

SBN Progress – July 2018

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I. SBND PMT Testing

The PMTs for the SBND Photon Detection System (PDS) are being tested eight at a time in a cryostat filled with liquid argon. Figure 1 is a photograph of the inside of the cryostat that shows the mounting of the PMTs, while Figure 2 shows a typical single photoelectron pulse above the low background. After the initial PMT testing is completed, all 160 PMTs will be installed in the CAPTAIN cryostat, shown in Figure 3, for a complete system test in liquid argon.



Figure 1: A photograph of the inside of the cryostat that is testing eight PMTs at a time in liquid argon.

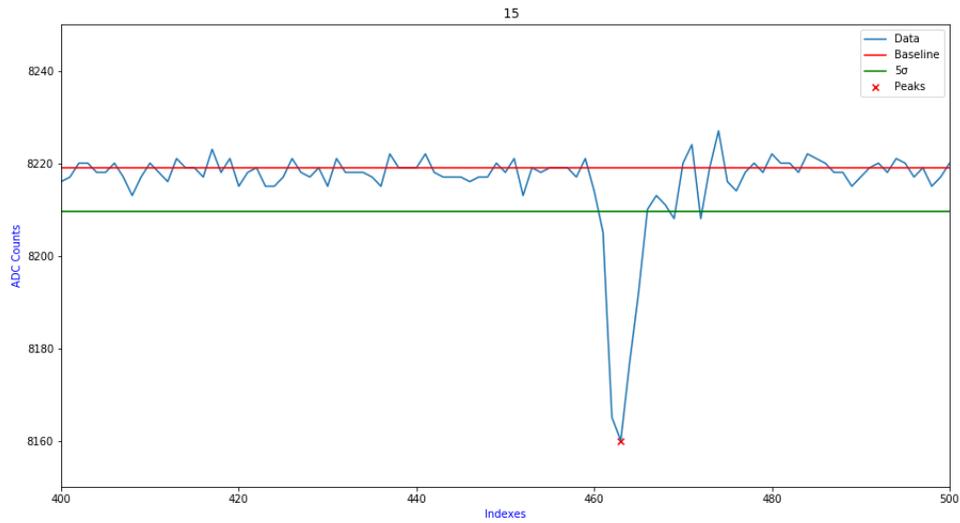


Figure 2: A typical single photoelectron pulse above the low background from one of the PMTs immersed in liquid argon. The time scale on the horizontal axis corresponds to 2 ns units.

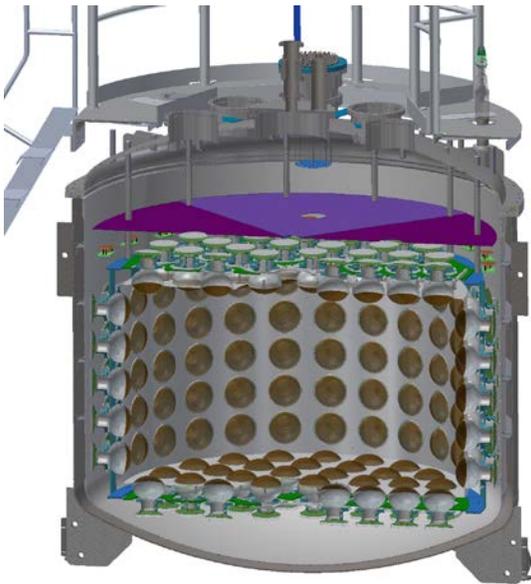


Figure 3: A schematic drawing of the CAPTAIN cryostat, which will enable a complete system test in liquid argon for all 160 PMTs of the SBND PDS.

II. New MiniBooNE Electron-Neutrino Appearance Results

New MiniBooNE electron-neutrino appearance results (see arXiv:1805.12028) were presented at the Neutrino 2018 conference that confirm the signal observed by the

LSND experiment. With a total of 12.84×10^{20} protons on target in neutrino mode, which is approximately double the neutrino data previously reported, MiniBooNE observes a 4.5σ excess of electron-neutrino candidate events in the canonical 200-1250 MeV range. Combining the 11.27×10^{20} protons on target in antineutrino mode with the neutrino-mode data, MiniBooNE observes a 4.8σ excess of electron-neutrino candidate events. Figure 4 shows the event excess as a function of visible neutrino energy (Evis) and $\cos\theta$ (U_z) in both neutrino mode and antineutrino mode. Assuming a 2-neutrino oscillation hypothesis, Figure 5 shows the MiniBooNE allowed oscillation regions. As shown in the figure, the MiniBooNE allowed 1σ region lies mostly within the LSND 90% CL band, which demonstrates good agreement between the LSND and MiniBooNE oscillation signals.

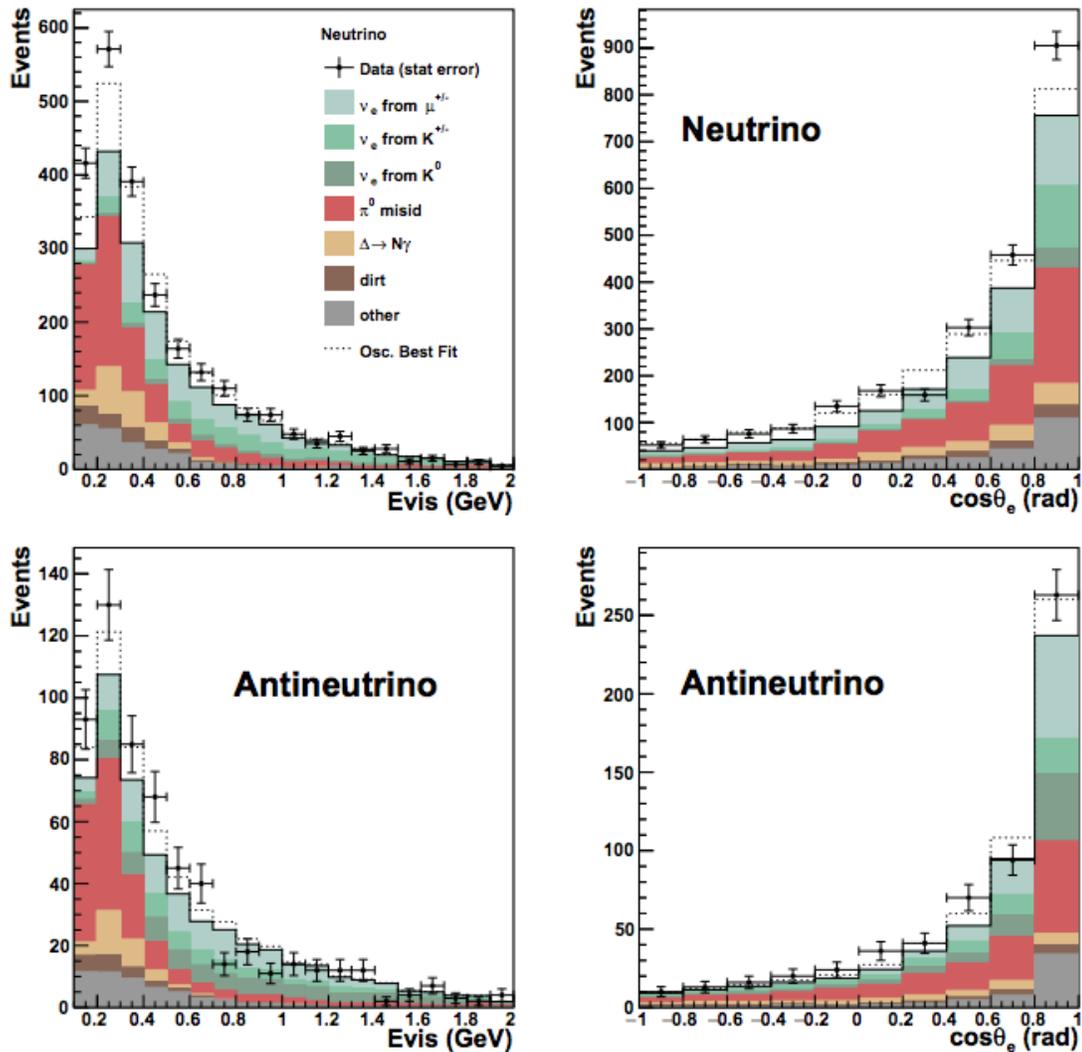


Figure 4: The MiniBooNE event excess as a function of visible neutrino energy (Evis) and $\cos\theta$ (U_z) in both neutrino mode and antineutrino mode.

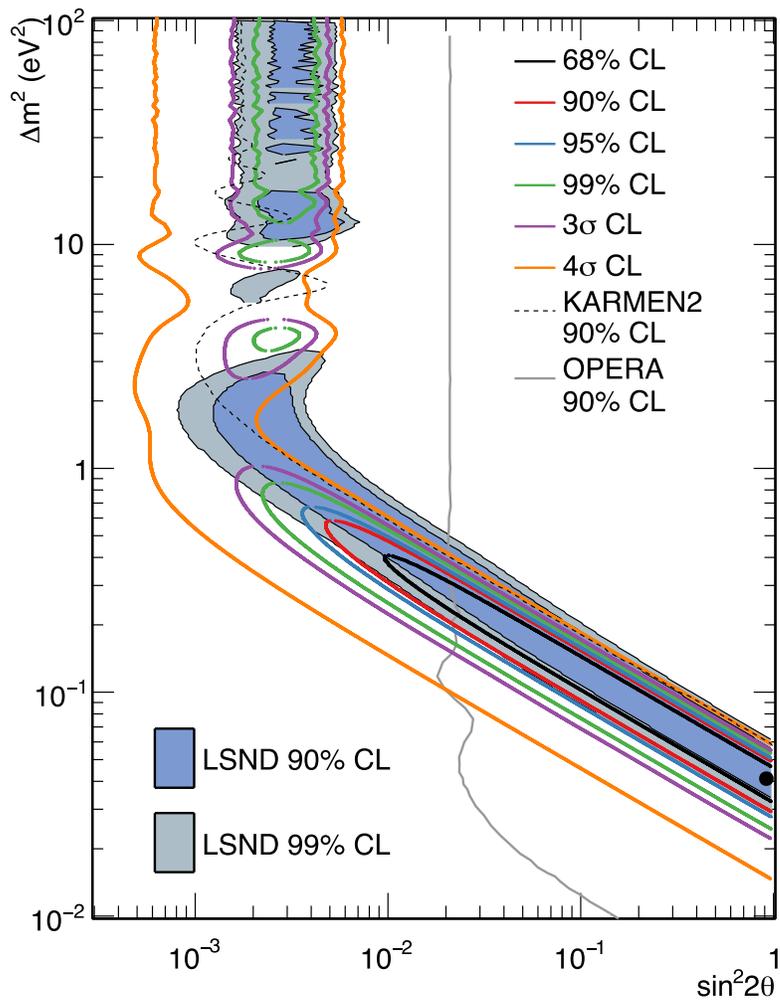


Figure 5: The MiniBooNE allowed oscillation regions, assuming a 2-neutrino oscillation model.