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# (I) Photon-Counting X-ray Detectors: A New Generation of Medical X-ray Imaging

*Wednesday 9 June 2021 11:45 (30 minutes)*

Medical x-ray imaging has revolutionized modern medicine. A necessary and critical component of a medical x-ray imaging system is the x-ray detector. Over the past 50 years, x-ray detectors have evolved from film-screen systems, to computed radiographic cassettes, culminating in flat-panel digital x-ray detectors that directly capture image data during patient examination, bypassing the need for an intermediate data readout between data acquisition and image viewing. This approach has increased the efficiency of medical imaging procedures, with the added benefit of improved image quality. Flat-panel detectors also enable cone-beam computed tomography, which is used in dentistry, interventional radiology, and radiation therapy treatment planning and verification. Flat-panel x-ray detectors used in clinical practice are energy-integrators, which means that the image signal is proportional to the intensity of the x-ray beam. Recent technological innovations, largely developed to satisfy the needs of CERN's particle collision experiments, have resulted in photon-counting x-ray imaging detectors. These detectors enable identifying individual photon interactions at rates adequate for a large range of medical applications. This technology may reduce the radiation dose of x-ray imaging procedures, and may enable new energy-based x-ray imaging methods that estimate the shape of medical x-ray spectra to provide new types of image contrast not possible with energy-integrating detectors. This talk will discuss the basic physics of photon-counting x-ray imaging and the key factors that need to be overcome to realize the full potential of this exciting new technology.

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