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# 222Rn-related background in nEXO

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nEXO (next-generation Enriched Xenon Observatory) is a proposed experiment to search for neutrinoless double beta (0νββ) decay of 136Xe with a projected half-life sensitivity of ˜10ˆ28 years using 5×10ˆ3 kg of isotopically enriched liquid-xenon in a time projection chamber (TPC). Targeting this sensitivity requires addressing and reducing the backgrounds in the detector. Of particular interest is the 222Rn daughter 214Bi, whose decay includes a γ-ray line at 2448 keV, close to the 136Xe 0νββ decay Q-value of 2458.07 ± 0.31 keV. 214Bi decays are followed in close time-succession by the alpha decay of 214Po. These pairs of correlated decays are easy to tag if they occur in the bulk of detector. However, 214Bi that drift and decay at the cathode are tagged with much reduced efficiency and represent a non-negligible background for nEXO. Using data from EXO-200, ˜80% of 214Bi decays in nEXO will occur at the cathode. Additionally, 214Bi decays occurring behind the TPC field cage can also contribute to nEXO background if they cannot be tagged using scintillation-only BiPo coincidences. We explore strategies to identify event-by-event and with high efficiency the 214Bi decays at the nEXO cathode and in the xenon outside the field cage. This study includes optimizing the light collection efficiency for alpha and beta decays occurring on detector surfaces, as well as careful design of the cathode electrode.

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