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Time over Threshold (TOT) as a measure of Energy deposition by gamma quanta in plastic scintillator used in J-PET

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The Jagiellonian Positron Emission Tomograph (J-PET) [1-4] is one of its kind based on the organic scintillators developed at Jagiellonian University in Krakow. The organic scintillators are hydrocarbon compounds, therefore, the gamma quanta interact predominantly via the Compton effect. The energy loss of incident photon in scintillator varies with scattering angle of outgoing photon. In this study, we present a method to establish a relationship between the maximum energy deposited by incoming gamma quanta in plastic scintillator and sum of the Time Over Threshold (TOT) spectra estimated from the signals measured from scintillator by using photomultiplier tubes and associated electronics. Such a study is also of utmost importance to distinguish the origin of photons i.e., either annihilation or de-excitation process.

Keywords: J-PET, Time Over Threshold (TOT), Plastic scintillator.

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