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New photosensor assembly in the Light only Liquid Xenon (LoLX) experiment: design and measurement prospects

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LoLX is a small scale R&D experiment, hosted at McGill University, which aims to study the properties of liquid xenon (LXe) scintillation light and characterize Cherenkov light emission in LXe with cutting-edge photo-detection technology. It supports next-generation rare-decay experiments, such as nEXO, which will search for neutrinoless double-beta decay in LXe. Interactions in nEXO produce scintillation light in the vacuum ultraviolet (VUV), and the photo-detection technology of choice are silicon photomultipliers (SiPMs), which have a high efficiency in this region, as well as exceptional gain.

The previous detector design included 96 Hamamatsu VUV4 SiPMs in a cylindrical geometry. Optical filters are used to separate Cherenkov and scintillation light produced by a radioactive beta source. In this talk we will present LoLX^2, the new cubic version of LoLX, which addresses a few issues encountered in its first iteration.

LoLX^2 will assess the performance of two types of SiPMs, Hamamatsu VUV4 and FBK HD3. It will deploy 40 of each type as well as a VUV-sensitive photomultiplier tube (PMT), which serves as a benchmark for SiPM photo-detection efficiency in VUV. We will give an overview of the new LoLX inner detector designed at TRIUMF, its assembly and the testing of the FBK HD3 SiPMs.

Keyword-1

LoLX

Keyword-2

Silicon photomultipliers

Keyword-3

neutrinoless double-beta decay

Author: BRON, Stephanie (TRIUMF)

Presenter: BRON, Stephanie (TRIUMF)

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