



Canadian Association
of Physicists

Association canadienne
des physiciens et physiciennes

Contribution ID: 4293 Type: **Oral Competition (Graduate Student)** / **Compétition orale (Étudiant(e) du 2e ou 3e cycle)**

(G*) Measurement of SiPM External Crosstalk in a LXe detector

Monday 27 May 2024 14:15 (15 minutes)

Silicon photomultipliers (SiPMs) are single-photon sensitive light sensors. The excellent radio-purity and high gain of SiPMs along with a high VUV detection efficiency make them ideal for low-background photon counting applications, such as in neutrino-less double beta decay and dark matter experiments employing noble liquid targets. The Light only Liquid Xenon (LoLX) experiment is an R&D liquid xenon (LXe) detector located at McGill University. LoLX aims to perform detailed characterization of SiPM performance, and to characterize the light emission and transport from LXe to inform future detectors. During Phase-1 of operations, LoLX employed 96 Hamamatsu VUV4 SiPMs in a cylindrical geometry submerged in LXe. Photons detected by a SiPM trigger an avalanche process in the individual photodiodes within the SiPM. The avalanche produces near infra-red photons that are emitted and can transport across the detector to other SiPMs which may produce correlated pulses on other channels, a process known as SiPM external crosstalk (eXT). With the Phase-1 LoLX detector, we performed measurements of SiPM external crosstalk in LXe with similar geometric acceptance as future planned experiments. In this presentation, we will present the measurement of SiPM eXT detection within LoLX, with comparisons to GEANT4 eXT simulations informed by ex-situ measurements of SiPM photon emission characteristics.

Keyword-1

SiPM external crosstalk

Keyword-2

Liquid Xenon

Keyword-3

Neutrinoless double beta deca

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Session Classification: (PPD) M2-1 Neutrinos | Neutrinos (PPD)

Track Classification: Technical Sessions / Sessions techniques: Particle Physics / Physique des particules (PPD)