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Performance verification of Ortho-Positronium Annihilation Detector of KAPAE¹ DONGWOO JEONG, HONGJOO KIM, HYEOUNGWOO PARK, ARSHAD KHAN, JIK LEE, Department of physics, Kyungpook National University — This research reports on detector design for the KNU Advanced Positronium Annihilation Experiment (KAPAE). Ortho-Positronium must annihilate to three or more odd number of gammas due to C-parity conservation. Ortho-Positronium, however, rarely decays involving single gamma, even number of gammas, or other particles. We expect to study new physics by observing these rare-decays so we need detectors to accurately measure the decay of ortho-Positronium. To this end, we devised a variety of environments using air, nitrogen, and aerogels. For the best performance of the detector, we experimented to determine the type and thickness of components such as trigger scintillators and reflectors. We also measured the scintillation properties of the 196 BGOs that will be used in the detector and verified that the BGOs can be used in the detector. Using this optimized ortho-Positronium decay environment, the difference in the decay time of ortho-positronium with and without Aerogel was investigated. We verified the detector's performance because the difference in decay time resulted in a well-formed ortho-positronium. This allowed us to apply the optimal results to our system configuration.

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