Contribution ID: **62** Type: **Poster**

P2.62: Ex/in-vivo imaging of small animals using MPPC-based photon-counting CT

Wednesday, 28 June 2023 17:46 (1 minute)

Photon counting computed tomography (PC-CT) is a new type of CT that is being studied worldwide. The radiation dose produced by PC-CT can be reduced up to 1/100 of that produced by the currently available CT scanners. In addition, obtaining information from multiple energy bands makes it easier to acquire images without artifacts and leads to accurate material decomposition. In this study, we use a detector system composed of a 64-channel multi-pixel photon counter (MPPC) coupled with a scintillator, which renders the proposed system to be simple and cost effective. We used the PC-CT in three experiments performed on mice and rats. The first experiment involves the in-vivo imaging of iodine-injected mice. The results showed that iodine accumulated in the kidneys and the bladder. Furthermore, we also captured time-shift images of the mice and successfully observed iodine being faded out of the kidneys. The second experiment involves the imaging of gold nanoparticle (AuNP)-injected mice. In this experiment, mice were sacrificed before imaging. AuNPs were successfully imaged in the kidneys. In addition, we performed high-resolution imaging and 3D reconstruction. The final experiment involved ex-vivo imaging of rat livers injected with a Gd-based contrast agent. Liver imaging revealed a difference in contrast between the non-injected liver and the Gd -injected liver. In addition, we estimated the concentration of the contrast agent, and the results indicated that the liver could not absorb more than 2.5 mg/mL of Gd-based contrast agent. We conclude that these findings have the potential to advance the clinical application of PC-CT. In the future, we aim to visualize the mechanism of drug delivery system in the human body and expand the detector area.

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Session Classification: Poster (incl. coffee)