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Estimation of 511 keV gamma scatter fraction in WLS layer in Total Body J-PET ; A simulation study

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Estimation of 511 keV gamma scatter fraction in WLS layer in Total Body J-PET

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Abstract:
A positron emission tomography (PET) scan plays an essential role in medical diagnostics and monitoring therapy. A new generation of Total-Body PET scanners based on plastic scintillators is being developed by the J-PET collaboration at Jagiellonian University [1].
The total body J-PET scanner comprises of 7 rings, each ring consisting of 24 modules. A single module is built of 2 layers each one 16 axially arranged plastic scintillator strips of 33 cm in length, read out by silicon photomultiplier (SiPM) arrays from both ends, and an additional layer of 50 wavelength shifter (WLS) fibers. In this study, an estimation of the scatter fraction of the Total-Body J-PET manufactured from plastic scintillator strips according to the NEMA NU 2-2018 standards by using GATE software. The scatter phantom was simulated as a solid cylinder with a length of 700 mm and an outside diameter equal to 203 mm while at a radial distance of 45 mm we have a hole with a diameter of 6.4 mm that linear source with total activity 1 MBq is placed [2,3]. For data processing, sinograms were generated and the Single Slice Rebinning (SSRB) algorithm was used for the calculated scatter fraction amount.

References:
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