

## Optimum threshold setting for a positron-sensitive probe with background rejection capability

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In a positron-sensitive probe composed of a plastic scintillator and a bismuth germanate (BGO), scattered annihilation photons in the plastic scintillator become background counts. Although these scattered annihilation photons can be rejected by higher threshold level settings for the scintillation pulse of the plastic scintillator and for that of the BGO, the system sensitivity is reduced. We have theoretically and experimentally optimized the threshold levels for both the plastic scintillator and the BGO. After calculating the energy loss in the plastic scintillator and the BGO for the scattered annihilation photons, we measured the background counts of a positron-sensitive probe by changing these threshold levels. Results revealed that one optimum threshold setting of the positron-sensitive probe was 0.3 of the peak level of the pulse for the plastic scintillator and 0.7 of that for the BGO. With these threshold levels, the background counts could be decreased to less than 0.2% of the true positron counts.

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