

Digital radiographic receptors have been available in medical imaging for the last two decades, but are just now becoming commonplace in the clinical environment in conjunction with the deployment and implementation of electronic image acquisition, display and archiving in radiology and the medical enterprise. Therefore, a need exists to identify the design and performance characteristics of these detectors to determine an appropriate system for a specific or general clinical task, and to keep abreast of the technological changes and innovations that are constantly occurring. Devices include Computed Radiography (CR) using photostimulable phosphor detectors, Charge-Coupled-Device (CCD) and Complementary Metal-Oxide Semiconductor (CMOS) cameras optically coupled to a phosphor scintillator, slot-scan CCD technology with linear or rectangular arrays, and thin-film-transistor (TFT) two-dimensional arrays coupled to phosphor converters and photodiodes or semiconductor detectors. Because digital devices produce images that are inherently signal to noise ratio limited (rather than contrast limited as is the case with analog film), each is designed to provide high spatial resolution simultaneous to delivering high detective quantum efficiency, and at the same time attempting to achieve low radiation dose. Some digital systems do this better than others. Quantitative analysis yields performance metrics including modulation transfer function (MTF), noise power spectrum (NPS), and detective quantum efficiency (DQE). Detector system applicability to a given imaging task, system cost, portability, image handling and practicality are issues that must be considered prior to purchase and implementation. This presentation gives the attendee an overview of these issues.

Learning Objectives:

- To understand the variety of digital detector technologies for medical radiography and mammography
- To provide an overview of each detector from a physics/quantitative perspective
- To compare the detectors in terms of image quality and radiation dose
- To review some issues regarding acceptance testing and periodic quality control
- To summarize the pros and cons with respect to user function, system integration, and costs