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Dynamic Imaging of moving radiotracers using combined PET and Compton camera system with scintillation pixel detectors

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Monitoring and imaging the moving radioisotope are required in several clinical situations, such as the tracer injection and its leakage monitoring in PET scan procedure. We have designed and developed a combined Compton camera and PET coincidence system to monitor the moving radioisotope using 3 mm pixel 8 x 8 GAGG scintillation crystal arrays coupled to SiPM arrays with time-over-threshold (ToT) based individual readout circuits and its dynamic imaging performance is compared. The measured resolution of PET and Compton camera is 3.2 mm and approximately 14 degrees for 22Na point source respectively. The radiotracers with the activity from 12.5 MBq to 100 MBq moving with the speed of 1 mm/s to 10 mm/s mimicking the blood flow are used in the experiment. In PET coincidence imaging, images are successfully visualized for all the activities with the resolution of 5.5 mm to 7.8 mm. In Compton imaging, images are correctly reconstructed only with the activity less than 25 MBq with the resolution of 20 mm because of the random coincidence events. PET showed better tracking capability of activity and speed of radiotracers up to 100 MBq. On the other hand, Compton imaging has wider field-of-view to monitor the large area compared with the limited FOV in PET system. The detail detector performance and imaging results will be shown in the conference.

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