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Argon Scintillation in the 160 - 650 nm range

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Gaseous argon detectors have been widely used in dark matter searches and neutrino experiments over the last decade, due to their distinctive ionization and scintillation characteristics. The primary and secondary scintillation in argon mainly result from the radiative de-excitation of singlet and triplet excimer states produced at gas pressures above 100 mbar. This prevalent light production mechanism dominates the argon scintillation spectrum, consisting of Gaussian-like emission, centered at 128 nm, with a 10-nm width, commonly referred to as the 2^{nd} continuum. On the other hand, alternative scintillation mechanisms, such as neutral bremsstrahlung and 3^{rd} continuum emission, have been less studied due to their lower scintillation yield compared to the 2^{nd} continuum. Despite this, their longer wavelength region, spanning from the near vacuum ultraviolet to the near-infrared range, is typically more compatible with current photosensors, thus eliminating the need for wavelength shifters. In this study, we conducted a comprehensive investigation of the yield and time properties of the primary and secondary scintillation emissions in gaseous argon within the 160-650 nm wavelength region. Alongside the fast emission, we observed a slow component with time constants of the order of tens of microseconds. The yield and time properties of the slow contribution were studied for a wide range of electric field values.

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