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William C Barber
DxRay Inc., USA

X-ray detectors for spectral photon counting in radiology

Energy integrating X-ray detectors are used in virtually all clinical X-ray systems including digital radiography (DR), digital mammography (DM), and computed tomography (CT). This is because of the high output count rate (OCR) required and detectors such as the energy dispersive photon counting X-ray detectors described in this presentation have been previously unobtainable. Photon counting detectors have the potential to significantly expand the diagnostic benefit of current clinical X-ray imaging applications provided they can achieve the required OCR while maintaining good energy resolution. Higher OCR is now obtainable due to the development of direct conversion semiconductor sensors connected to high throughput application specific integrated circuits (ASICs) which readout the fast signals from the sensors. In considering the development of photon counting detectors for clinical radiology sufficient performance in terms of the OCR and dynamic ranges, as well as the spatial and energy resolutions required for the specific application must be achieved. The sensors and ASICs used, as well as the methods for interconnecting the sensor pixels to the ASIC inputs, need to be designed with the ranges and resolutions required by the application kept in mind. Also modules need to be used which can be tiled with small dead space and preserved pixel pitch to achieve the required field of view (FOV). Sensor, ASIC, and interconnect design for application in clinical radiology will be discussed and clinical and preclinical results using CdTe, Si, and CdZnTe arrays for DR, DM, and CT respectively will be shown.

Biography

William C Barber completed his PhD in Physics in 2000 at the University of California Santa Cruz and Postdoctoral studies at the University of California San Francisco School of Medicine in 2006. He is currently Vice President of Medical Imaging at DxRay Inc., and Development Engineer at Interon AS. He has published more than 34 papers in reputed journals including 5 invited papers and has been developing novel high flux photon counting X-ray imaging arrays for applications in radiology.

wbarber@dxray.com

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