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Characterization of LXe Scintillation using VUV SiPMs in the Light-only Liquid Xenon (LoLX) Detector

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The Light-only Liquid Xenon (LoLX) experiment, operating at McGill University and TRIUMF, characterizes liquid xenon (LXe) scintillation and silicon photomultiplier (SiPM) performance. The detector consists of a 4-cm cube instrumented with an array of HPK VUV4 and FBK HD3 SiPMs. In this work, we present detector response measurements using ^{133}Ba and ^{137}Cs gamma sources. We developed a GPU-based optical simulation using Chroma to train a machine learning model to reconstruct position and energy. We demonstrate that the method improves energy resolution. We report the resulting light yield and energy resolution, alongside a comparative analysis of the HPK VUV4 and FBK HD3 sensor performance for future LXe experiments.

Primary author: LI, Xiang (TRIUMF)

Co-author: RETIERE, Fabrice (TRIUMF)

Presenter: LI, Xiang (TRIUMF)

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