Absolute determination of the primary scintillation yield of pure krypton

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Gas Proportional Scintillation Counters (GPSC) are gas-filled detectors in which the charge signal produced by radiation interaction is amplified by secondary scintillation promoted by electron impact (electroluminescence) taking place in the gas. Primary electrons produced by the interacting radiation are driven towards a scintillation region, where the applied electric field is high enough to excite but not ionize the noble gas atoms, producing a scintillation pulse through atom de-excitation proportional to the number of primary electrons and, thus, proportional to the incident x-ray energy. Additionally, the primary scintillation light produced is used as the event trigger in several present experiments. In order to decide what gas to use in a given experiment, it is of utmost importance to determine parameters such as the electroluminescence yield and the primary scintillation yield for each candidate. Pure noble gases are an obvious choice for this kind of experiments. Krypton is denser than argon, much less expensive than xenon, presenting even the highest absorption cross section for x-rays in the 14–34 keV energy range. These are advantages in applications where large detection volumes and high pressure are required. Using a GPSC coupled to a photomultiplier tube we have performed experimental studies on the primary scintillation yield for krypton. Preliminary results were obtained for 5.9- and 14.3-keV x-rays.