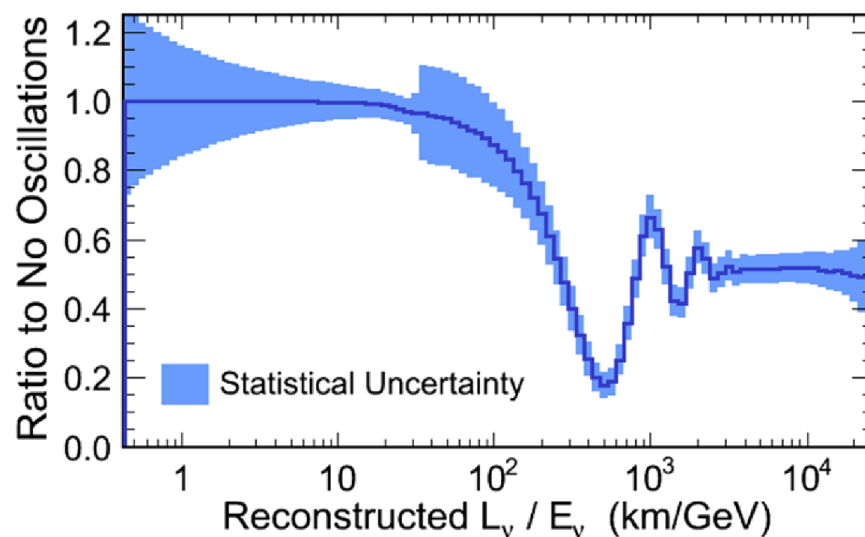
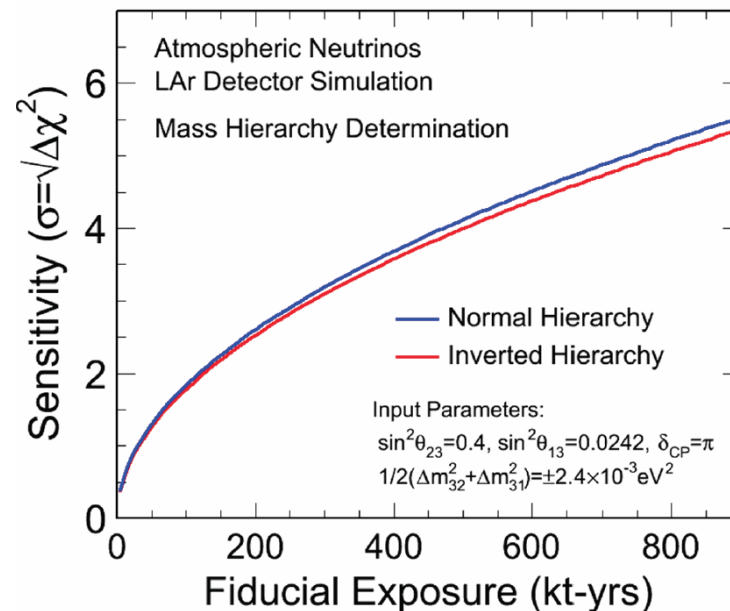


Working Group: CR Neutrinos

- **Science Goals for 10(40) ktons:**

1. Mass Hierarchy resolution
2. Precision measurement of Δm^2_{23} , octant of θ_{23}



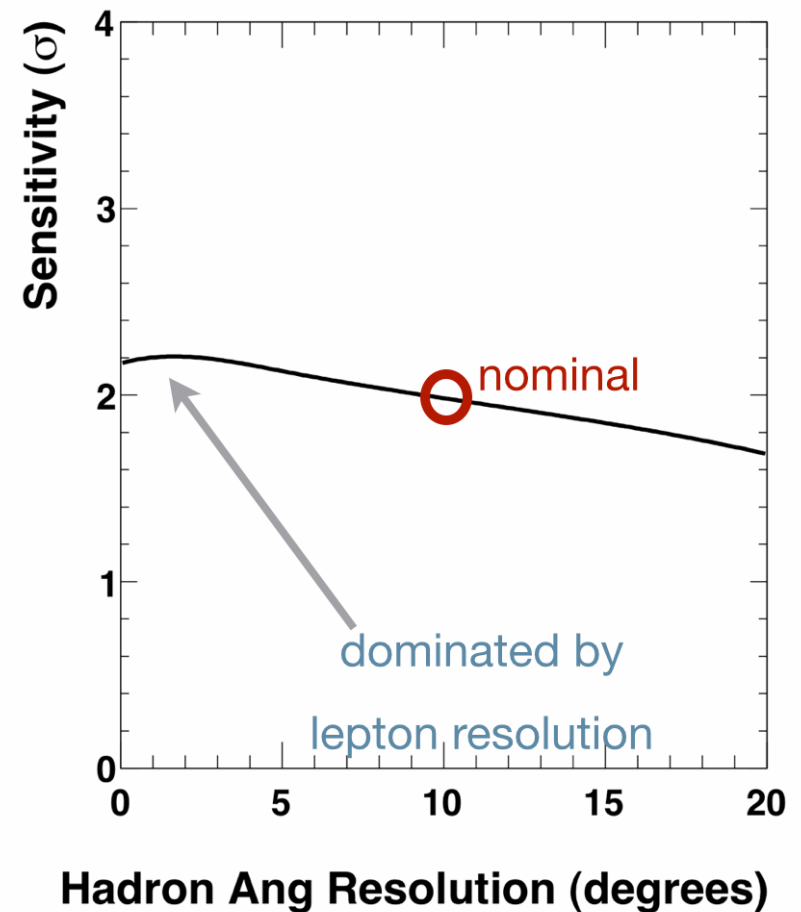
Completeness of Goals

- In addition to these topics, we expect atmospheric neutrino analyses on a wide variety of other topics – in particular BSM neutrino phenomenology.
- We have not carried out sensitivity studies of any of these topics to date.
- Will have to base our statements on the physics channels that we have studied.

Justification of Quantitative Goals

Our statements about goals at this point would be based on what we consider achievable.

Sensitivity degradation as a function of most of the key detector performance characteristics has already been evaluated.



Is the list of performance parameters in LBNF-DUNE-V1.8-parameters complete?

I think it might make sense to specify the beam context for these numbers.

Flavor / NC separation are a priori quite different for atmospheric neutrinos compared to beam neutrinos.

Add: A requirement on the pointing accuracy (of leptons, hadronic systems, or nus?)

	This is the range of values needed to achieve the scientific performance. Validation will be a continuous process as experimental design progresses	
Electron Neutrino Charged Current (CC) Efficiency	70-95	percent
NC to nue CC misidentification rate	0.4-2.0	percent
Muon neutrino CC misidentification	0.5-2.0	percent
Other Backgrounds		0 percent
Signal Normalization Error	1.0-5.0	percent
Background Normalization Error	2.0-15.0	percent
Muon Neutrino Charged Current (CC) Efficiency	80-95	percent
NC to numu CC misidentification rate	0.5-10	percent
nue CC to mu-CC misidentification	1.0-10.0	percent
Other Background		0 percent
Signal Normalization Error	1.0-5.0	percent
Background Normalization Error	2.0-10.0	percent
NC efficiency	70-95	percent
numu-CC misidentification	2.0-10.0	percent
nue-CC misidentification	1.0-10.0	percent
Other backgrounds		0 percent
Signal Normalization	1.0-5.0	percent
Background Normalization	2.0-10.0	percent

Five technical specifications likely to affect performance for my topic are:

- Measurements of the hadronic system (in particular direction) for the MH determination.
- Having a good understanding of the detector acceptance as a function of neutrino flavor, energy, angle.
- Livetime
- Detector monitoring on small (spatial and temporal) scales.
- Proton ID efficiency, decay muon ID efficiency.