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# Electroluminescence yield in noble gases in uniform electric fields

Dual phase and high-pressure gaseous optical-TPCs are used in many modern day experiments to detect rare events, e.g., in experiments that search for the neutrinoless double beta decay [1,2] and WIMP dark matter [3-5]. These experiments use the electroluminescence processes in the gas to amplify the primary ionization signals produced by radiation interaction inside the detector active volume. Pure noble gases are an obvious choice for this kind of experiments. In order to decide what gas to use in a certain experiment, it is of utmost importance to determine the electroluminescence yield for each candidate. Using a gas proportional scintillation counter, coupled to a large area avalanche photodiode (LAAPD), we have done experimental studies on the electroluminescence yield for argon, krypton and xenon. With our setup it is possible to compare the pulse amplitudes generated by the VUV photons and the 5.9-keV X-rays interacting directly in the LAAPD. Thus, one can calculate the number of charge carriers produced by the scintillation pulse and, hence, the number of photons impinging the LAAPD. The value of the scintillation amplification parameter obtained, defined as the number of photons produced per drifting electron per kilovolt, was 81 photons/kV for argon, 113 photons/kV for krypton and 140 photons/kV for xenon. The energy resolution and the scintillation and ionization thresholds were also studied. Best energy resolution values for 5.9 keV x-rays of 12.5%, 9.5% and 7.8% were obtained for argon, krypton and xenon, respectively. The scintillation and ionization thresholds obtained were 0.55 and 3.0 kV $cm^{-1}$ $bar^{-1}$ for argon, 0.7 and 3.3 kV $cm^{-1}$ $bar^{-1}$ for krypton and 0.8 and 4.5 kV $cm^{-1}$ $bar^{-1}$ for xenon.

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