

# LBNE Reconfiguration Physics Working Group 1<sup>st</sup> Meeting

April 11, 2012

Present:

- Mel Shochet, U.Chicago (chair)
- Mary Bishai, BNL
- Ed Blucher, UChicago
- Steve Brice, FNAL
- Milind Diwan, BNL
- Bonnie Fleming, Yale
- Gil Gilchriese, LBNL
- Mark Messier, Indiana
- Stephen Parke, FNAL
- Gina Rameika, FNAL
- Kate Scholberg, Duke
- Jenny Thomas, UCL
- Charlie Young, SLAC
- Sam Zeller, FNAL
- Jeffrey Appel, FNAL (Scientific Secretary)

Mel reviewed the structure of the LBNE Reconfiguration effort, the anticipated cost range possible for a first phase of the LBNE project (\$600M-\$700M, one third of the full original LBNE estimate), and the role of the Physics Working Group in assessing the physics reach of LBNE Phase 1 options as given by the Steering Committee.

The main goal of any LBNE Phase 1 proposal is viewed as CP violation sensitivity, since that was the widely-accepted recommendation from P5. Other physics goals are only useful in this context to broaden the program – an important and useful thing.

The timing of the effort is driven by actions soon on the FY2013 budget (in Congress) and the FY2014 budget (OMB and DOE decisions) – both anticipated to occur in the next 2-3 months.

The next discussion was on the initial set of options from the Steering Committee, and the assumptions which should be made. The following conclusions and questions came out of that discussion:

- 1) Assume that the mass hierarchy is known, either from NOvA and T2K before the Phase 1 project is started or using the Phase 1 project results by the end of its running.
- 2) Depth dependent projections can make use of the LBNE document on depth requirements for each of the LBNE physics goals, which Mary Bishai offered to distribute.
- 3) LAr on the surface will not be capable of proton decay or supernova neutrino physics measurements, but may also have difficulties with trigger rates and maximum drift lengths). Risks can be identified, but no new work likely possible on the available time scale. There are LBNE documents on this which might be made available to the Working Group.
- 4) Use  $\sin^2(2\theta_{13})$  of 0.092, the Daya Bay value – consistent with making the most use of previous work. Just make certain that the value used is used uniformly.
- 5) All detector capability parameters must be specified. Mary Bishai offered to send a list of parameters for the LBNE studies (used commonly by her, Gina, and Sam). Mark Messier offered to do the same for the NOvA studies.
- 6) 700 kW needs a translation to protons on target per year. NOvA uses 6E20 POT for its projections. The Lab will provide a number. [Post meeting, the Lab has agreed that this is an agreeable translation.]
- 7) NOvA and T2K assumptions/projections should be used to justify the projection that the mass hierarchy will be known – or add LBNE Phase 1 if needed.
- 8) Assume half neutrino running, half antineutrino running for LBNE Phase 1, since NOvA studies indicate a fairly broad optimization-sensitivity curve for this fraction.
- 9) The suggestion was made for one additional option for Homestake in which the near detector and detector building are dropped (could be added in a later phase). Mel agreed to ask that the Engineering/Cost working group estimate how much additional detector mass could be added from the savings so that the physics group could assess whether such an option is useful.

The planned organization of the April 25-26 Workshop was requested so that people can prepare travel, etc. At least, how much time will be assigned to each working group for presentations?

Kate Scholberg offered to work with Jen Raaf on the non-neutrino physics reach.

It is thought that the information is also available for options 1-6 for oscillation reach, though plots will have to be prepared. Mary Bishai and/or Gina Rameika and Sam Zeller will distribute some draft plots in the next few days.

The next meeting will be early next week.