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Calibration Sources for the Light-only Liquid Xenon (LoLX) Detector

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Some of the most sensitive detectors used for low-background searches, such as dark matter and neutrinoless double beta decay, are liquid xenon-based detectors. These require stringent background discrimination and mitigation, and silicon photomultipliers (SiPMs) present a promising alternative to traditional photomultiplier tubes (PMTs) due to their lower levels of radioactivity. In order to characterize SiPM performance, the Light-only Liquid Xenon (LoLX) collaboration makes use of a cubic configuration of 80 SiPMs to perform comparative studies of two different sensor manufacturers, Fondazione Bruno Kessler and Hamamatsu, as well as a PMT for light monitoring. LoLX 2 is designed to operate in approximately 5 kg of liquid xenon (LXe), and provides a means to study Cherenkov and scintillation light production in the medium. In the previous iteration of the detector, LoLX 1, a strontium-90 needle was positioned inside the geometry and used as a beta source to study LXe cherenkov light production within an octagonal configuration of Hamamatsu SiPMs. This poster provides an overview of several additional calibration sources used for light yield and energy resolution studies, including various gamma sources, as well as a hafnium-181 point-like source located within the center of the LoLX 2 configuration for position-independent analyses. This poster also explores the potential use of a liquid xenon mixture incorporating xenon-127 gas for monitoring of long-term SiPM stability and performance.

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