Initial Thoughts on IIFC-vP Plan for LBNE up to November 2013 IIFC Meeting at BARC, Mumbai

LBNE and IIFC-νP Working Meeting
Fermilab, 6 – 7 June, 2013

Brajesh Chandra Choudhary + Raj Gandhi
University of Delhi, Delhi for the IIFC-vP Collaboration

What is Maximum Possible Within the Constraints

1. *Simulation and sensitivity studies*
2. *Development of STT Prototype Design and tooling Requirements*
3. *Dipole Magnet Design*

Progress on (1) and (2) is possible if modest, but critical support from LBNE-US can be provided (being discussed offline). Progress on (3) is possible if Sanjay Malhotra from BARC can be presed to assist. Shekhar Mishra in talk with BARC management on this topic. He can add himself. Some progress on Magnet related studies to be shown by Sanjib Mishra tomorrow.

Simulation, Sensitivity Studies & Detector Optimization

Focus on – a set of "three" studies for ND

1. ***Absolute flux measurement for ν_μ $vbar_\mu$***
2. ***Quasi-elastic interactions***
3. ***Energy scale of v and vbar***

Use LBNE-ND and parametric smearing for reconstruction. Try to figure out efficiency and purity. Launching pad for detailed studies (~1 yr) leading to GEANT4 based modeling of detector (~1.5yr), leading to detector optimization (~2 yrs).

Simulation, Sensitivity Studies & Detector Optimization

By November – hope to achieve progress on:

1. ***Generating Simulation Samples: Generate sets of exclusive & inclusive CC and NC events – for all 4 neutrino species. Data format to be agreed. Students/Postdocs can get involved.***
2. ***Determine Data Framework for the data files. Establish broad principles for conducting various analyses.***
3. ***Analyze the simulated samples: To reach a refined sensitivity to various processes – in particular, QE, Resonance, inclusive ν_e and $\bar{\nu}_e$, π^0 reconstruction, NC events and ν vs anti-ν interactions.***
4. ***For analysis use existing neutrino data to cross-check and calibrate the simulation results.***

Simulation, Sensitivity Studies & Detector Optimization

Post-November, into the next year, we will continue to progress towards the following technical goals:

1. ***Configuring the GEANT4 Simulation Package: Set up the geometry of the STT, the ECAL, the magnetic field model of the dipole magnet and the muon detector.***
2. ***Simulating Alternatives: Quantify the effects of different STT and ECAL parameters, the two critical detectors in HIRESMNU.***
3. ***Study algorithms for track-reconstruction and particle-ID, evaluate resolution-smearing effects and efficiencies.***

WILL DEPEND ON RESOURSE AVAILABLE in India & USA

Development of STT Prototype Design + Tooling Req.

Hope to arrive at a design for the STT prototype by 11/2013. Make progress on study towards the mechanical design, M&S, tooling, gas-requirements, and a readout scheme. In the following six months, we hope to set up the lab at PU, acquire/purchase tooling, material, and proceed toward constructing the first prototype module (???).

Lead persons & Institutions: IUCPS, Vipin, Christopher and Robero will take lead. Students from IIFC-vP taking courses to assist. With support from LBNE-US Roberto proposes to spend up to two months in India in 2013-2014 to work with Vipin and colleagues at PU. This will likely happen after 11/2013.

If seed funding from DAE/DST arrives, we hope to buy Vipin's teaching-time --- at least one semester --- for the coming academic year, and such trips (to/for CERN/FNAL) and M&S that are needed. Beyond 11/13, the hardware costs will be more substantial, so that progress will be contingent upon seed funding.

ROBERTO TO DISCUSS MORE DETAIL IN STT TALK.

Progress Towards Magnet Design

Work to progress once BARC is on-board. To be designed and simulated by scientists involved in the project (BARC/FNAL); fabricated in close collaboration to industry.

At the present juncture, requires no addtional financial support, but does require that Sanjay Malhotra from BARC join the LBNE-India effort.

Lead persons & Institutions: Sanjay Malhotra et al. (BARC), TBI (FNAL), TBI(LANL), TBI (Indian Institutions and IUCPS)

Besides the goals (1), (2) and (3) discussed on page 2, other major categories of work are RPC, Instrumentation (Gas system, DAQ, Electronics and Safety) and the ECAL. Progress on them, however, will need to wait until after 11/2013 and the arrival of funds from the Indian funding agencies.

THANK YOU