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Characterizing infrared scintillation light in xenon

Xenon in gaseous and liquid form is a widely used target material for rare-event searches, including the direct detection of dark matter. Its scintillation properties in the ultraviolet (UV) spectrum are well-known and extensively used. However, the potential of infrared (IR) scintillation light remains largely unexplored. Characterising this IR component is important for evaluating possible improvements in the physics output of future astroparticle detectors.

In a first measurement campaign, we studied the scintillation of xenon gas at room temperature with a dedicated setup equipped with an alpha particle source as well as one IR- and two UV-sensitive photomultiplier tubes. This allowed the first time-resolved measurement of the IR scintillation response, revealing both a fast nanosecond-scale and a slow microsecond-scale decay component. Remarkably, our measurements showed that the IR light yield is comparable to the UV yield. We also investigated the effects of gas pressure and impurity levels on the IR signal.

Several upgrades to the experimental setup are now underway to deepen our understanding of this unexplored scintillation component and its implications for xenon-based detectors.

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