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Spectral Features of Argon Light Emission for Next-Generation Rare Event Detectors

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We present recent advances in the spectroscopic characterization of scintillation and electroluminescence (EL) light in gaseous argon. A detailed investigation was conducted using a wavelength-sensitive time projection chamber to study light emission in two spectral regions: the well-known second continuum at 128 nm, and a broader, softer component spanning the far and mid-ultraviolet range (160–325 nm), commonly associated with the third continuum.

Time-resolved measurements with α and β sources in gaseous argon revealed that this fast, soft-UV component —characterized by a decay time of approximately 5 ns—can contribute up to 20% of the total photon yield. Importantly, its intensity shows little dependence on electric field strength or gas pressure. In addition, we provide new spectroscopic evidence of this component in EL light produced by ionization electrons accelerated in a high-field region, using radioactive sources.

These findings challenge the long-standing assumption of monochromatic photon emission in argon and indicate that spectral information may play a more significant role than previously thought in noble gas detectors. This insight opens new avenues for particle identification and background rejection, and may enhance the design and performance of next-generation detectors for dark matter and neutrino experiments.

In this talk, we will present the current status, key results, and future prospects for the spectroscopic analysis of scintillation light in liquid argon.

Collaboration you are representing

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