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(G*) (POS-63) Optimization and Characterization of Bi-Detector Coincidence Beta-Ray Spectrometry System

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We present optimization and characterization of a Si-plastic scintillator coincidence beta-ray spectrometer. Recent recommendation to lower the dose limit for the lens of the eye by International Commission on Radiological Protection posed new health physics requirement in the country. Beta-ray dosimetry is of great importance for nuclear industries, particularly during the maintenance periods. The beta-ray spectral data is most fundamental and vital information for accurate beta-ray dosimetry for mixed beta-gamma fields that are often encountered during the nuclear maintenance work. To this end, a Si-Plastic scintillator coincidence beta-ray spectrometer has been developed. The spectrometer can collect pure beta-ray spectra by rejecting the gamma-ray detection events through coincidence. The pulse height and arrival time of each detector signal was processed by a compact digital system and was collected in list mode. A recent upgrade in the digital processor enabled the spectrometer to cover the entire beta energy range of interest.The responses of the spectrometer to beta and gamma were characterized by experiments and Monte Carlo simulations. Spetrcal measurements under beta-gamma mixed fields with various beta and gamma count rates using 90Sr and 137Cs sources were executed as the evaluation of the system performance. The coincidence beta spectrum was quite stable and consistent in most energy region with the increase of the gamma count rate for a fixed beta field. Development of a real-time spectrum analysis method is currently underway.

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