13th International "Hiroshima" Symposium on the Development and Application of Semiconductor Tracking Detectors (HSTD13), Vancouver, Canada

Contribution ID: **84** Type: **Poster**

Contrast Agent Estimation Result of 2-dimensional Photon Counting CT Detector which Combined MPPC and YGAY-scintillator Array

The great potential of photon-counting (PC) detectors in medical CT imaging is highly supported by their ability to count individual photons and measure their energy simultaneously, which makes it possible to obtain specific multi-energy imaging. It is appropriate with the use of contrast agents for medical CT imaging diagnostic, which has specific energy for each contrast agent. The development of PC CT which combined the multipixel photon counter (MPPC) and the yttrium-gadolinium-aluminum gallium garnet (YGAG) scintillator array was improved from 1-dimensional to 2-dimensional detector to shorten the imaging time, which will reduce the radiation exposure as an important factor for medical imaging. The 2D PCCT uses a 256-channel pixel array (with 1 × 1 mm for each pixel size) in the form of 16 × 16 channels, with four large-scale integrated circuit boards, each processing 64-channel signals. The initial CT imaging experimental setup is to estimate the contrast agent using 100 keV and 0.1 mA X-ray generator tube voltage and current respectively and using 11.6 mm and 32 mm of each diameter and high of the Gadolinium (Gd) contrast agent sample. We obtained CT image data with 6 different energy thresholds at 27-33 keV, 33-50 keV, 50-65 keV, 65-80 keV, 80-90 keV, and 90-100 keV. We applied the filtered back projection algorithm to reconstruct the CT images for every row (the horizontal 16-channel array). We successfully obtained the contrast agent estimation by 3D CT image of the 5mg/mL and 10 mg/mL Gd contrast agents. The initial qualitative concentration estimation was obtained by comparing the CT value data results with the ideal CT value of NIST data. The estimation result is 10.43 ± 1.55 mg/mL and 5.47 ± 1.62 mg/mL respectively for 10 mg/mL and 5 mg/mL Gd contrast agents. We will briefly report the result of the detailed quantitative evaluation.

Submission declaration

Original and unplublished

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Track Classification: Applications in biology, medicine, medical equipments