

Screen 07 - Monte Carlo evaluation of a total-body rat preclinical scanner based on AI-enhanced BGO detectors.

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This work presents the Monte Carlo characterization of a total-body rat preclinical scanner obtained through experimental detectors characterization and simulated phantom acquisitions. The proposed scanner has a 112.8 mm inner diameter and 357 mm axial FOV which is able to cover the whole rat body. The scanner architecture consists of 7 rings each of which has 8 BGO detectors. Each detector consists of a $51 \times 51 \times 12$ mm³ BGO crystal read by 6 mm SiPMs by Hamamatsu. Recent works have shown that BGO performance can be enhanced with the use of AI algorithms. In the simulation pipeline, several parameters obtained through experimental detectors characterization have been included. Among these are the detector spatial resolution of 1.1 FWHM (x,y) and 1.8 mm FWHM(DOI), an energy resolution of 20.2 % and a temporal resolution of 300 ps. NEMA NU4-2008 image quality phantoms have been simulated. The image quality results are reported in terms of noise, recovery coefficient (RC) and spill-over ratio (SOR) while the performance in terms of spatial resolution have been investigated using a Derenzo phantom. The histogram-mode data were reconstructed by using ordered-subset-expectation-maximization (OSEM) algorithm.

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