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# of a New Technique of 4πβ-γ Detection System to Perform Primary Methods for the measurement of activity of radionuclide

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This study describes a new technique of 4πβ-γ detection system to perform primary methods for the measurement of activity of radionuclide. Characterization of the detectors, plastic scintillators for β-detector and a NaI(Tl) detector for γ-detector, has been investigated by using Monte Carlo GEANT4 simulation and experimental measurement. In addition, an optimum configuration of plastic scintillator detector was examined to maximize electron detection probability and minimize photon interference probability at the same time. A hardware configuration of the 4πβ−γ instrument which utilizes a CAEN N6751 digitizer as the digital acquisition device has been implemented. The digitizer applied pulse shape discriminator procedure to process detector signals and generate binary list-mode files that represent measurement data of detectors. An offline-analysis technique based on the Python program for the coincidence counting was written to analyse the list mode data. This technique effectively applied time settings (such as dead-time and resolving-time), algorithm of coincidence counting and its correction, correction of background and decay, activity concentration calculation, and efficiency extrapolation with weighted linear fit as well. Using this technique, accurate calculations of absolute radioactivity measurement can be performed repeatedly offline since raw detector signals were first experimentally measured, reducing time and unwanted fluctuations in the experimental measurement.

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Promotional text

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