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Simulation study of a limited angle PET system with 50 ps CTR panel detectors GAPER RAZDEVEK, ROK DOLENEC, PETER KRIAN, Univ of Ljubljana, STAN MAJEWSKI, University of California Davis, Davis, United States of America, ANDREJ STUDEN, Univ of Ljubljana, SAMO KORPAR, ROK PESTOTNIK, Jozef Stefan Institute, Ljubljana, Slovenia — We present a simulation study of key performance characteristics of a limited angular coverage TOF PET system consisting of 2 or 4 flat-panel detectors. Such devices are of interest, as they enable novel ways of designing adjustable, modular and mobile PET scanners. We have investigated the impact of the coincidence time resolution (CTR) on image quality as it is crucial for obtaining distortion-free and artefact-free images with incomplete angular sampling. Panels consisting of LSO crystals of different lengths (5 mm - 20 mm) and CTR as low as 50 ps are considered. We have evaluated spatial resolution, image quality and count rates following the NEMA NU 2-2018 standard, imaged a Derenzo phantom for a visual inspection of the resolution, and evaluated the performance in a more realistic scenario by imaging a digital human phantom generated with XCAT software. A reference scanner based on the Siemens Biograph Vision was used as comparison. We demonstrate that very good image quality without distortions can be obtained with a simple and robust limited angle system. As expected, CTR is crucial in recovering sensitivity and improving resolution in the two-panel design, while designs with longer crystals are considerably impacted by the parallax error.

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