

PICO 500 Muon Veto Optical Calibration System

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The PICO 500 detector will continue the search for one of the leading dark matter candidates: the WIMP. Even under 6800 feet of rock shielding at SNOLAB, the PICO 500 bubble chamber is still exposed to a background of cosmic muons. The resulting interactions within the chamber's active fluid are very difficult to discern from the extremely rare WIMP-nucleon interactions that the experiment will attempt to detect. The muon veto subsystem of PICO 500 uses PMTs to detect the Cherenkov light emitted by muons passing through the water tank surrounding the bubble chamber, and tags muon-related events so that they are not mistaken for a WIMP interaction. In order to accurately place the arrival of a muon on a timeline relative to a detector event, it is crucial for the muon veto to be precisely calibrated in the time domain. This talk will cover the design of the PICO 500 muon veto optical calibration system, including light source layout optimization and mechanical design, with an emphasis on using and generating very short nanosecond scale LED light pulses to calibrate the PMTs.

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