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Precise treatment of pion decays in flight in the PEN experiment

EMIL FRLEZ, University of Virginia, PEN COLLABORATION — The PEN experiment at Paul Scherrer Institute aims to measure the leptonic decay $\pi^+ \to e^+\nu(\gamma)$ branching ratio with $5 \cdot 10^{-4}$ relative uncertainty. The shower leakage for 70 MeV monoenergetic positrons in the CsI electromagnetic calorimeter is of the order of 2 % for $E_{\mathrm{CALO}} < 50\,\mathrm{MeV}$ and presents an important systematic uncertainty. We discuss the ways the low energy e^+ tail can be extracted from the measured data and distinguished from $\pi \to \mu \to e$ decays in flight (DIF) that results in a positron in the same $0 - 50\,\mathrm{MeV}$ range. We compare the measured e^+ energy tail spectra and DIF with realistic GEANT4 simulations done with the photonuclear processes included.

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