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Surface background rejection using tetraphenyl-butadiene

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We directly measure exceptionally long (∼ms) scintillation lifetimes of tetraphenyl-butadiene, a common wavelength shifter used on surfaces in liquid argon detectors. The magnitude of the scintillation tail relative to the prompt signal is found to differ under alpha, beta, and UV excitation, allowing for pulse-shape discrimination (PSD). Using PSD we show that surface backgrounds from Radon daughters in liquid argon detectors can be suppressed by a factor of 10^3 with negligible loss of nuclear recoil acceptance.

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