AbstractID: 12863 Title: Radionuclide imaging with a CCD-based, high-resolution x-ray detector in single photon counting mode

Purpose: To demonstrate use of the high-resolution Micro-Angiographic Fluoroscopic (MAF) detector in single-photon counting (SPC) mode for nuclear medicine imaging. **Method and Materials:** The MAF uses a CCD camera and fiber-optic taper, has 1024 x 1024 pixels with effective pixel size of 35 microns and is capable of real-time imaging. A 300 micron cesium iodide is coupled to a light image intensifier through a fiber optic taper. Large variable gain of the LII provides quantum-limited operation with essentially no additive instrumentation noise and enables the MAF to operate in both energy-integrating (EI) and the very-sensitive low-exposure SPC modes. To evaluate the MAF in SPC mode, a custom-made phantom, with hot rods ranging from diameters 0.9mm to 2.3mm, filled with 1mCi of ^{125}I was used as a test object. A medium-energy, gamma-camera collimator with 1-mm diameter parallel holes was placed between the phantom and the MAF. Data was acquired at 20 fps. The collimator was used in two ways: (i) Stationary and (ii) Moving multiple times in random directions during data acquisition to blur the septal pattern with approximately the same number of counts detected per position. Each frame of the two sets was processed using two algorithms to localize events: (i) simple-threshold and (ii) weighted-centroid methods. The processed frames were added to give the final image. **Results:** (i) Stationary collimator: The image showed a grid-like pattern corresponding to the septa walls of the collimator. All of the hot rods in the phantom can be identified. (ii) Moving collimator: The septal pattern is blurred out, and all of the rods can be clearly identified. **Conclusion:** The same MAF can be used in both nuclear-medicine imaging and x-ray imaging in SPC mode for dual-mode imaging. Currently we are limited by collimator resolution for radionuclide imaging. Support from: NIH Grants R01EB002873 and R01EB008425.