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New Study for SiPMs Performance in High Electric Field Environment

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In the search for the nature of the neutrino, neutrinoless double beta decay ($0\nu\beta\beta$) plays a significant role in understanding its properties. By measuring the $0\nu\beta\beta$ decay rate with the desired sensitivity, it is hoped to verify the nature of the neutrino (Majorana or Dirac particle), lepton number violation and help determine the values for the absolute neutrino masses.
The Enriched Xenon Observatory (EXO), with its two phases; the current EXO-200 and the future multi-tonne upgrade nEXO, is aiming at search for the $0\nu\beta\beta$ decay of ^{136}Xe.
A key parameter that defines the detection sensitivity/capability of the detector is its energy resolution. nEXO aims to reach < 1% energy resolution at the Q-value of the decay. Efficient detection of LXe scintillation photons is critical to achieve this desired value. The current nEXO concept has an array of silicon photomultipliers (SiPMs) located behind the field shaping rings for this purpose.
Although, during the past decade, substantial development in the area of SiPMs has offered what appears to be a superior alternative to conventional methods for our detector, SiPMs are still counted as relatively new technology. Hence, not all their features have been examined under the influence of extreme working environments. Although, it is known that the SiPMs are stable against the change in the magnetic field, but little is known about their behavior in high electric field variations. In the current design of the nEXO field cage, the SiPMs will be exposed to different electric field values along the drift axis.
In this work we perform new study on the SiPMs performance under the influence of the exposure to high electric field value.

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