INITIAL RESULTS OF A POSITRON EMISSION TOMOGRAPHY/COMPUTED TOMOGRAPHY SMALL-ANIMAL IMAGING DEVICE WITH CO-PLANAR GEOMETRY

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In this work we report initial results from a prototype of a small-animal positron emission tomography (PET)/ computed tomography (CT) system based on a common rotating gantry. The PET system consists of two detector modules based on MLS arrays and four large-area, flat-panel type PS-PMTs. The CT scanner uses a micro-focus X-ray tube and a semiconductor X-ray detector in a cone-beam geometry. Space for opposed PET detectors and the CT scanner has been allocated on the same face of the gantry disk, thus achieving a co-planar geometry that perfectly aligns the trans-axial and axial centers for both image modality systems. Shields around the detectors reduce cross modality contamination due to scatter in the sample when it is illuminated by the X-ray source. The gantry rotates 360 degrees to provide complete data sets for the CT image reconstruction program that implements a fast version of the FDK algorithm. OSEM algorithms (2-D and 3-D) as well as FBP are available for PET image reconstruction. Sequential acquisition protocols minimize the scan duration, and CT information can be used to implement PET imaging corrections. The co-planar geometry of this system provides intrinsically co-registered datasets, and eliminates the need for animal repositioning to change modality imaging. Avoiding undesired movement of the animal or attached accessories reduces the time required to perform the experiment and minimizes movement errors. The compactness and ergonomics of the system save space and enable direct visual monitoring of the animal.