Introduction

The Fermilab Director has said he believes that the prospects for getting support from the funding agencies for the future neutrino physics program would be greatly enhanced if we had a roadmap with a consensus from the neutrino community supporting the plan.

Any one of us could draft a “roadmap”. However, we need a process in which all of the group can provide input, and we can build a consensus.

These meetings provide an opportunity to construct a roadmap backed by a consensus.

If we can do this within our small local group, we will be in a position to give it broader exposure and build a broader consensus in a wider forum.
Roadmap Ingredients?

1. List of long-term PHYSICS GOALS
   - Inclusive
   - Concise
   - If possible quantitative

2. Description of how the approved program serves the goals
   - We have a solid well motivated approved program
   - There is more to do beyond the approved program

3. Identify the options for the next step(s) beyond the approved program
   - Describe physics reach of candidate next-generation experiments
   - Justify next step(s) within the framework of the goals

4. Identify possible longer term experiments/facilities that might be required
   - Motivate R&D
Starting Point

1. Today we wanted just to introduce the idea/task of constructing a ROADMAP.

2. Perhaps a good place to start is to attempt to construct a list of goals.

3. The goals seem to fall into two classes:
   - Goals that can be defined independent of future experimental results
   - Goals that will emerge if certain experiments yield certain results

4. There are a large number of ways to list the goals. Start with an example. Probably shouldn’t worry about the details in this meeting … just use the example to illustrate the idea.
Long-Term Neutrino Oscillation Goals

Independent of future experimental results:

1. Test the oscillation framework
   (Example: Determine whether >99% of all the observed $\nu_e, \nu_\mu \rightarrow X$ transitions accounted for within a three-flavor mixing framework?)

2. Determine which is the correct solar solution (LMA ?)

3. Measure, or limit, $\sin^2 2\theta_{13}$ with a sensitivity of $O(10^{-4})$

4. Determine whether $\sin^2 2\theta_{23}$ is different from 1 with a precision of $< 10^{-2}$
   (measure $\sin^2 2\theta_{23}$ with a precision of $O(10^{-2})$)

5. Measure $|\Delta m^2_{32}|$ with a precision of $O(1\%)$
**Additional Neutrino Oscillation Goals**

If LMA is confirmed:
1. Measure $\sin^2 2\theta_{12}$ with a precision of $O(1\%)$
2. Measure $|\Delta m^2_{21}|$ with a precision of $O(1\%)$

If $\nu_\mu \rightarrow \nu_\tau$ is observed in a long baseline accelerator experiment:
3. Determine the sign of $\Delta m^2_{32}$

If LMA confirmed & $\nu_\mu \rightarrow \nu_\tau$ is observed in a long baseline experiment:
4. Observe, or limit, CP-Violation, with a sensitivity to $\delta$ of $O(0.1\pi)$

If there is evidence for additional physics beyond three-flavor oscillations
5. New exciting goals will emerge
**Approved Steps Towards Our Goals**

1. **Test the oscillation framework at the 1% level**
   - MiniBooNE: LSND or not?
   - MINOS: Observe oscillation “wiggle” – test oscillation framework at the x% level?

2. **Determine which is the correct solar solution**
   - KamLAND: LMA or not?
   - Borexino: LMA or not? LOW or not? SMA or not?

3. **Measure, or limit, \( \sin^22\theta_{13} \) with a sensitivity of \( O(10^{-4}) \)**
   - MINOS: 90% CL sensitivity = few × 10^{-2}
   - ICARUS: 90% CL sensitivity = few × 10^{-2}

4. **Determine \( \sin^22\theta_{23} \) with a precision of \( O(1\%) \)**
   - MINOS: Determine to \( \sin^22\theta_{23} \) with a precision of 5-20%?
   - ICARUS: Determine to \( \sin^22\theta_{23} \) with a precision of 5-20%?

5. **Measure \( |\Delta m^2_{32}| \) with a precision of \( O(1\%) \)**
   - MINOS: Determine to \( |\Delta m^2_{32}| \) with a precision of \( \sim10\% \)?
   - ICARUS: Determine to \( |\Delta m^2_{32}| \) with a precision of \( \sim10\% \)?