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Study by Monte Carlo method of cross radiation in the bimodal tomographic system ClearPET/XPAD3-CT

A detailed simulation of cross radiation in the PET and CT detectors of the tomographic bimodal system for small animals ClearPET/XPAD3-CT, was made using the Geant4 Monte Carlo code. A positron emitter radioactive point source (FDG- ^{18}F) was located in the center of the tomographic system, inside a spherical water phantom. Positron-electron annihilations occurring within the phantom produce gamma photons that arrive both to PET (phoswich) and CT(XPAD3) detectors. Simultaneously X-ray photons from the generator tube, oriented towards the XPAD3 detector are scattered by the phantom, arriving to the phoswich detector. Therefore, we have in both detectors undesired incident radiation coming from the other system. From this study conclude that cross gamma rays contribute about 3.5% of the total intensity in the XPAD3 detector, while cross X rays arriving to the phoswich detector contribute about 3.0% of the total intensity, which is actually reduced to below the noise level, taking into account a Cu filter layer of 0.5mm, which covers these detectors. In this work, it is proposed to optimize the shielding of the system without impairing the efficiency of the detectors

Primary authors: OLAYA DÁVILA, H. (Physics School, Universidad Pedagógica y Tecnológica de Colombia, Tunja- Colombia); SEVILLA, A.C. (Physics Department, Universidad Nacional de Colombia, Bogotá D.C –Colombia); CASTRO, H. (Physics Department, Universidad Nacional de Colombia, Bogotá D.C –Colombia); MOREL, C. (CPPM –Université de la Méditerranée, Aix Marseille II, 13288 Marseille cedex 09 - France)

Presenter: OLAYA DÁVILA, H. (Physics School, Universidad Pedagógica y Tecnológica de Colombia, Tunja-Colombia)

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