LBNE Calibration Studies

1. Simulation Tasks

   The primary goal of the simulation task will be to quantitatively determine the calibration requirements for the far and near detectors.

   The task will be carried out using generic and collaboration wide software tools, such as GLOBES and various existing detector simulations along with available reconstruction tools. The GLOBES framework can be used to study the impact of energy scale bias and resolution at the far and near detectors as well as their interplay with respect to the physics sensitivity of the LBNE experiment. Detailed studies are planned which differentiate between the requirements for signals and backgrounds for the principal analyses (nu-mu disappearance and nu-e appearance).

   Cosmic muons are likely to form a principal component of the energy/momentum calibration of the far and near detectors and detailed simulations of the cosmic muon flux at the underground experimental sites are required to determine the rate of partially contained and through-going muons and Michel electrons in a given detector volume. Such a simulation will have to include various configurations of muon telescopes or detector components (e.g. outer volume for water Cherenkov or outermost layer for near detector) to evaluate the optimal size, configuration and position of such a device in the future experiment.

   While the generic requirements can be determined somewhat independently of any specific detector configuration the initial studies will be followed up by more detailed simulation studies involving specific detector configurations and reconstruction tools. The latter studies are meant to guide the development of specific detector calibration tools and detector configurations as well as a calibration scheme.