SBN Progress – January 2017

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I. SBND PMT Support Box

Figure 1 shows the latest design of the SBND Photon Detection System (PDS) support box for the PMTs. The PDS has 120 TPB-coated Hamamatsu R5912 8" phototubes (PMTs). The PMTs will be grouped in 24 modules with 5 PMTs per module. Each module will have a support box (44" x 48") with removable covers for environmental control (light and humidity) during storage and shipping. The bottom module has the covers in place, while the top module has the covers removed.
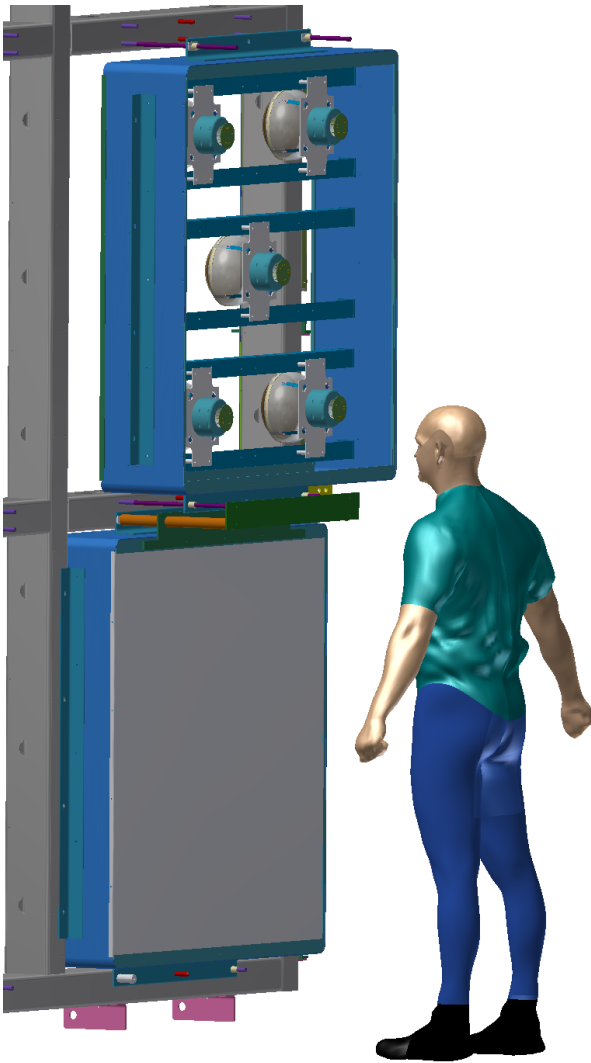

Figure 1: The latest design of the SBND Photon Detection System (PDS) support box for the PMTs. The bottom module has the covers in place, while the top module has the covers removed.

II. SBND PMT Timing Resolution

Figure 2 shows the PMT laser test results for single photoelectrons. The PMT timing resolution, including electronics, is measured to be approximately 0.9 ns.
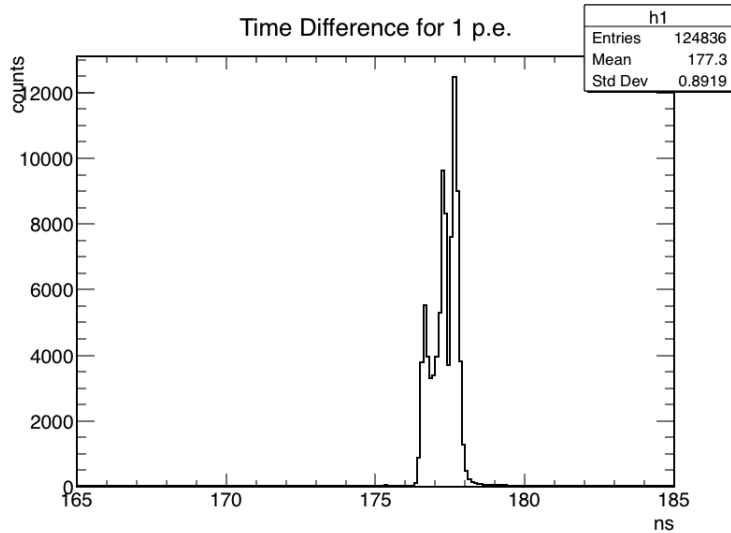

Figure 2: The PMT timing resolution is measured to be approximately 0.9 ns for single photoelectrons.

III. New MiniBooNE Data

The MiniBooNE experiment has collected an additional 4.9 E20 POT in neutrino mode since October 2015, which has increased the neutrino mode statistics by ~75%. Using a subset of the new data (2.92 E20 POT), Figure 3 shows the absolute timing distribution relative to the neutrino beam (modulo 19 ns) of a sample of muon-neutrino charged-current events (left) and the 515 electron-neutrino charged-current candidate events in the energy range >200 MeV (right). The timing distribution may allow a determination of whether the MiniBooNE excess events are due to electron or photon events.
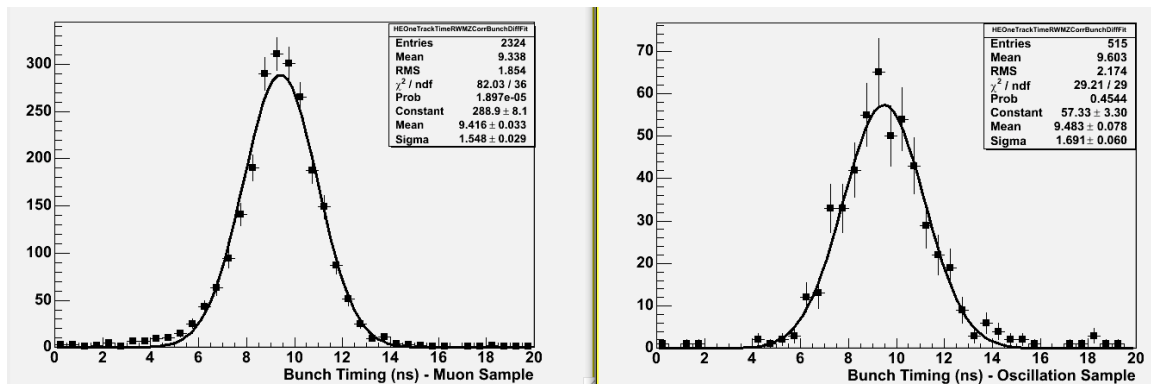
Figure 3: The absolute timing distribution relative to the neutrino beam (modulo 19 ns) of a sample of muon-neutrino charged-current events (left) and the 515 electron-neutrino charged-current candidate events in the energy range >200 MeV (right).

IV. MiniBooNE Beam-Dump Results

MiniBooNE took data in beam-dump mode in 2014 and collected 1.86 E20 POT. This enables MiniBooNE to set improved limits on light dark matter, as shown in Figure 4. A paper will be submitted to PRL soon & two other channels are being analyzed.
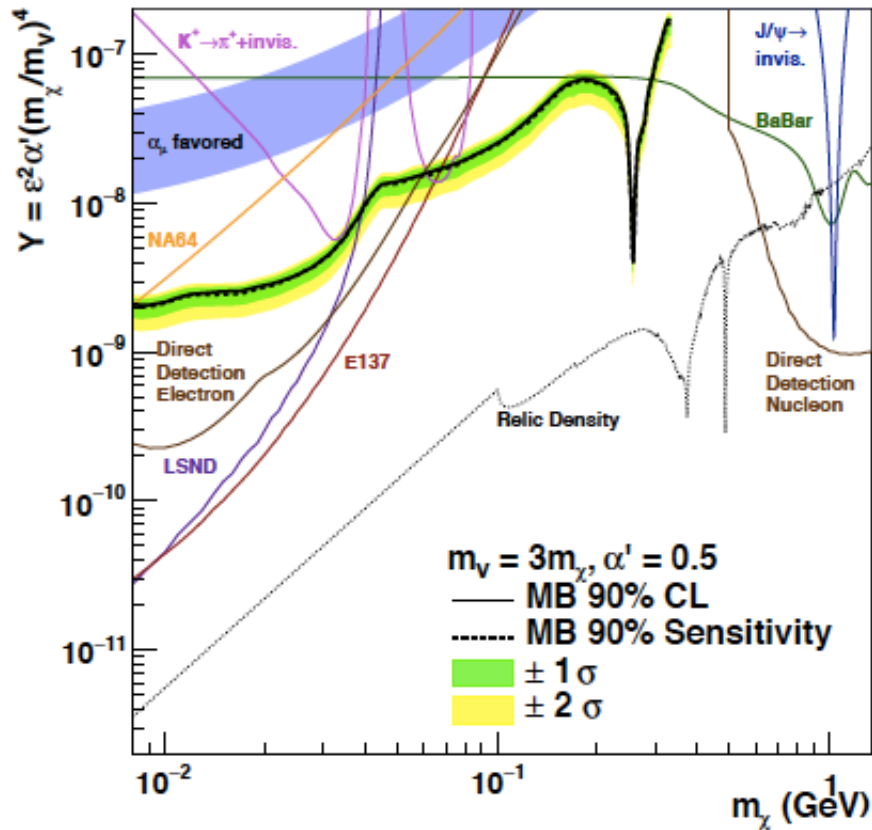

Figure 4: Limits on light dark matter from the MiniBooNE beam-dump run.