SBN Progress – July 2019

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I. SBND PDS Laser Calibration

The design of the PDS laser calibration system is complete and is shown in Figure 1. The current plan is to install 5 diffusers per cathode plane using existing holes. The diffusers are connected to the PMT feedthrough flange by 8m long fiber optic cables. The Q1B semiconductor laser, shown in Figure 2, will be able to run at both UV (211 nm) and visible (537 nm) wavelengths. The laser will have an 8 ns output pulse, two orders of magnitude programmable intensity, externally triggerable capability up to 10 Hz, and fiber coupled output. The laser, fibers, and diffusers will be tested in the 10-ton CAPTAIN cryostat this summer.

Figure 1: The design of the PDS laser calibration system.

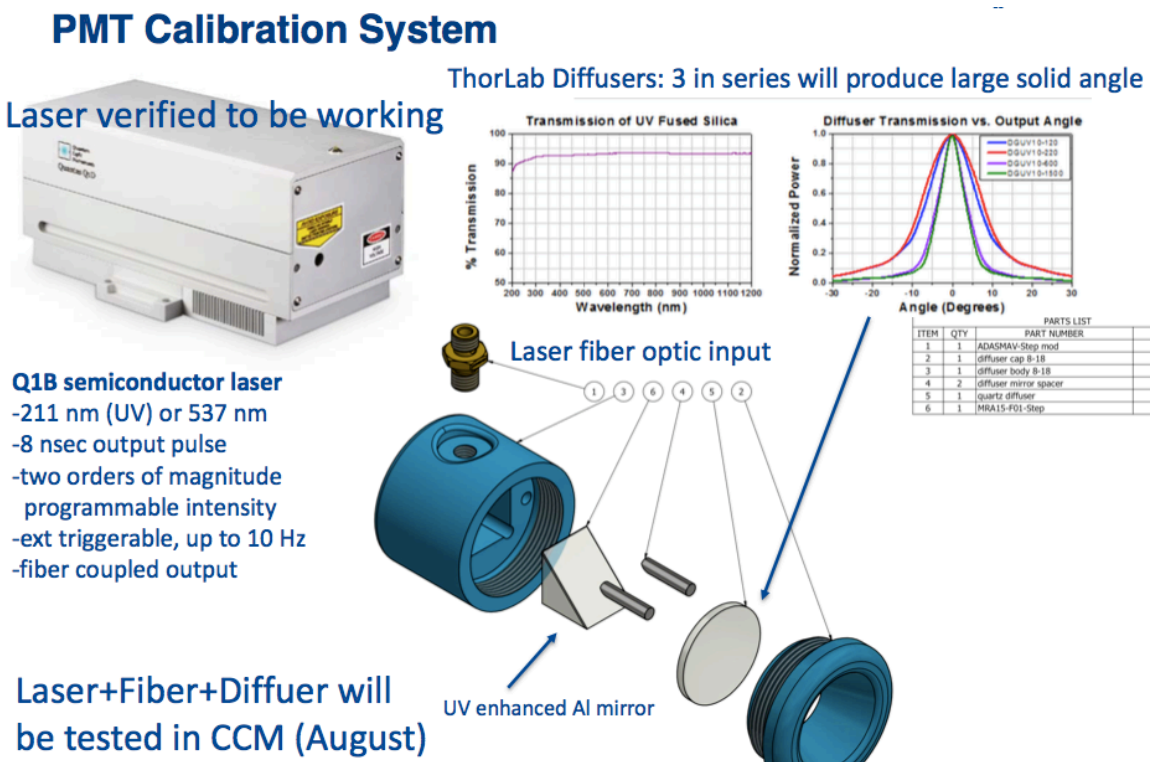

Figure 2: The Q1B semiconductor laser that will be used for the PDS calibration system.

2. PDS Calibration with 39Ar Decays

Monte Carlo simulation studies have been performed to study the use of 39Ar decays for calibration. Figures 3 and 4 show the expected position and timing resolutions for 39Ar events. Position resolutions of ~15 cm and timing resolutions of ~1 ns are achievable.

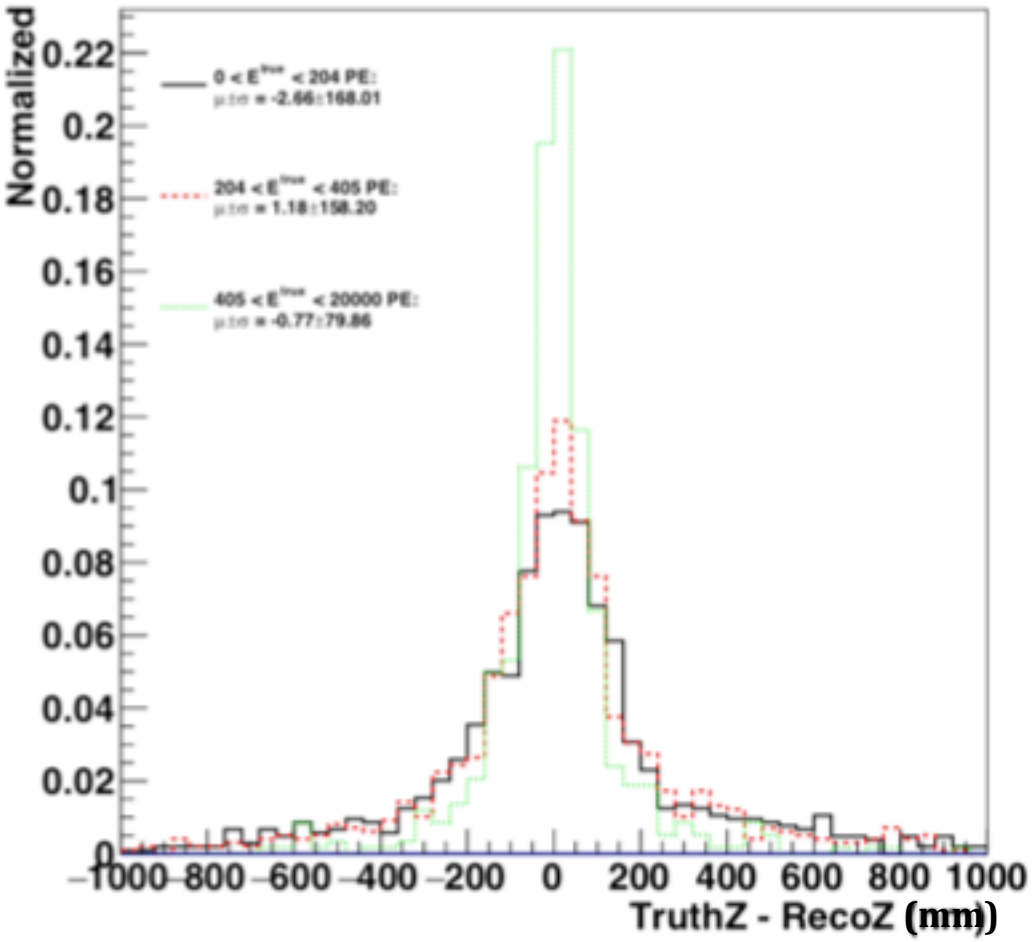

Figure 3: The position resolutions (~15 cm) that can be achieved for 39Ar decays.

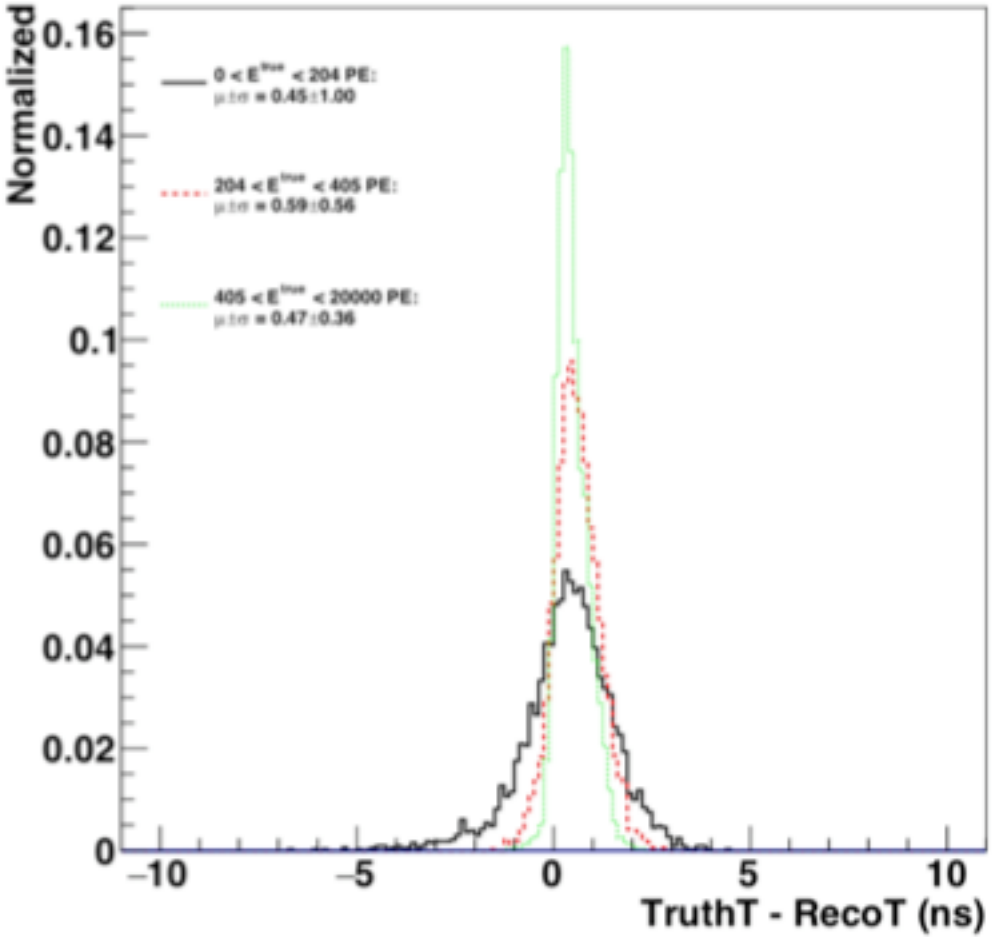

Figure 4: The timing resolutions (~1 ns) that can be achieved for 39Ar decays.

3. Shipment of PDS Box to Fermilab

A prototype box with 5 PMTs and 1 placeholder ARAPUCA will be shipped to Fermilab this summer. The prototype, shown in Figure 5, will allow the deployment of 8 ARAPUCAs per box.

Figure 5: The prototype box with 5 PMTs and 1 placeholder ARAPUCA that will be shipped to Fermilab this summer.