LBNE NDS February 2014 Quarterly Report

1. Progress with the Prototype Cherenkov Detector

Work has continued on the prototype Cherenkov detector (see Figure 1) in terms of automating the gas system and DAQ. In preparation for the Phase 1 Readiness Review on February 18-19, 2014, the gas panel plumbing and cable routing have been completed, the pump has been positioned in the bottom of the gas rack, and shelves have been added for the DAQ and the "chipmunk" detector. Phase 1 unattended operation has actuators left in acquiescent state, gas system at atmospheric pressure and valved off, PMT voltage on, and DAQ operational. Phase 1 attended operation will have actuators controlled locally and gas system operated locally from vacuum to 2 atmospheres. Figure 2 is a photograph of the controls panel and touch pad outside alcove 2.

Figure 1: A photograph of the Cherenkov detector in the NuMI alcove.

Figure 2: A photograph of the controls panel and touch pad.

For the DAQ we are currently using a Tektronix MSO3034 scope with a 2.5 GHz sample rate and 300 MHz bandwidth. The DAQ is network based, which allows remote readout, and a Python-based automated DAQ is being developed. NuMI beam pulses have been observed with the Cherenkov counter filled with argon at 1 atmosphere, corresponding to a muon momentum threshold of 4.45 GeV/c. Figure 3 shows a typical NuMI beam pulse, while Figure 4 shows the individual RF buckets.

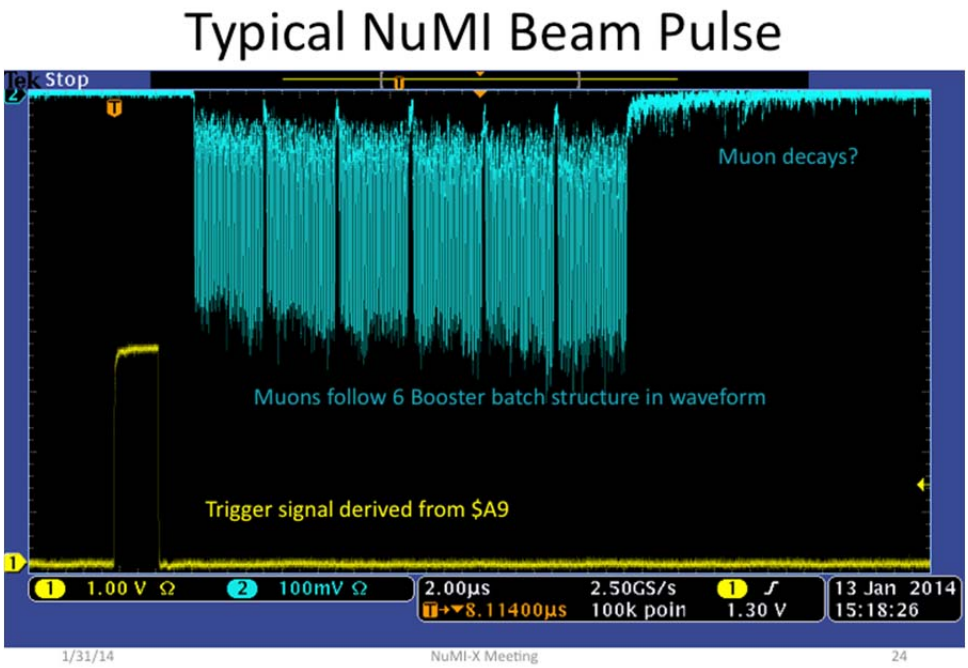

Figure 3: Muons observed by the Cherenkov detector, showing a typical NuMI beam pulse.

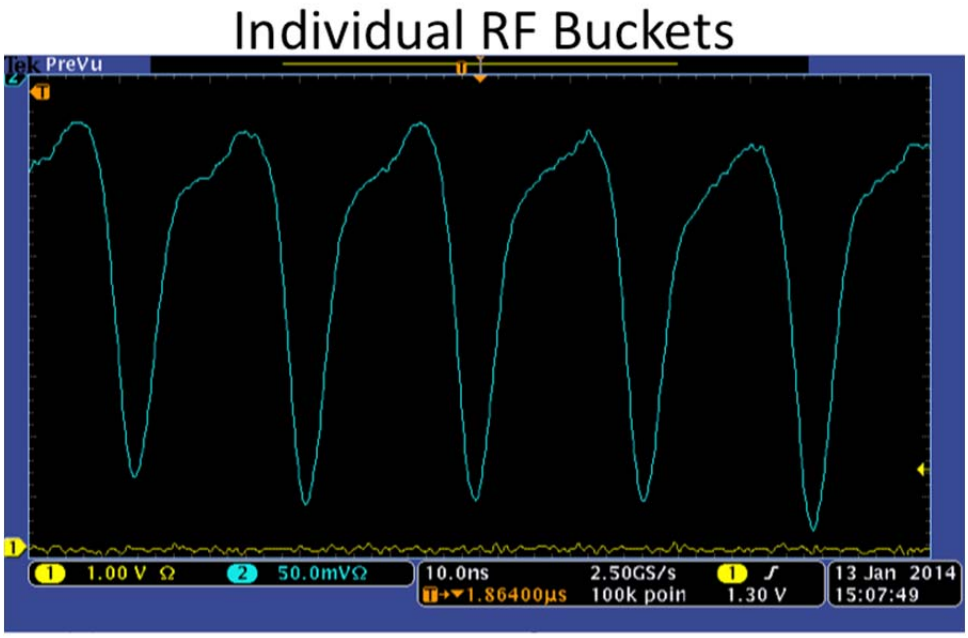

Figure 4: Muons observed by the Cherenkov detector, showing individual RF budgets.

2. Reference Design for the Near Neutrino Detector

A reference design has been established for the near neutrino detector. As shown in Figure 5, the design consists of a 3.5 x 3.5 x 7.0 m^3 straw-tube tracking detector (STT) that is surrounded by an electromagnetic calorimeter (ECAL) made up of layers of plastic scintillator and lead. The STT and ECAL are positioned inside of a 0.7 T dipole magnet. In addition, muon identifier detectors (MuIDs) made up of resistive plate chambers are located upstream and downstream of the magnet between layers of steel and are also inserted between steel layers of the magnet.

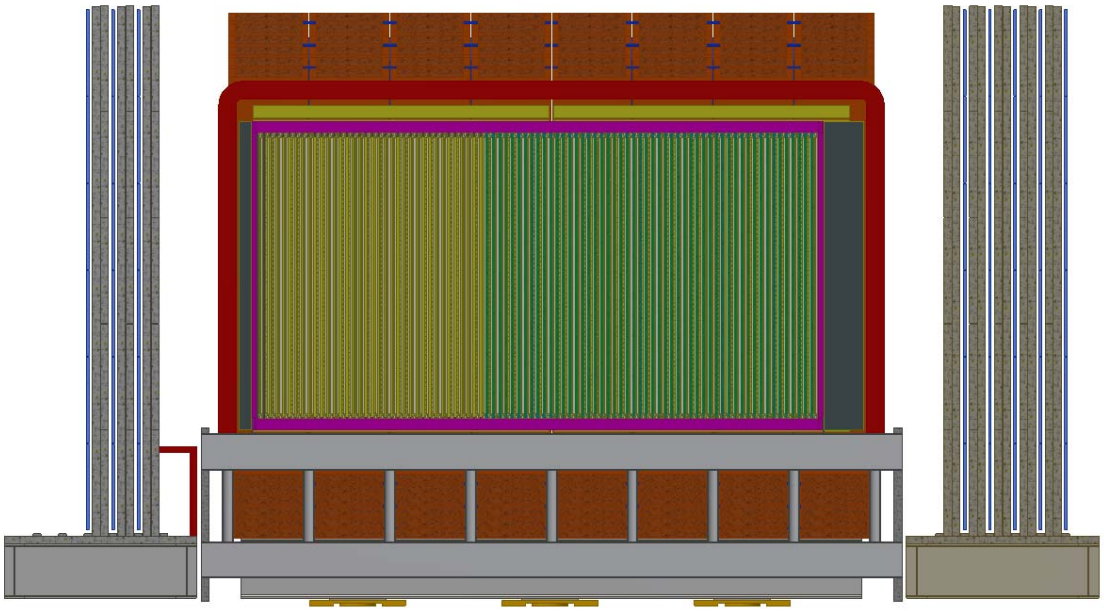

Figure 5: A schematic drawing of the near neutrino detector reference design.

3. Near Neutrino Detector ECAL Assembly

Work has begun on assembly and shipping procedures at IIT Guwahati for the near neutrino detector electromagnetic calorimeter (ECAL). Figure 6 shows a draft assembly area layout for one of the options. The ECAL would be fully assembled at IIT Guwahati and shipped by rail to a seaport.

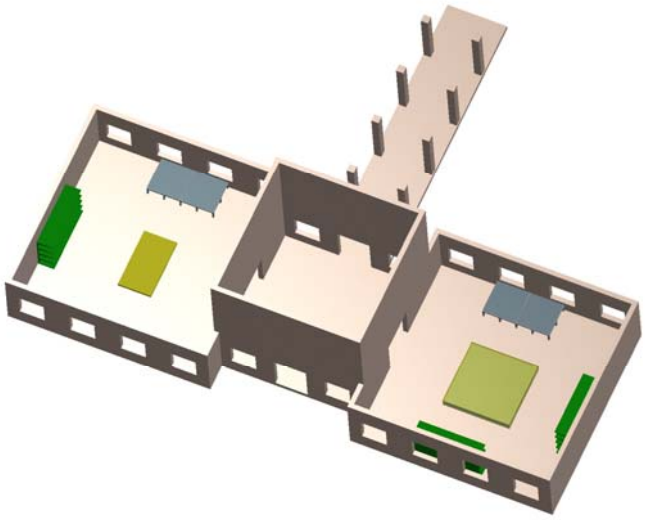

Figure 6: A draft ECAL assembly area layout for one of the options at IIT Guwahati.