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Development and Tests of the LED Calibration System for the Daya Bay Reactor Neutrino Experiment MELINDA MORANG, DAYA BAY COLLABORATION — The Daya Bay reactor neutrino experiment must measure the neutrino rate and spectrum with very precision. Thus, the detector modules must be carefully calibrated in order to produce reliable data. This study consists of hardware research and development for the LED portion of the detector calibration system, for which a fast timing resolution is key. We used a photomultiplier tube and CAMAC DAQ to test possible components, including pulsing circuits, LEDs, coaxial cable, and an electrical slip ring. We produced a 4ns light pulse using a DEI PCO-7110 Laser Diode Driver Module and an Industrial Fiber Optics, Inc. IF-E92A 430nm LED in parallel with a 0.12μ H inductor. We determined that the Moog, Inc. electrical slip ring does not significantly distort or widen the light pulse, and the Cooner Wire CW2040-3650F coaxial cable causes only a very small amount of pulse widening. Because these quick pulses are fast enough for use in the calibration system and because the slip ring and coaxial cable are satisfactory, these components are viable options for Daya Bay. Because these components are all commercially available, they would be simpler to use and possibly more reliable than custommade components. Thus, we have demonstrated that these components are a good option, and we recommend them as the baseline of the LED calibration system for Daya Bay.

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