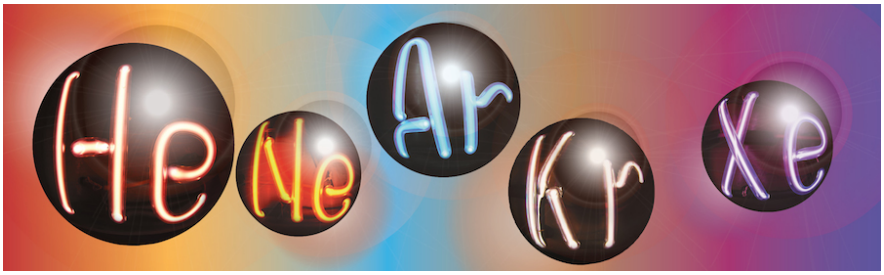

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Investigation of photoluminescence as a source of instrumental backgrounds in xenon TPCs

Friday, 24 October 2025 11:20 (20 minutes)

Liquid xenon time projection chambers (LXe TPCs) exhibit delayed photon and electron signals occurring long after an initial interaction. While they represent a significant background for low-energy searches, the origin of these delayed signals remains not fully understood. We explore the hypothesis that vacuum ultraviolet (VUV) scintillation photons from xenon induce delayed photoluminescence (PL) in detector materials. This results in delayed photon emission that can, in turn, photoionize impurities and produce delayed ionization signals. To examine this scenario, we combine data from the XENONnT experiment with dedicated PL measurements performed using a local R&D setup. We study the relationship between PL, delayed photon emission, and delayed electron production to assess their contribution to observed backgrounds in LXe TPCs. This work contributes to a deeper understanding of delayed electrons phenomenology and PL-induced backgrounds. A detailed understanding and mitigation of these effects is crucial for achieving the sensitivity goals of next-generation LXe TPC experiments.

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