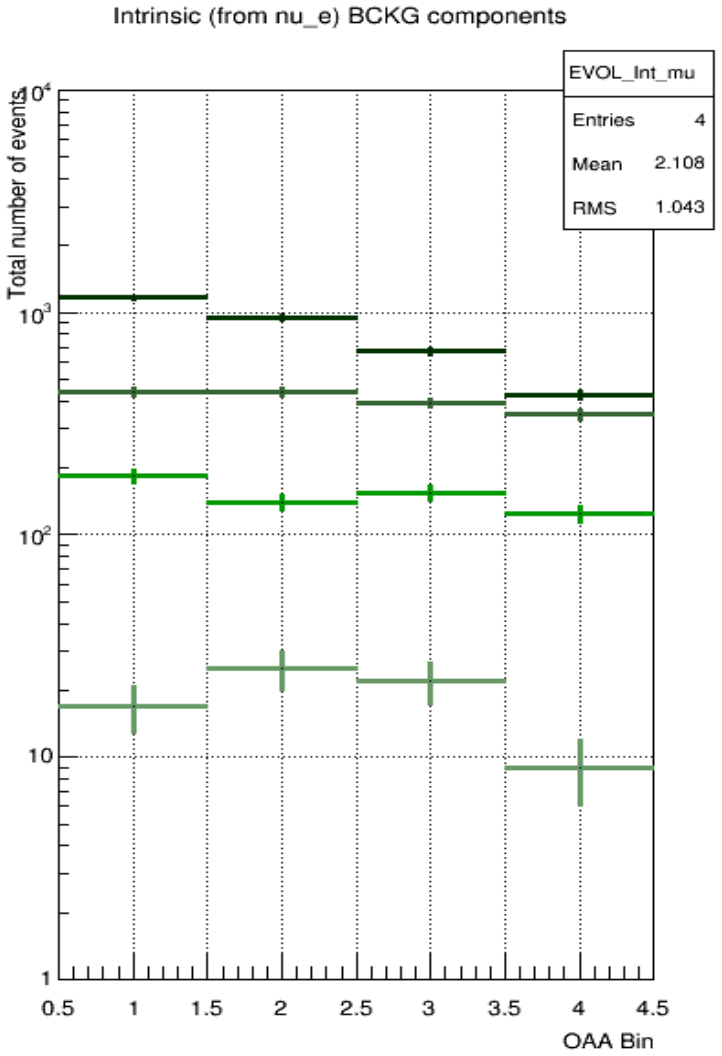


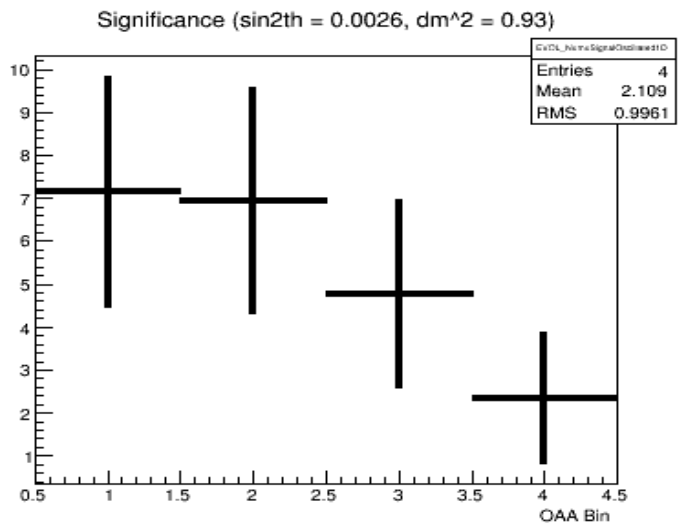


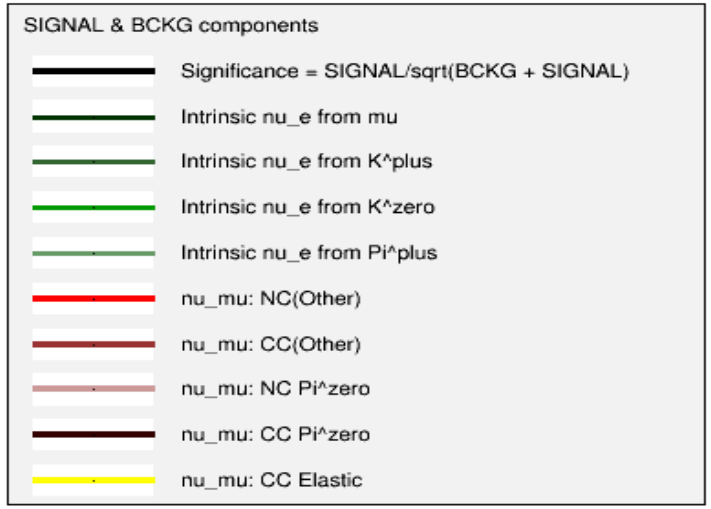


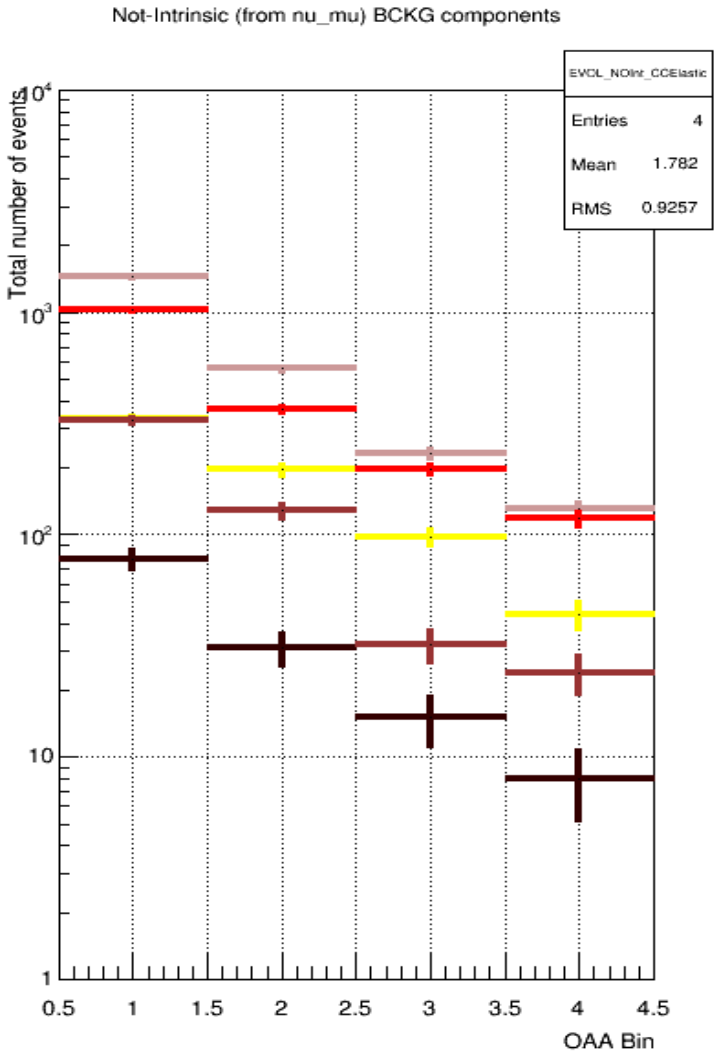


BCKG & Significance II (4m) in terms of the OAA









Future plans

- We started implementing the BCKG components reduction to see whether it has a big impact on the sensitivity.
  - We had some technical troubles we have to fix
  - Should we decrease all the NC components?

    We have the idea of reducing them to have the same proportion that is observed in SK -> Any other ideas?
- Keep on working on the FLUX systematics overestimation