LANL MicroBooNE 3QFY14 Quarterly Report
August 2014

1. Event Display (Wes Ketchum)

A sample event display of a simulated event is shown in Figure 1. The event is from a BNB Genie muon-neutrino + cosmic sample. Genie reports that the neutrino interaction produces a 1.4 GeV/c muon, 700 MEeV/c proton, 100 MeV/c proton, and a 100 MeV/c neutron. The location of the neutrino interaction, along with the drift window corresponding to the BNB beam gate time, is highlighted on the figure. Only the "raw data" objects are shown (no reconstruction).

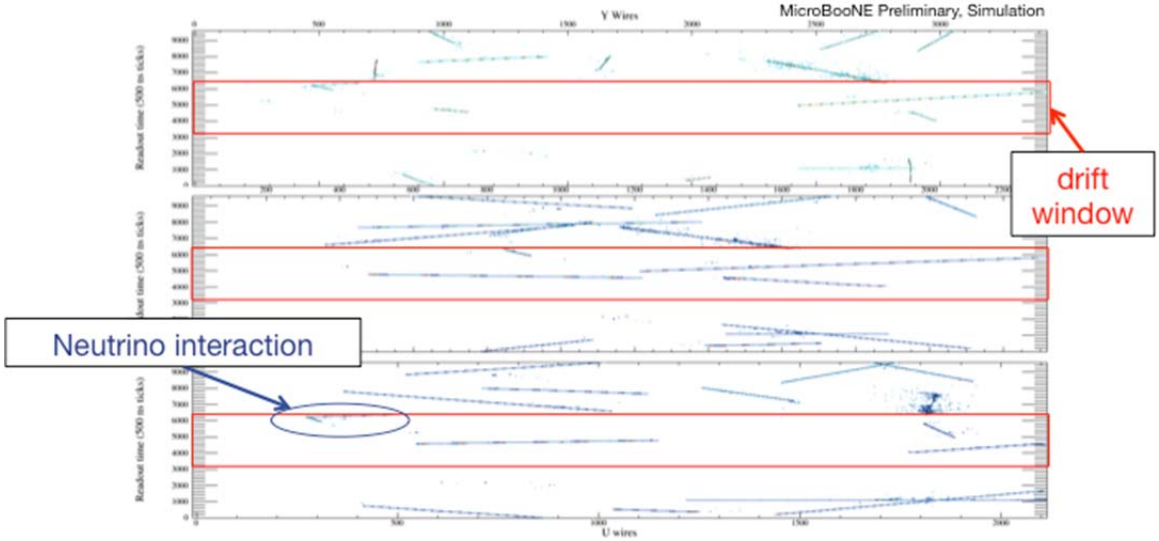

Figure 1: An event display of a simulated event.

2. Event Reconstruction (Wes Ketchum)

There has been continued progress on the reconstruction of neutrino events. Figure 2 shows the outline of the event reconstruction strategy. The cosmic muon reconstruction is in good shape, and the focus is now on track reconstruction of neutrino events and the development of analysis tools. The shower reconstruction is under rapid development with the optimization of cluster reconstruction.

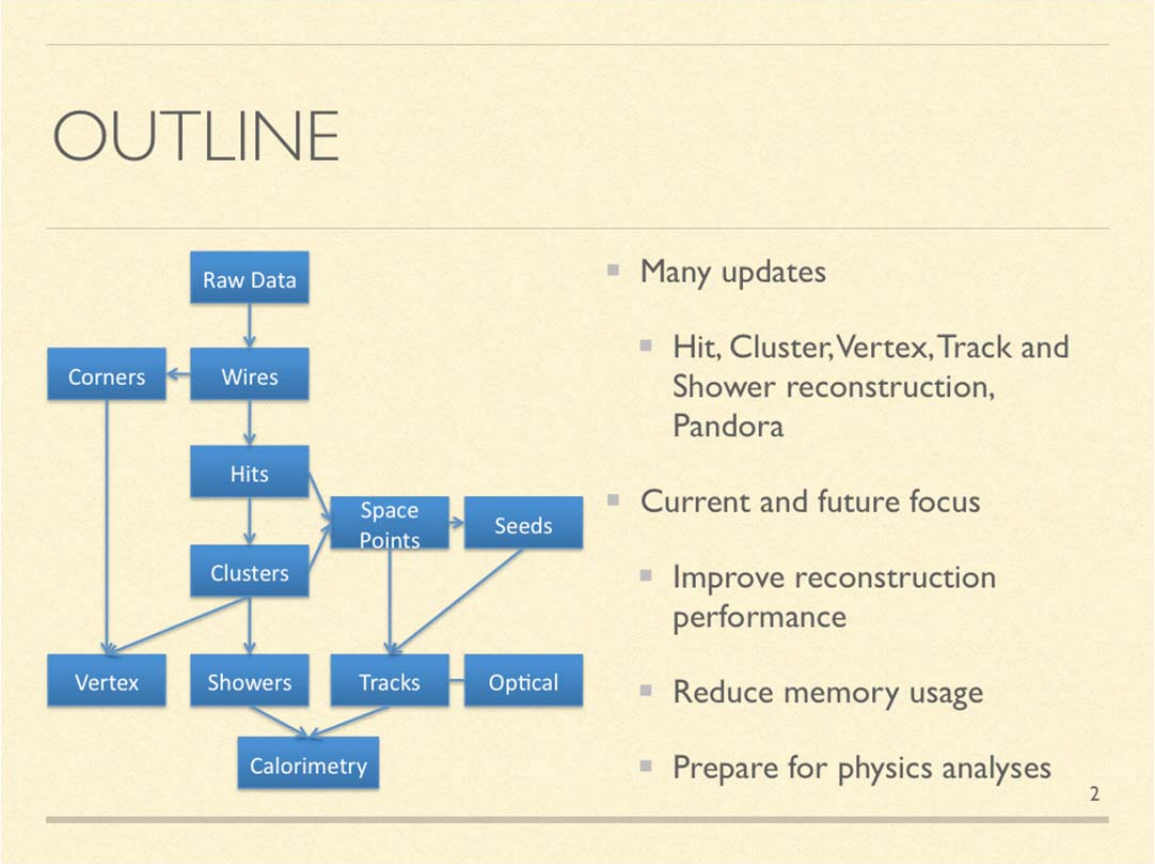

Figure 2: The outline of the event reconstruction strategy.

3. Neutrino Event Timing Resolution and Beam Alignment (Richard Van de Water)

The absolute neutrino event timing resolution with the BNB fiber-optic readout has been measured using CCQE muon-neutrino events in the MiniBooNE detector, which has been running in beam-dump mode. Figure 3 shows the absolute neutrino event timing distribution for a sample of 1337 CCQE muon-neutrino events. The time resolution (RMS) is determined to be 2.234 nsec. Good timing resolution to reject backgrounds can be obtained in MicroBooNE by measuring the scintillation light with the photon detectors, relative to the BNB beam time.

Work has been ongoing on the analysis of data from the newly installed BNB multiwires. Preliminary results are encouraging and beam position resolutions on the order of a few tenths of a milliRadian, on a spill by spill basis, have been achieved. There still remains an overall systematic uncertainty on the proton beam position on the order of 1 m at the MicroBooNE location. This is due to complexities in the alignment and survey of the BNB. To mitigate this problem, a plan is being devised to perform a beam pointing calibration at the 25m absorber position using SWIC multiwires. This will be done at the end of the FNAL fall shutdown and will only require a week of time to complete. The beam direction calibration will insure

that we can direct the proton beam onto the center of the MicroBooNE detector to within 10 cm.

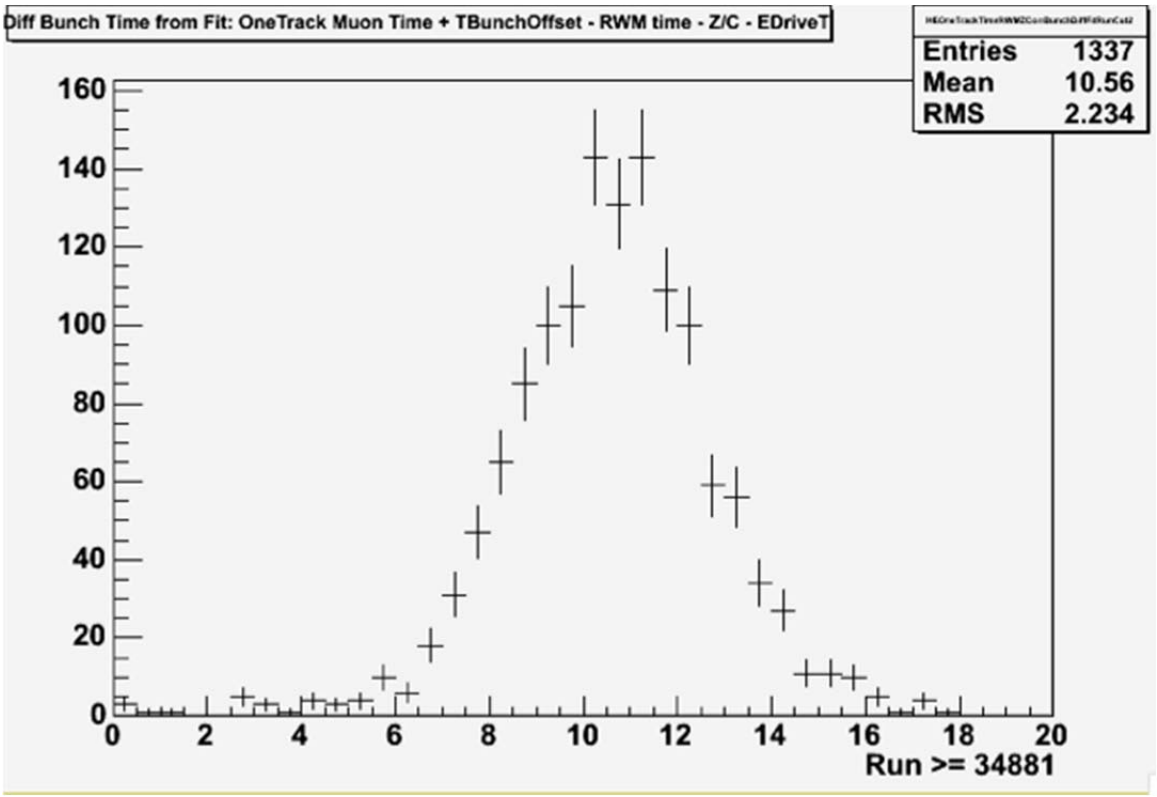

Figure 3: The absolute neutrino event timing distribution for a sample of MiniBooNE CCQE muon-neutrino events.