

Conference notes:  
Minute-taker: James Maloney  
Neutrino Working Group Meeting 10-24-11 FNAL

Nova with more exposure - Prof. Mark Messier (by Ryan Patterson):

Purpose to explore limits of current facilities as baseline for future projects (NuMI@700kW and NOvA). Show how sensitivity will evolve with upgrades.

Reviewed NOvA as it stands now, including block assembly timeline for far detector

3 sigma sensitivity to  $\sin^2 \Theta(13) > 0$  and mass heirarchy resolution reviewed

Plots showing contour for  $\sin^2 \Theta(13)$  for baseline and upgrades at 1 2 and 3 sigma

Idea of an 8GeV LBNE beam – Jeffrey Nelson:

Proposed “old” idea of 8 GeV LBNE detector. (See Doug Michael’s talk from FNAL Proton Driver WS in Oct ’04)

Seeks to solve problem of increased low energy flux for the LBNE

Looked at 2 MW 8 GeV on axis beam to get improved lower energy flux

3 GeV proton less attractive due to low pion yields POT

“optimized” unoscillated rate of CC events at 1290 km plot shown (adds shoulder to beam)

if at 8 GeV you really don’t get higher flux at lower energies

LB beam that uses 8GeV protons before MI could solve low energy flux problem in LBNE

Provides upgrade path for program in Project X era

Connection between neutrino CP violation and leptogenesis – Dr. Boris Kayser:

Looking for CP violations because the arguably would make Leptogenesis more plausible

Explained origins of leptogenesis theory – out growth of seesaw theory of why neutrinos are so light

Without heavy neutrinos – very hard to pin down what happened in early universe (can only measure 12 of 21)

Argument provided for See-saw relation based upon observations

Leptogenesis and light neutrino CP violations imply each other

Neutrino/antineutrino systematics and CP violations – Jorge. G Morfin:

First step in Leptogenesis to find CP violations – discussion of experimental measurement of CP violations

As  $\sin^2 \theta_{13}$  increases, asymmetry decreases so systematic errors more of a concern

Systematic errors associated with each step: measuring convolution of energy dependent cross sections for both neutrino and antineutrino and relative flux between each

Unknown nuclear effects also discussed as an error source

QE cross section dependent on nuclear model of initial nucleon kinematics

Some slides showing how CP discovery potential is dependent on these error

Proposes Intensity frontier systematic error working group to collectively work on these challenges

DAEdALUS beam source – Jose Alonso:

Compact neutrino sources of pion plus decay at rest systems

Compact source provides flexibility of source placement

800 MeV protons desired, 1/2/5 MW average 5/10/15 MW peak power

Concept design involves accelerating H<sup>2+</sup> ions

Pushes tech so long list of challenges, but no show stoppers

Ion Source 30 mA H<sup>2+</sup>

Injector cyclotron similar size to current ion sources – test stand at BEST cyclotrons to develop and test central region

Target dump concept presented

Establish feasibility in next year – ongoing R&D, developing roadmap for prototyping and construction

Physics with DAEdALUS – Georgia Karagiorgi:

Uses 3 accelerator sides close to underwater detector (GD-doped)

Goal: Independent measure of  $\theta_{13}$  and  $\delta_{cp}$

Insensitive to matter effects

Detector needs to identify  $\bar{\nu}_\mu$  to  $\bar{\nu}_e$

High stats well understood event samples, allows you to obtain absolute flux

Advantages – nature forces  $\nu$  flux distribution to be same for all base lines

- Determined systematics identical for all baseline
- Low backgrounds
- Measurements not sensitivity to mass hierarchy

DAEdALUS complements LBNE and large detector at DUSEL and gives possibility of doing more physics