SBN Progress – January 2016

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I. SBND Photon Detection System Support Structure

A revised design of the SBND Photon Detection System (PDS) support structure has been made and has been fully integrated with the Fermilab CAD/step file models. The new design has a total of 120 8" R5912 Hamamatsu phototubes, corresponding to 30 phototubes per APA plane, as shown in Figure 1. Proposed DUNE-style light guide bars fill in the space between the phototubes.

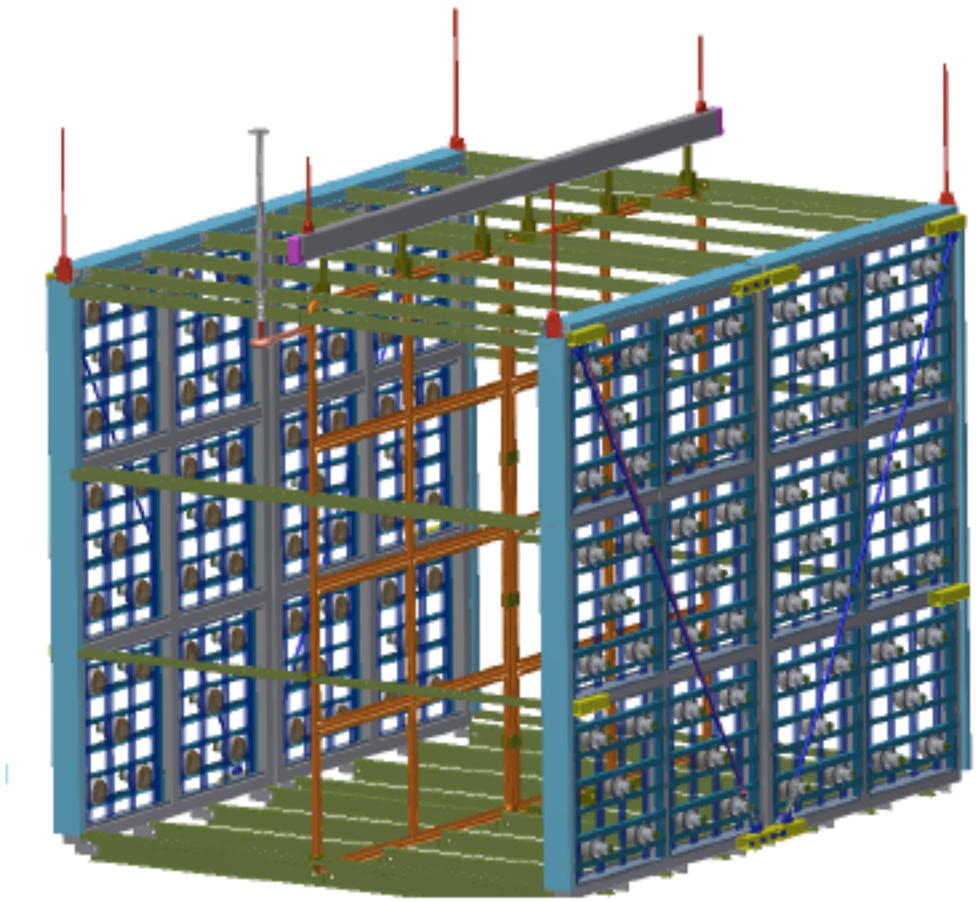

Figure 1: A schematic drawing of the PDS support structure.

II. SBND Photon Detection System Electronics

Two CAEN models, 1725 and 1730, are available with the large memory option (~5 Ms/channel) and are being considered for the PDS electronics. The 1725 digitizes at 250 MHz, has a 14 bit ADC, and is packaged with 16 channels per board. The 1730 is similar, but with 500 MHz digitization. The 14 bit ADCs would provide 5 bits for a single photoelectron and a dynamic range of approximately 512 photoelectrons. The electronics will have fiber optic readout (80 Mbit/s) and a 64 MHz external clock. Work has begun with the DAQ group on interface and synchronization issues.

III. SBND Photon Detection System Schedule

A preliminary schedule has been developed for the design, construction, and installation of the PDS. As shown in Figure 2, the project should be complete by the end of CY2017.

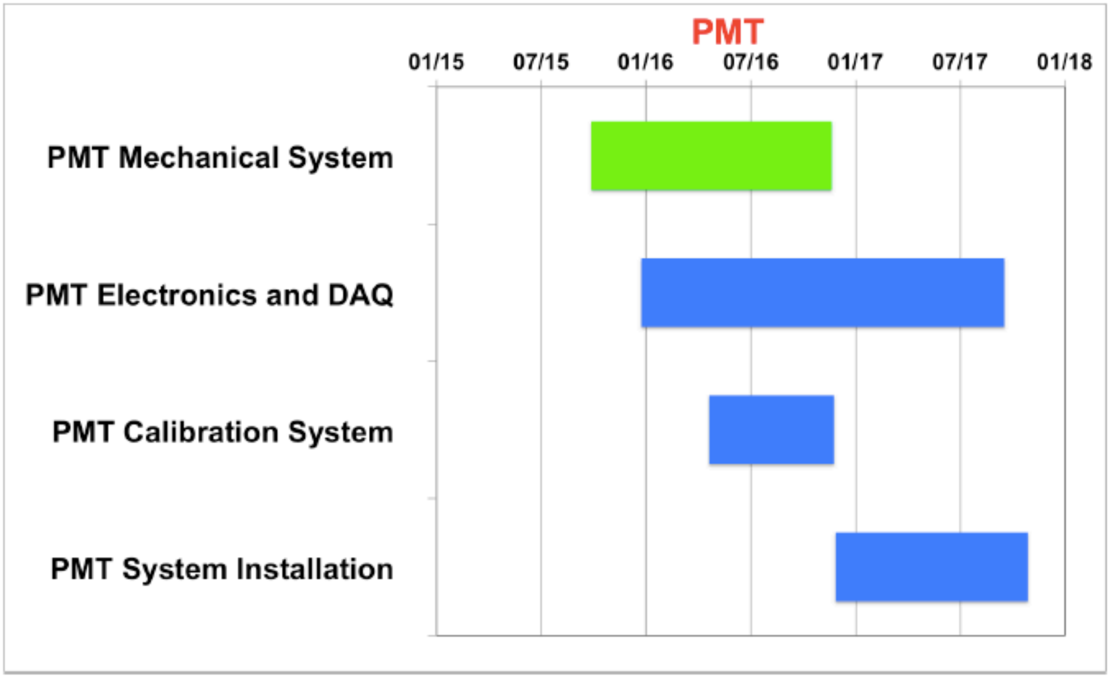

Figure 2: Preliminary schedule for the design, construction, and installation of the PDS.

IV. BNB Neutrino Flux

As part of the MicroBooNE experiment, the MiniBooNE detector has been taking data in order to check that the BNB neutrino flux has not changed since the magnetic focusing horn was replaced earlier this year. Figure 3 shows the raw (unprocessed) rate of neutrino events per proton on target (POT) as a function of calendar time through 2015. More statistics will be collected; however, the figure demonstrates that the neutrino event rate with the new focusing horn is consistent with previous running. Therefore, the neutrino beam conditions for MicroBooNE appear to be the same as they were for MiniBooNE.

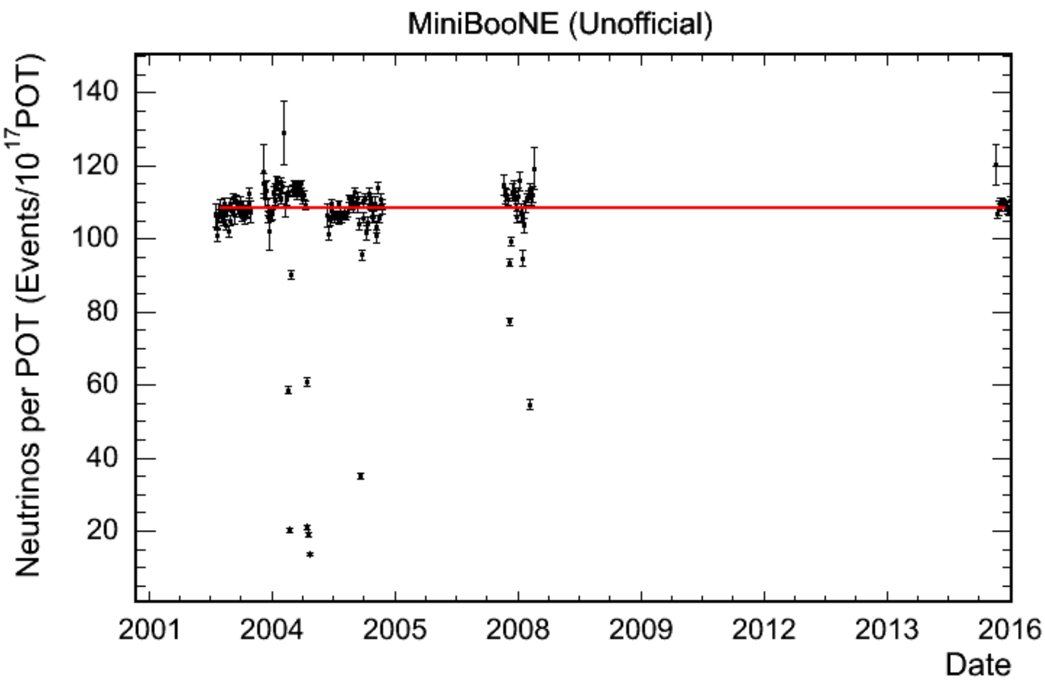

Figure 3: The raw (unprocessed) rate of neutrino events per proton on target (POT) as a function of calendar time through 2015.

V. MicroBooNE PMT Hit Rate

To help understand the MicroBooNE phototube hit rate of ~200-300 KHz, we have begun to measure the hit rate in MiniCAPTAIN. At present, the phototube hit rate in MiniCAPTAIN is ~400 Hz, which is much lower than the MicroBooNE hit rate, even after correcting for the difference in photocathode sizes (1" diameter for MiniCAPTAIN vs 8" diameter for MicroBooNE). We will continue to measure the hit rate in MiniCAPTAIN as the liquid argon purity improves.