Nue Sensitivities with LAr1

Corey

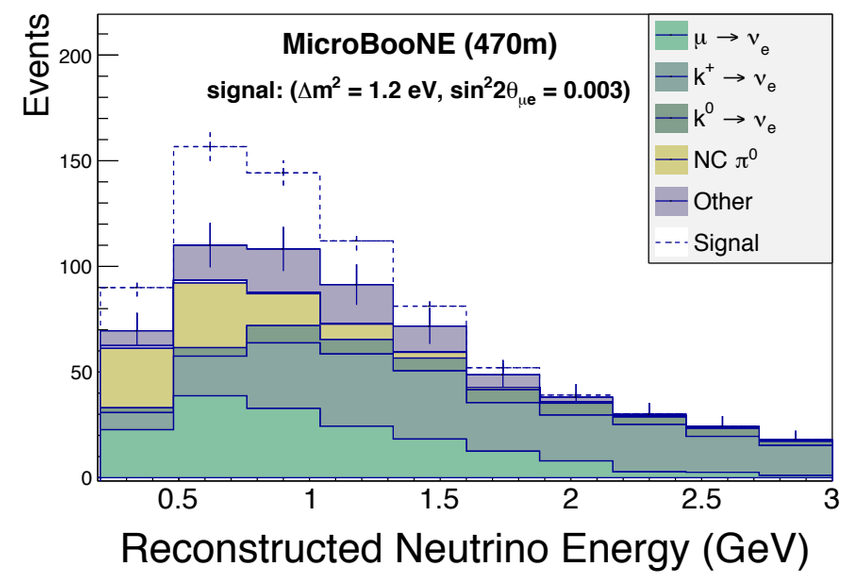
Oscillation from numu into nue

$$P^{3+1}_{\nu_\mu \to \nu_e} = \sin^2\theta_{\mu e} \sin^2 \frac{\Delta m^2_{41} L}{4E}$$

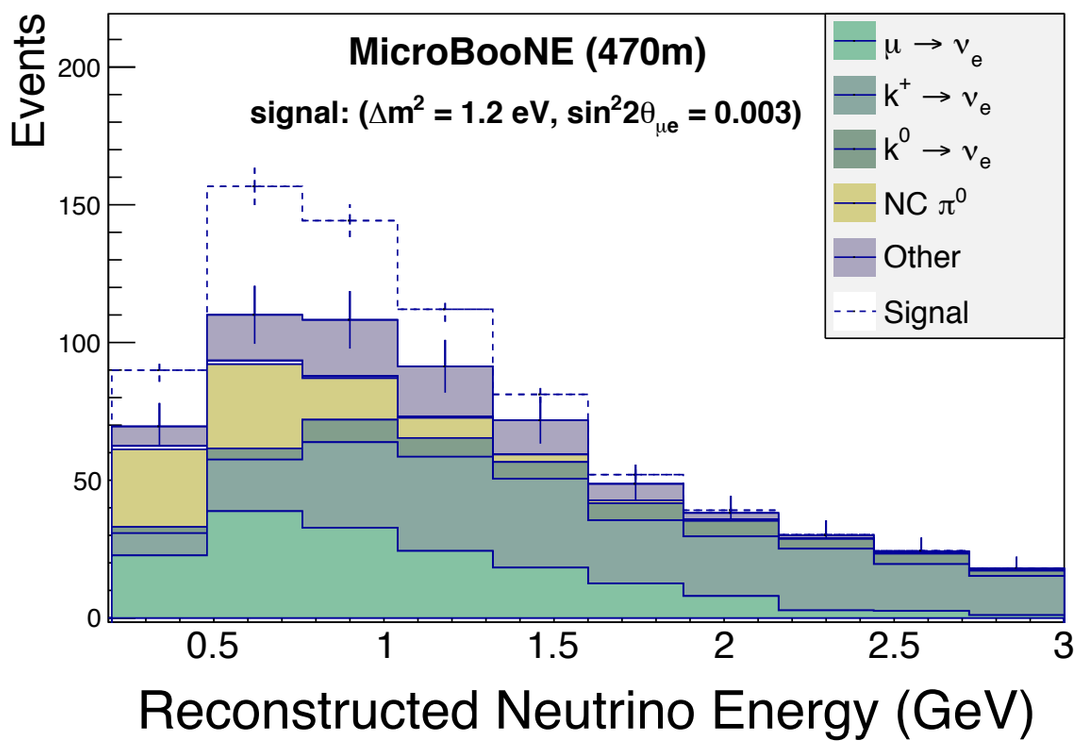
- Perform a scan over a range of dm, th and at each point calculate a simple chi squared between "data" and background
- Signal is modeled using a fully oscillated numu flux, with each neutrino scaled by the formula above

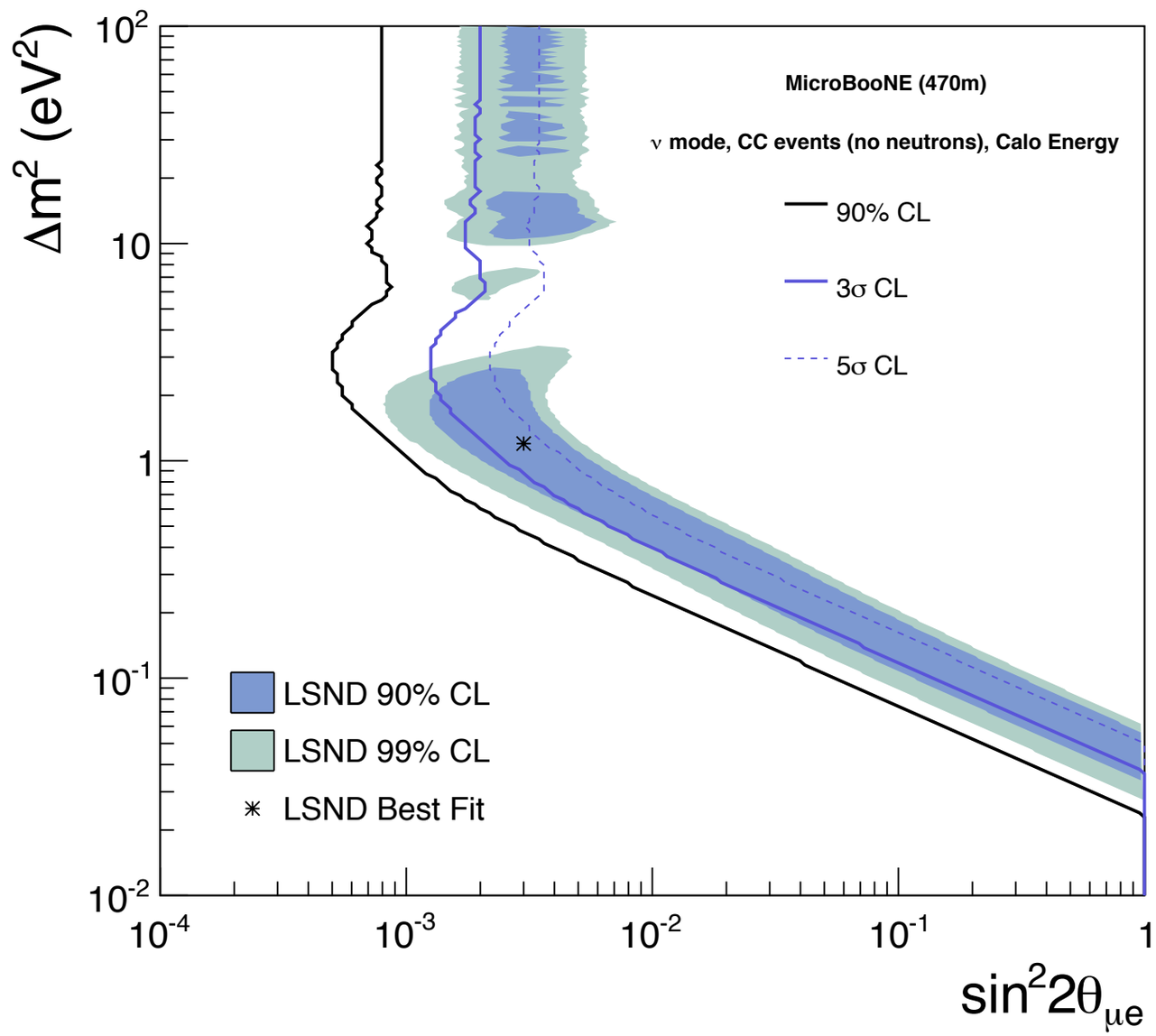
What goes in the background data?

- Intrinsic electron neutrinos
- Muon neutrino misID (currently 0.1%)
- NC misIDs (6% of NC neutral pions with only 1 photon contained, other misc. single photon events)



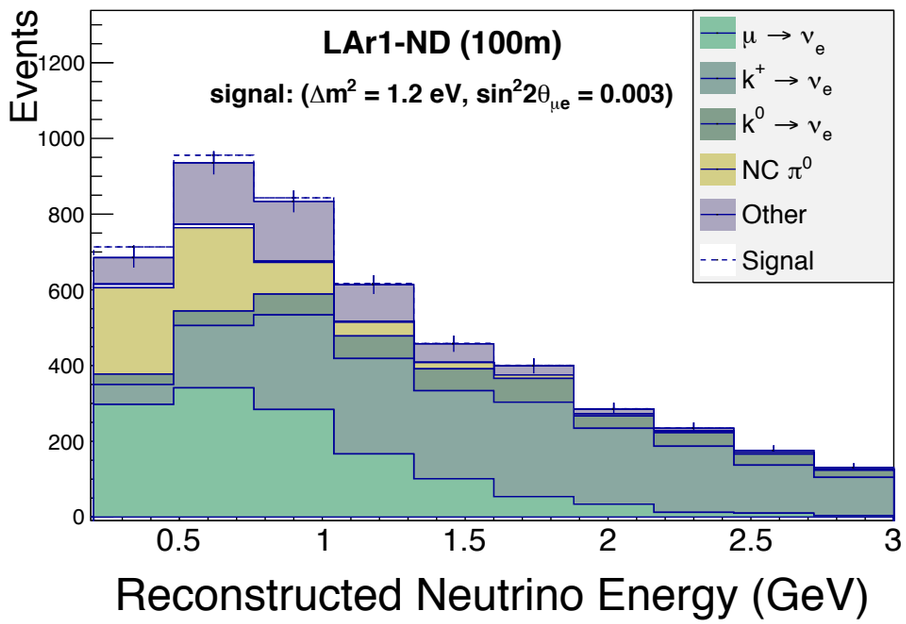
MicroBooNE Only

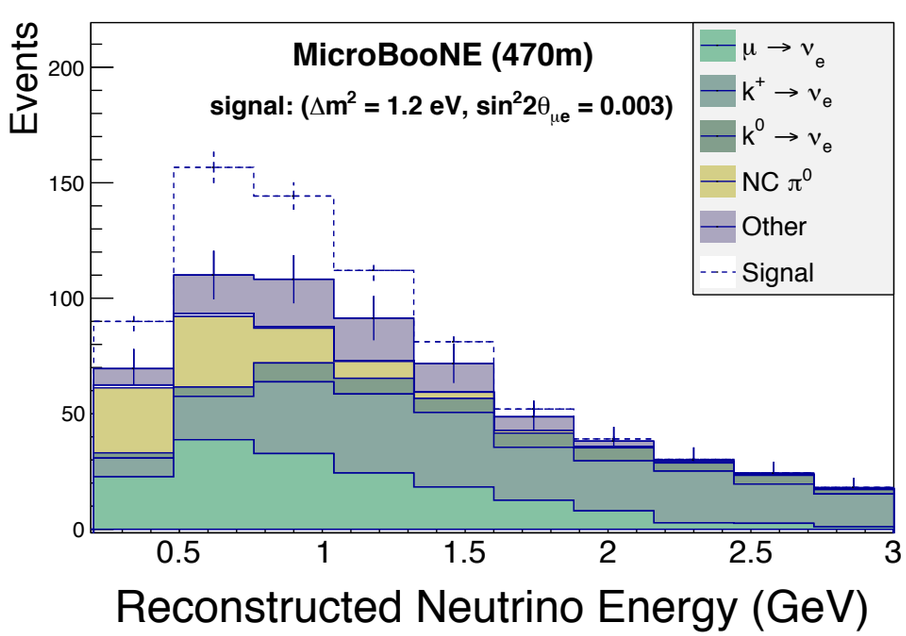


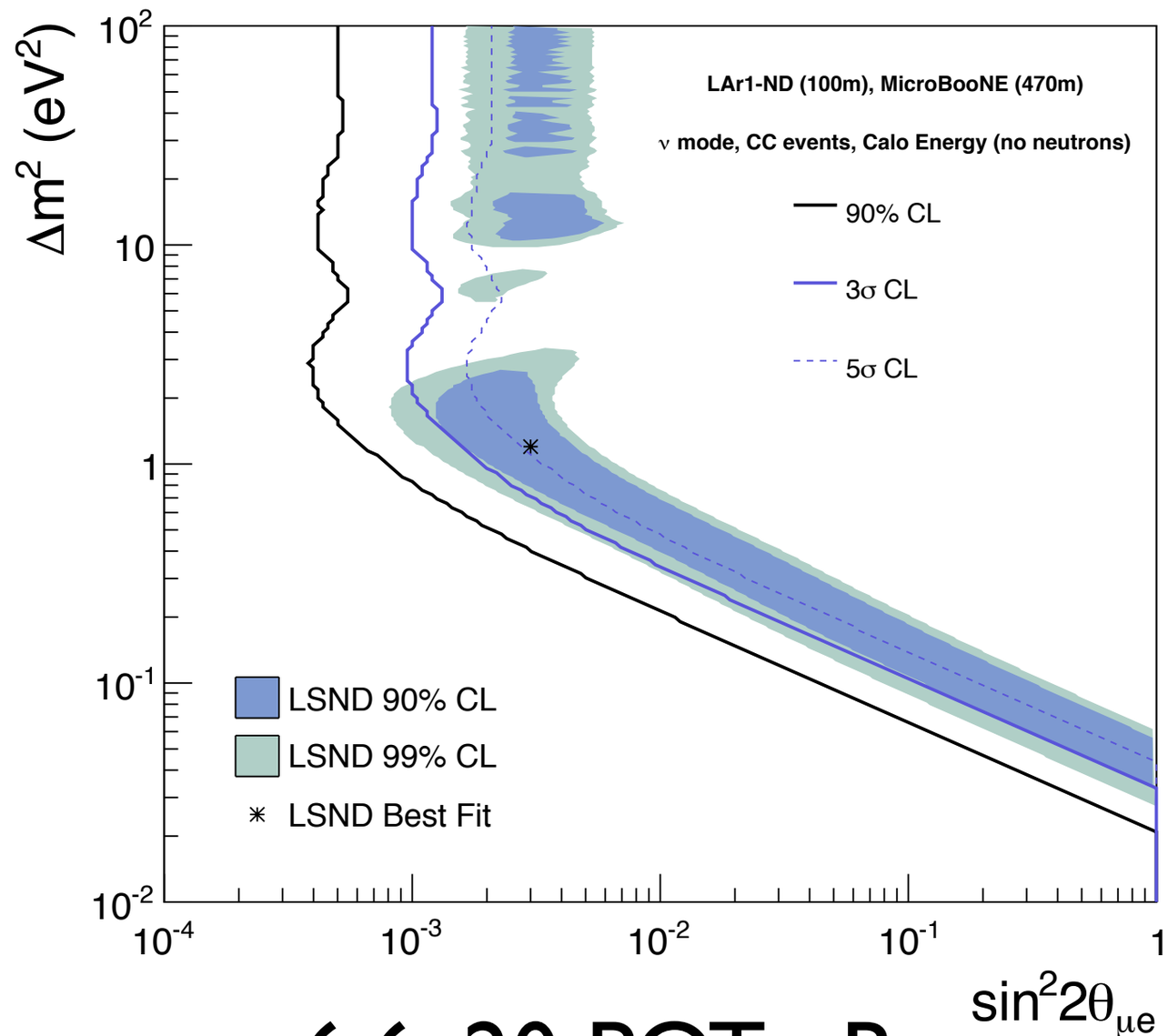


6.6e20 POT

Microboone + LAr1-ND







6.6e20 POT uB
2.2e20 POT ND

Advantage of the ND

- Can use the near detector to constrain errors in the detectors down stream.

40t fid

LAr-ND

$$\sigma_{tot}^2 = \sigma_{stat}^2 + \sigma_{sys}^2$$

$$\sigma_{sys} = 20\%$$

61t fid

MicroBooNE

$$\sigma_{tot}^2 = \sigma_{stat}^2 + \sigma_{sys}^2$$

$$\sigma_{sys} = \sigma_{Stat,ND}$$

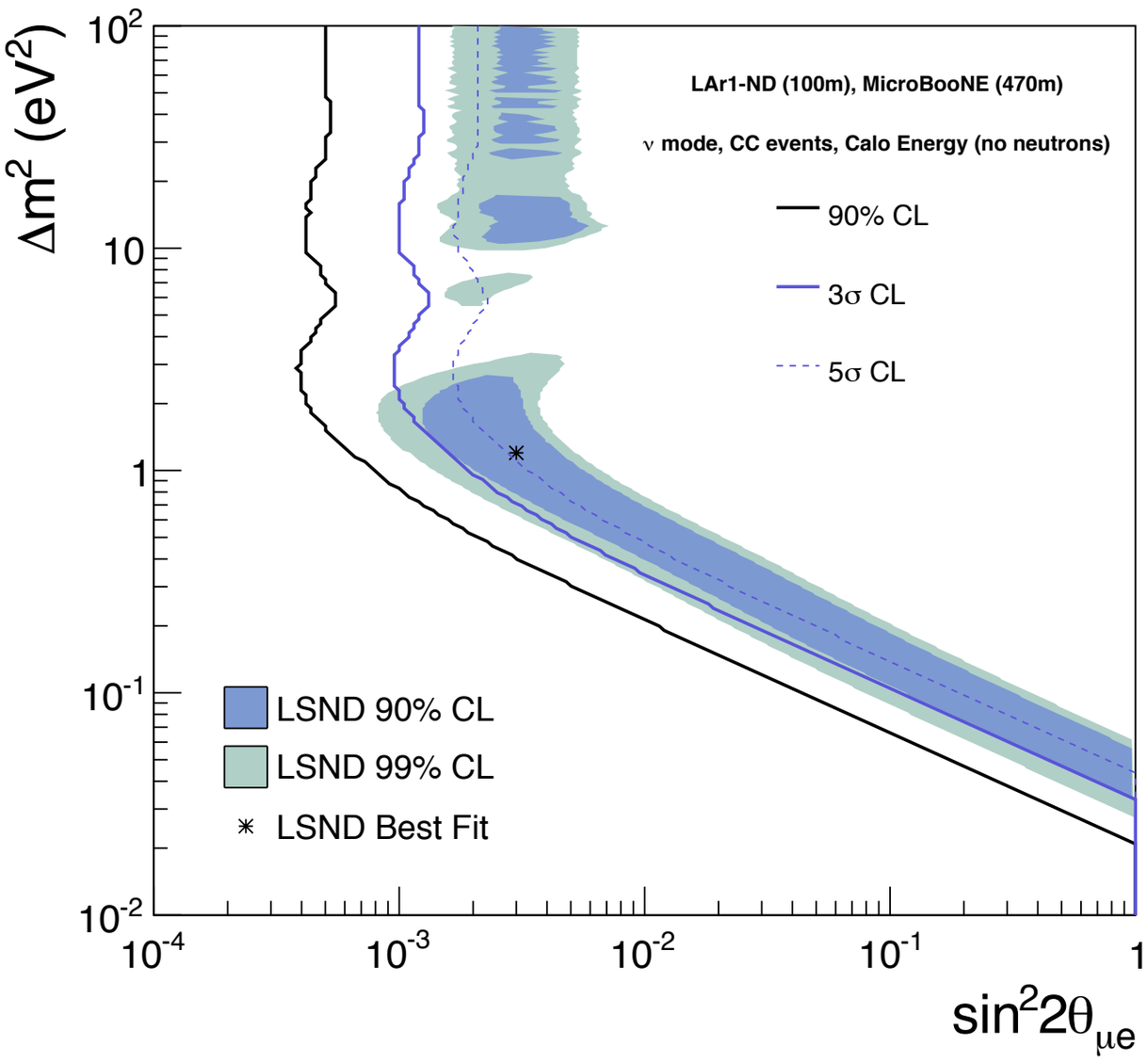
1kt fid

LAr1-FD

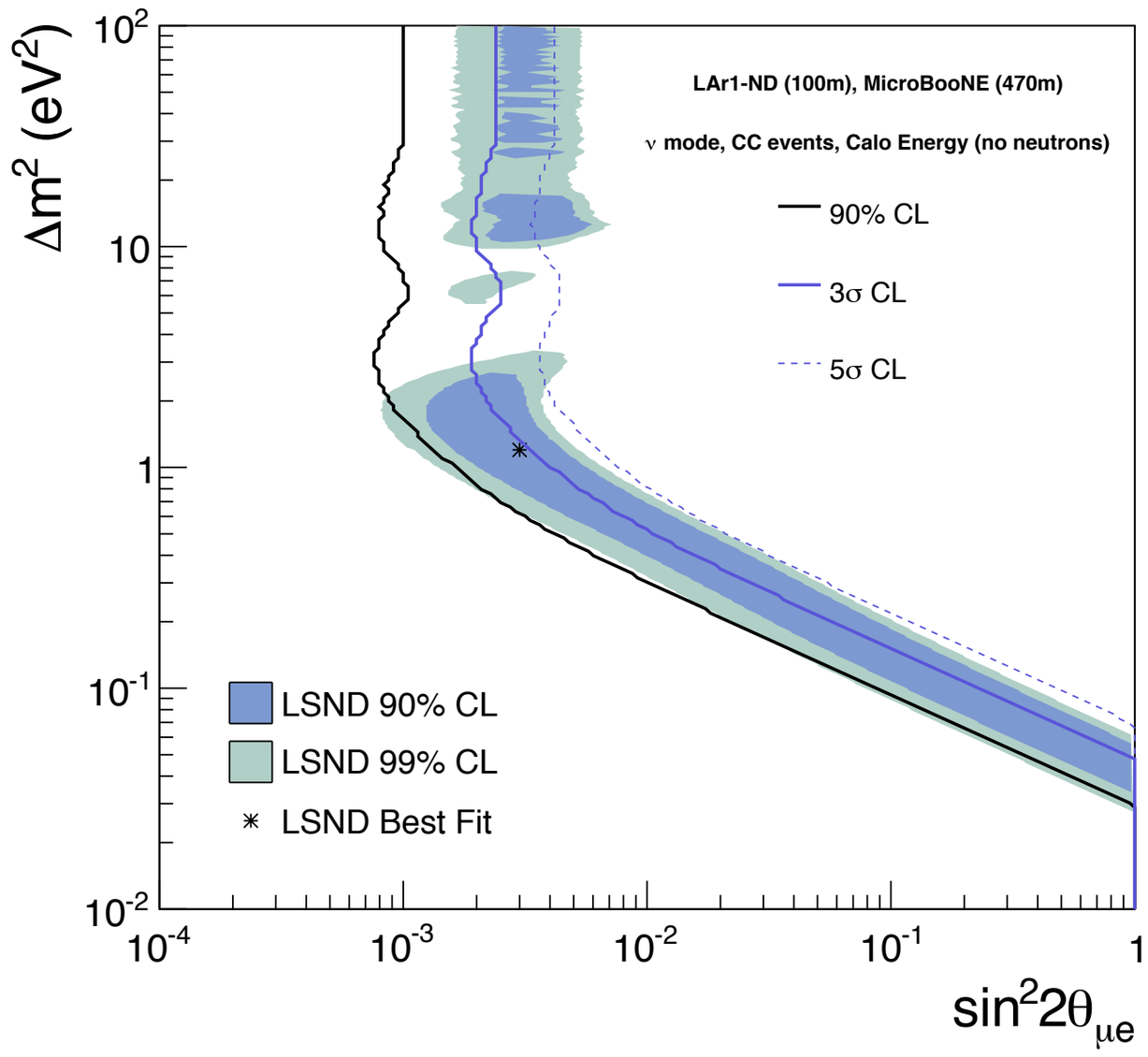
$$\sigma_{tot}^2 = \sigma_{stat}^2 + \sigma_{sys}^2$$

$$\sigma_{sys} = \sigma_{Stat,ND}$$

Advantage of the ND

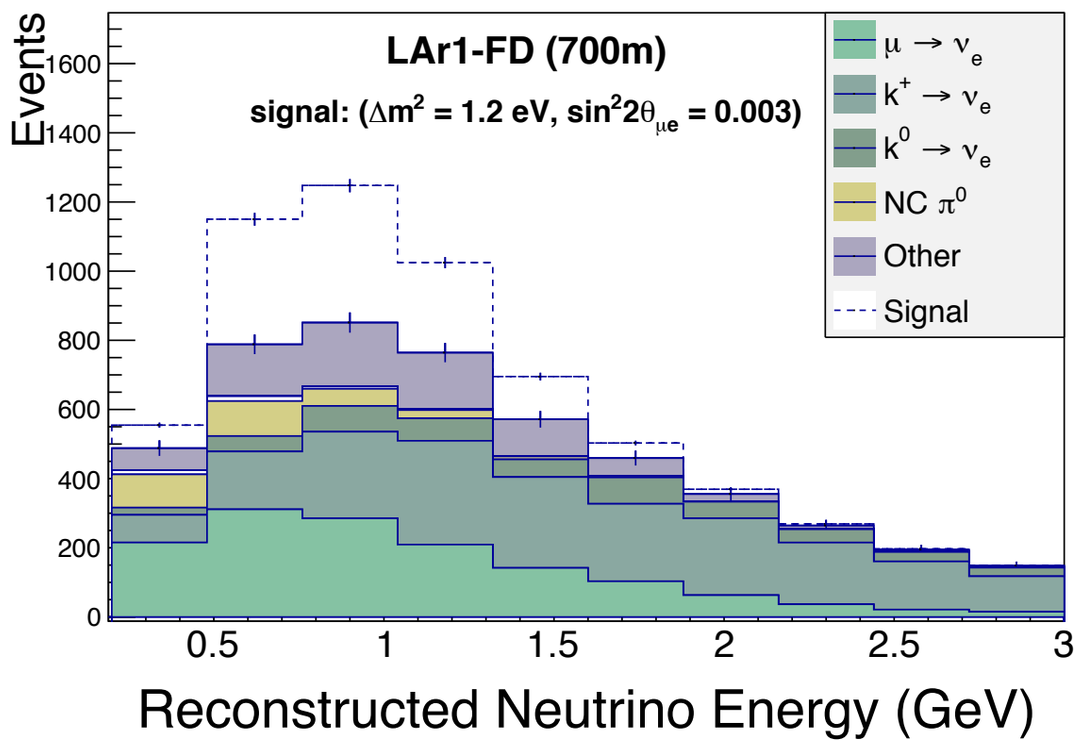


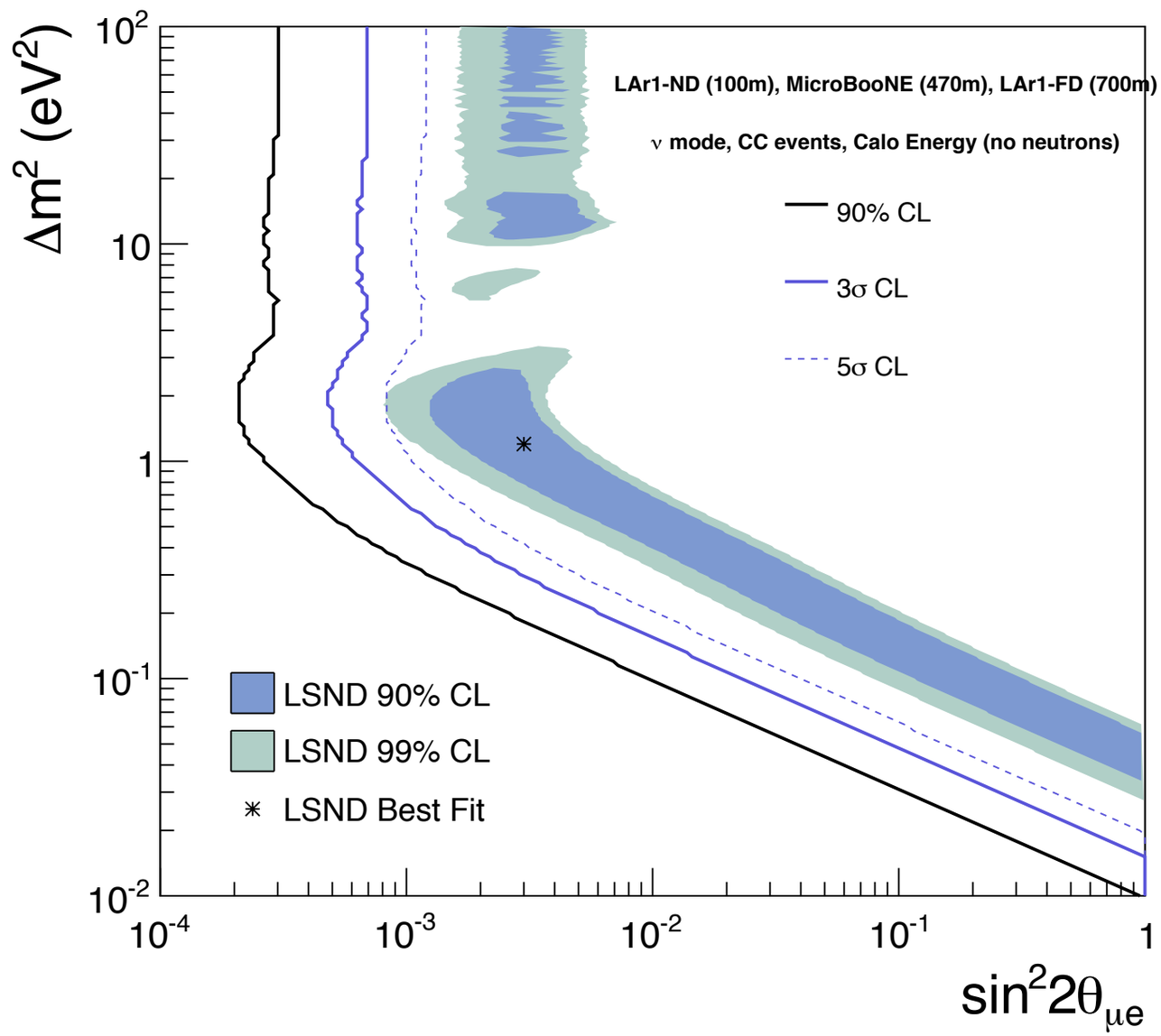
uB sys = ND stat



uB sys = flat 20%

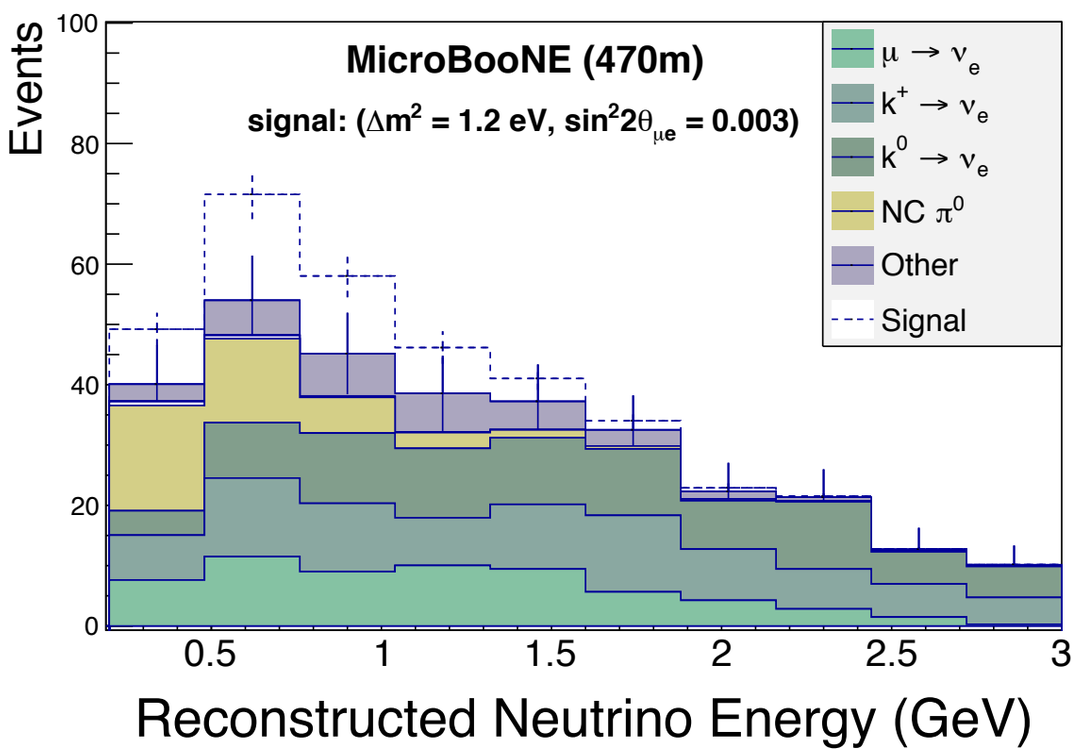
Full LAr1 Program

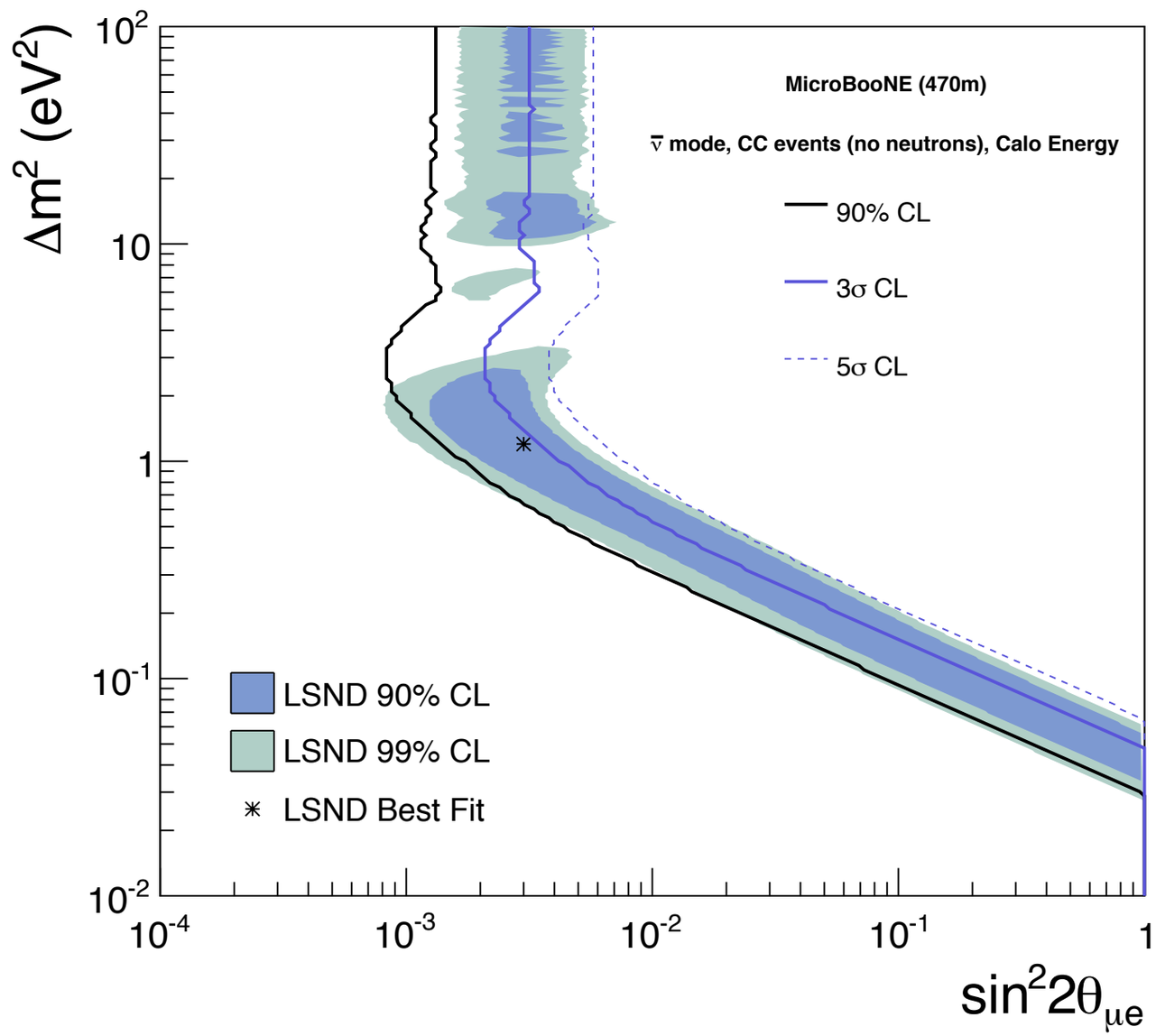




6.6e20 POT (all)

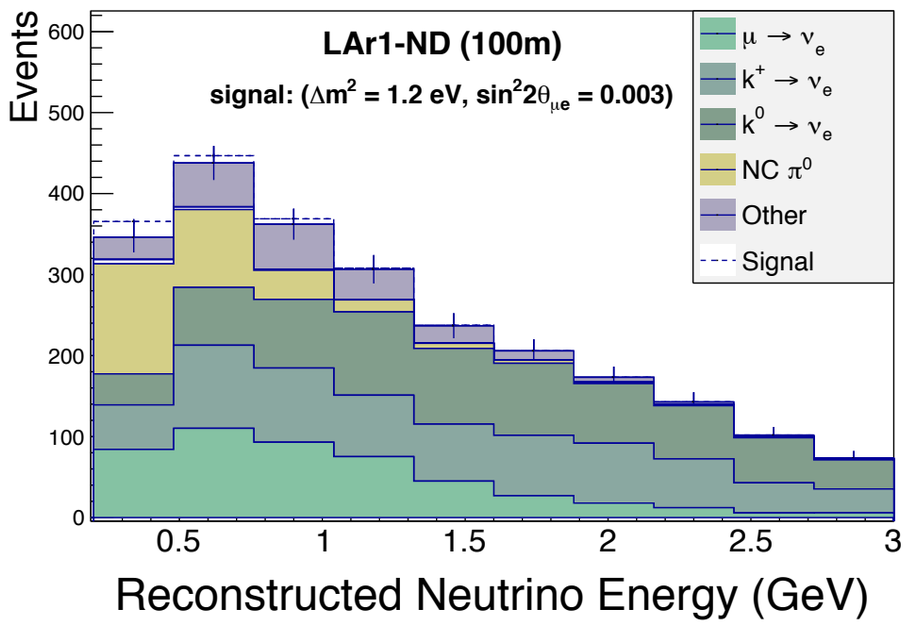
uB Anti nu

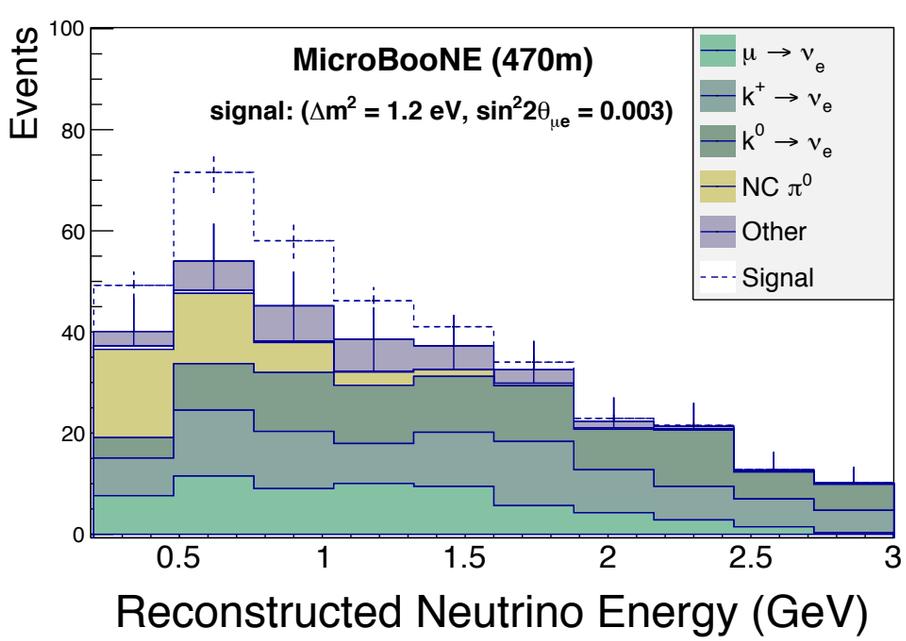


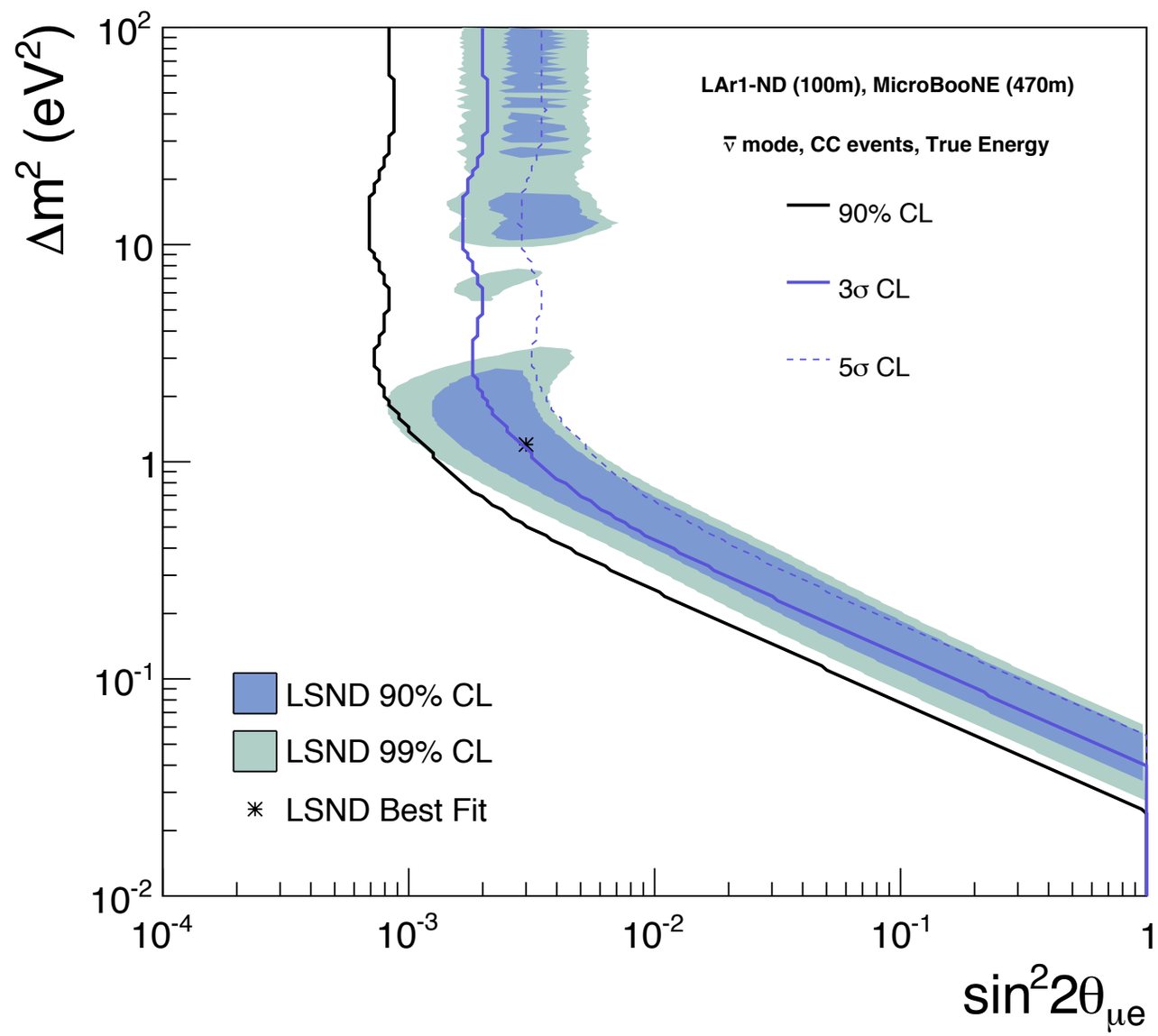


10e20 POT

uB + ND Anti nu

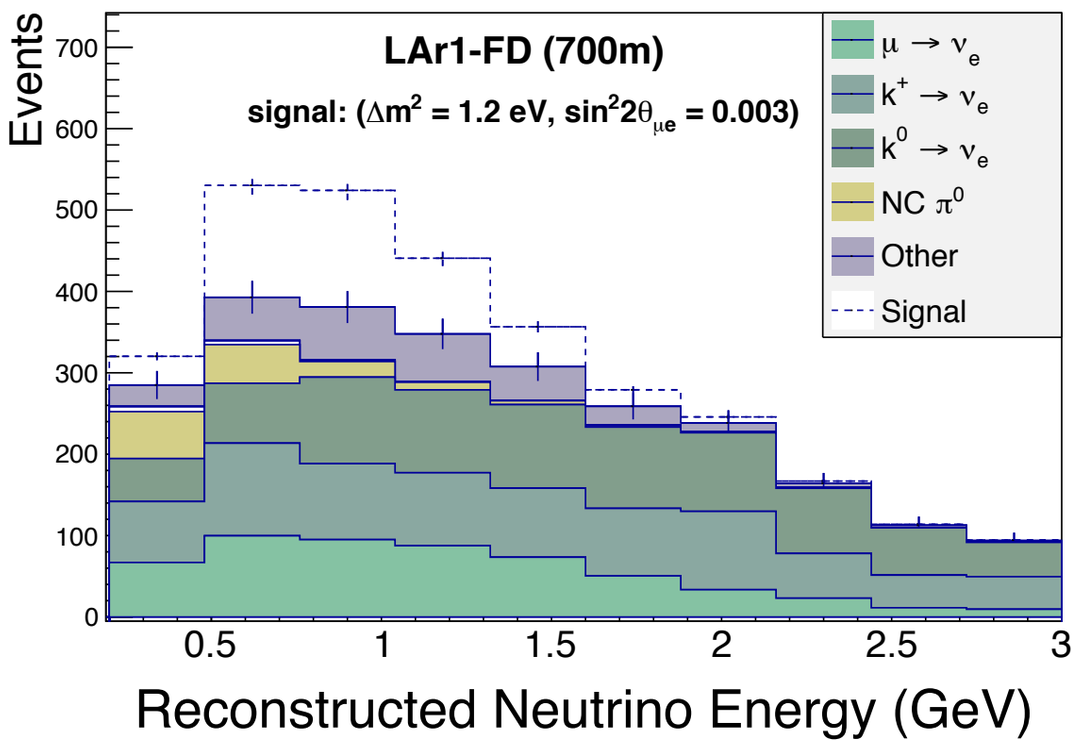


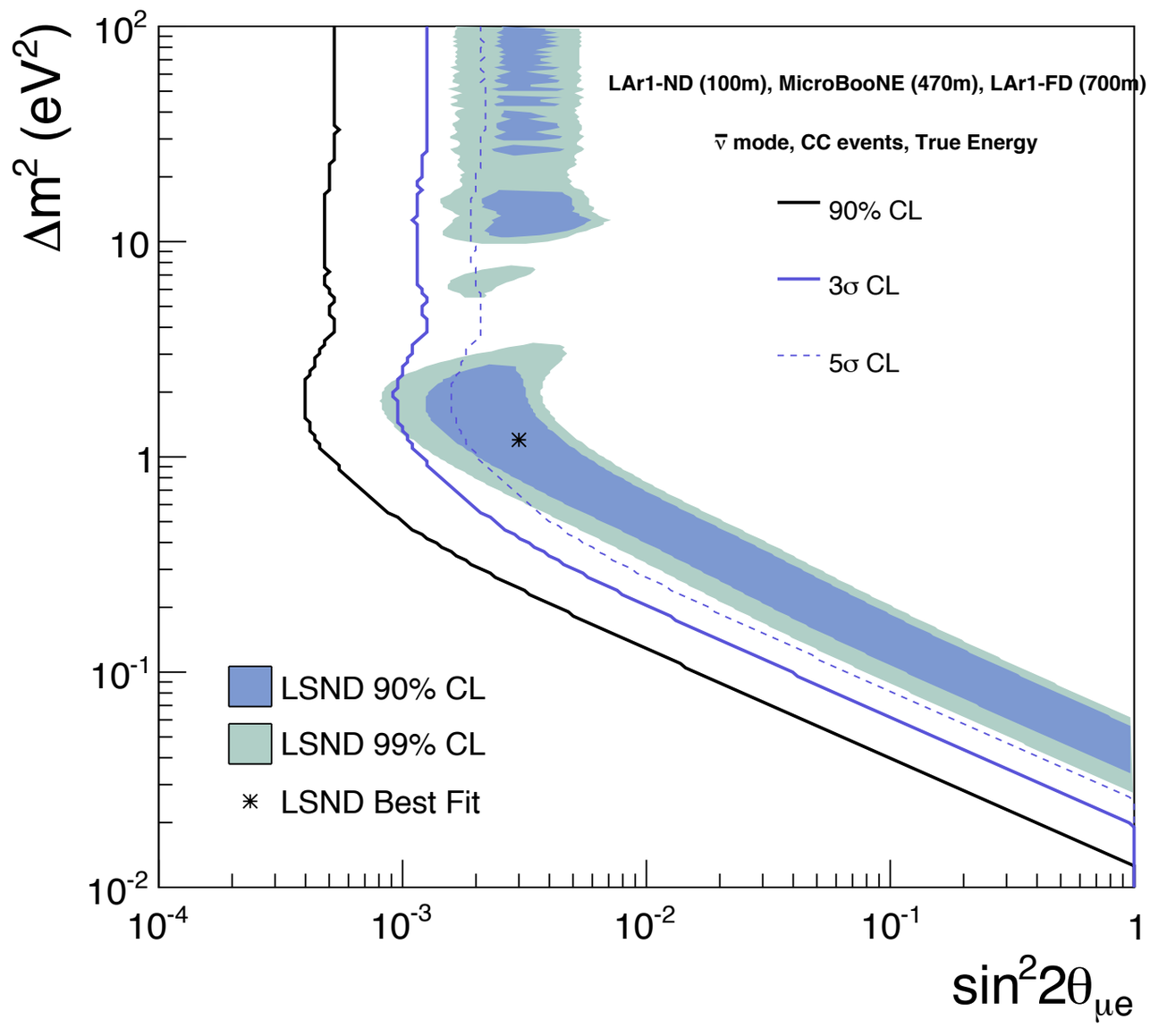




10e20 POT

Full Program, Anti Nu





10e20 POT

Still to Come

- Event rates useful to cross section analysis for all 3 detectors, both modes.
- Event rates from the numi beam in uB, FD
- Effect of ND detector size, shape on sensitivities