Abstract Submitted
for the APR20 Meeting of
The American Physical Society

monte carlo simulation of the positronium annihilation detector for kapae using geant4.[1] HYEOUNGWOO PARK, Kyungpook Natl Univ, HANWOOK BAE, The University of Tokyo, JIN JEGAL, SEDONG PARK, DONGWOO JEONG, HONGJOO KIM[2], Kyungpook Natl Univ — The KNU Advanced Positronium Annihilation Experiment (KAPAE) utilizes a precision detector for new physical phenomena research. Positronium has the unique system of electron (particle) and positron (antiparticle), we can study physical process which are forbidden by standard model. In standard model, positronium decay possesses by either singlet spin state (para-positronium: p-Ps) or triplet spin state (ortho-positronium: o-Ps). In contrast to the pair annihilation of p-Ps, o-Ps annihilation decay to 3 gamma's and decay time is 142 ns. Therefore, we designed a novel compact precision detector for o-Ps annihilation. To understand detector performance such as gamma detection efficiency, background rejection capability and detector optimization it is necessary to use Monte Carlo simulation. In this study, we used the Monte Carlo simulation toolkits Geant4 to simulate performance of the detector. The 3D model that use the real dimension of the detector was used for the simulation as well as Na-22 radioactive decay, o-PS and p-PS decay model is included in the simulation. We will present the simulation results such as an example of event display, trigger performance, decay time, gamma-ray energy distribution and efficiency estimation and they will be compared with data.

[1]This research was supported by the IITP and NRF funded by the MEST, korea (Nos. 2019-0-01578 and 2018R1A2A1A05022079).
[2]Corresponding author

HyeoungWoo Park
Kyungpook Natl Univ

Date submitted: 09 Jan 2020 Electronic form version 1.4