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Study of primary scintillation yield of pure krypton

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Gas Proportional Scintillation Counters (GPSC) are gas-filled detectors wherein the charge signal arising from radiation interaction undergoes amplification via secondary scintillation induced by electron impact (electroluminescence) within the gas medium. Primary electrons produced by the interacting radiation migrate towards a scintillation region, where the applied electric field is high enough to excite but not ionize the noble gas atoms, consequently generating a scintillation pulse through atom de-excitation. This pulse is directly proportional to the number of primary electrons, thereby correlating with the incident x-ray energy. Moreover, the primary scintillation light serves as the event trigger in several modern-day experiments. The selection of gas for a specific experiment is based on crucial determinants such as electroluminescence yield and primary scintillation yield for each candidate. Pure noble gases emerge as an evident choice for such experiments. Krypton, denser than argon and more cost-effective than xenon, presents the highest absorption cross-section for x-rays in the 14–34 keV energy range, rendering it advantageous for applications needing of large detection volumes and high pressure. We have performed experimental studies on primary scintillation yield for krypton. Preliminary results were obtained for 5.9-, 14.3-, 21.6-, 22.1- and 25-keV x-rays. Wsc-values between 75.3 eV and 82.9 eV were obtained for the different x-ray energies.

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