

# Fabrication and Data Acquisition of the KAPAE Phase II Detector for Investigating Invisible Decay in Positronium Annihilation

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The KNU Advanced Positronium Annihilation Experiment (KAPAE) has developed a phase II detector to search for positronium invisible decay such as milli-charged particles, mirror world, axion, new light X-boson, and extra dimensions. KAPAE phase II detector optimized to detect gamma rays emitted during the annihilation of positronium and identify missing energy. It consists of a  $5 \times 5$  array of BGO scintillation crystals with the size of  $3 \times 3 \times 15$  cm<sup>3</sup> along with 16 channel  $4 \times 4$  array of SiPMs on one side of each BGO and a custom DAQ system for collecting scintillation signals. In this presentation, we are presenting the fabrication process of the KAPAE Phase II detector, such as the surface treatment of BGO scintillation crystals, trigger system, data calibration techniques, and Geant4 Monte-Carlo simulation results such as detector optimization and sensitivity for detecting invisible decay.

## Alternate track

1. Detectors for Future Facilities, R&D, Novel Techniques

## I read the instructions above

Yes

**Authors:** Mr JEONG, Dongwoo (Kyungpook National University); KIM, HongJoo (Kyungpook National University)

**Co-author:** Dr PARK, Hyeoung Woo (Kyungpook National University)

**Presenter:** KIM, HongJoo (Kyungpook National University)

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