

Abstract Submitted
for the SES16 Meeting of
The American Physical Society

Geant4 Monte Carlo Simulations of PEN Experiment¹ CHARLES GLASER, Univ of Virginia, PEN COLLABORATION — The PEN experiment performed at the Paul Scherrer Institute is a precision measurement of $\pi^+ \rightarrow e^+\nu_e(\gamma)$ branching ratio with the goal of obtaining a relative uncertainty of 5×10^{-4} or less. The ratio of decay rates $\Gamma(\pi \rightarrow e\bar{\nu}(\gamma))/\Gamma(\pi \rightarrow \mu\bar{\nu}(\gamma))$ provides a key confirmation of the V–A nature of the electroweak interaction. The detector apparatus consisted of active beam and target counters, a mini-time projection chamber and multi-wire proportional chamber for beam and decay particle tracking, a plastic scintillator for particle identification and a spherical CsI electromagnetic calorimeter. The Geant4 Monte Carlo simulation is used to calibrate energy spectra, obtain the acceptances of the experiment, and more fully comprehend background events. Ultra realistic events are generated by placing detector elements correctly at the sub-millimeter level, recreating the beam profile, accounting for noise and photo electron statistics, and producing synthetic waveforms and digitized outputs. Proper simulation ultimately leads to more reliable discrimination of background events, thereby improving cut based or multivariate branching ratio extraction.

¹Work supported by NSF grants PHY-0970013, 1307328, and others.

Charles Glaser
Univ of Virginia

Date submitted: 30 Sep 2016

Electronic form version 1.4