

## LBNE NDS November 2013 Quarterly Progress Report

### 1. Observation of a NuMI Beam Spill with the Prototype Cherenkov Detector

The prototype Cherenkov detector has been installed and operated in the NuMI alcove 2. The detector is filled with 1 atmosphere of argon and has been exposed to the NuMI beam. The Cherenkov detector pitch and yaw adjustment are functional with local control, and the DAQ computer and a temporary slow controls rack are connected to Acnet (although some issues remain). In addition, the Bitscope is connected to Acnet and is controlled by the local DAQ computer. Figure 1 shows the muon signals from a single NuMI beam spill. The yellow curve shows the mistimed accelerator signal, the green curve is from a scintillator in the beam that is read out by a phototube, and the blue curve is from the Cherenkov detector. The Cherenkov detector is able to clearly observe the beam microstructure.



Figure 1: The muon signals from a single NuMI beam spill. The Cherenkov detector (blue curve) clearly shows the beam microstructure.

## 2. Near Neutrino Detector Reference Design Document

A reference design document for a Fine-Grained Tracker (FGT) has been made for the LBNE near neutrino detector. The FGT consists of a straw-tube tracker (STT) and an electromagnetic calorimeter (ECAL) inside of a 0.4T dipole magnet. The STT has dimensions 3.5m x 3.5m x 6.6m and contains both foils for producing transition radiation for electron particle identification and targets containing pressurized argon gas for measuring neutrino-argon cross sections. The ECAL consists of layers of lead and plastic scintillator. In addition, a muon identifier (MuID), consisting of resistive plate chambers (RPCs) sandwiched between layers of steel, is located in the steel of the magnet, as well as upstream and downstream of the dipole magnet. A schematic drawing of the FGT is shown in Figure 2.

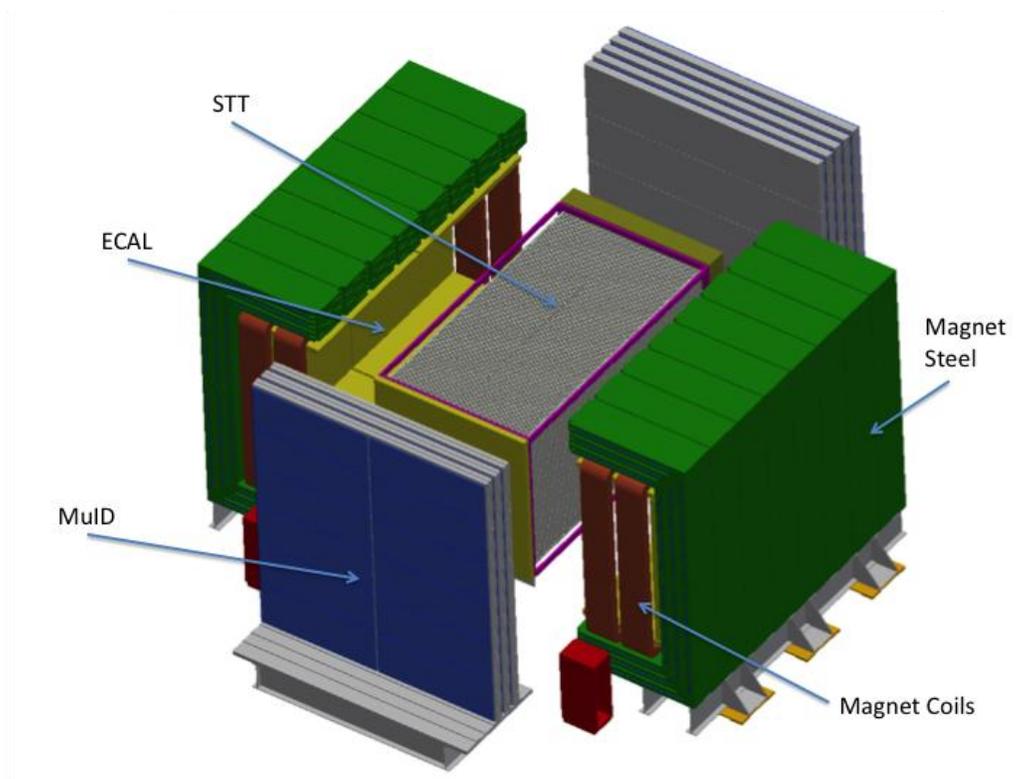


Figure 2: A schematic drawing of the FGT reference design.

## 3. Straw-Tube Prototype Detector Design

A straw-tube prototype detector with 5 straws has been designed for our Indian colleagues. It will serve as a first step for the construction of a full-scale prototype STT detector. A schematic drawing of the detector is shown in Figure 3, while Figure 4 shows a cross-sectional view. The straw tubes are glued together with composite

sheets on the outside for rigidity. The straw-tube internal components are copied from the COMPASS detector design.



Figure 3: A schematic drawing of the five straw-tube prototype detector.

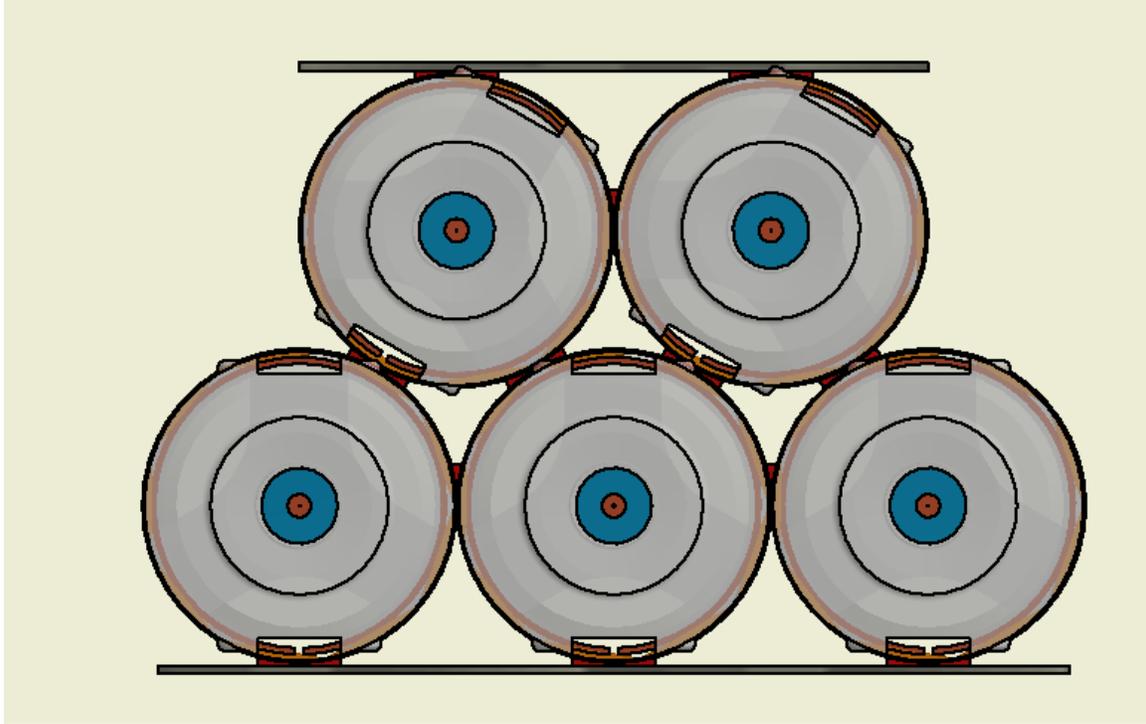


Figure 4: A cross-sectional view of the five straw-tube prototype detector.