

Further studies of unusual slow components in electroluminescence signal of two-phase argon detector

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Proportional electroluminescence (EL) in noble gases is used in two-phase detectors for dark matter search to record ionization signals in the gas phase induced by particle scattering in the liquid phase (S2 signals). The fast component and two unusual slow components have been previously observed in the EL pulse shapes of a two-phase argon detector, with time constants of about $5 \mu\text{s}$ and $60 \mu\text{s}$. The unusual characteristic property of slow components is that their contribution and time constants increase with electric field. In this work, the slow components have been further studied in a wide range of reduced electric field, varying from 3 to 9 Td, and for different EL gap thicknesses. The pulse shapes were also studied at different readout configurations and spectral ranges: using cryogenic PMTs and SiPMs, with and without a wavelength shifter (WLS), in the VUV and visible range. The results obtained can have practical applications in DarkSide dark matter search experiment.

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