

AbstractID: 12777 Title: A new simple, accurate, and quantitative approach for routine quality assurance in digital radiography

**Purpose:** We report on a new approach for measuring the MTF, instrumentation-noise-equivalent exposure (INEE), and DQE that is easily implemented, highly accurate, and does not require specialized measurement devices. No slits, edges, alignment devices, or other costly accessories are needed. **Method and Materials:** A method has been developed to obtain the MTF, INEE, and DQE using only the noise characteristics in dark- and flat-field images. For demonstration, measurements were done on three different detector technologies: an x-ray image intensifier, a flat-panel detector, and a solid-state x-ray image intensifier. Ten dark-field and flat-field images (obtained at one exposure level using RQA 5) were acquired according to standard guidelines and the NPS was measured for each set of images. The electronic part of the NPS (constant, irrespective of exposure) and the quantum part of the NPS (proportional with exposure) could then be separated. MTFs were determined from the quantum part of the NPS using the new noise-response (NR) method. Frequency-dependent INEEs were measured by determining the exposure where quantum and electronic noise would be equivalent, thereby quantifying the quantum-limited operating range of the detector. DQEs were determined from the measured MTFs and NPSs. A software package was written to automate the analysis. **Results:** Using this simplified approach, we observed agreement within 5% at the detector Nyquist frequency (even better agreement at lower spatial frequencies) with the most rigorous metric measurement methods. Measurements took less than 10 minutes per detector and were stable over a three-month period, indicating no changes in, or problems with, detector performance. **Conclusions:** This work describes a simple technique for quantitative measurement of detector performance in terms of resolution (MTF), noise (INEE), and signal-to-noise ratio (DQE) that can be practically implemented into routine QA programs to assist in the verification of proper imaging system performance.

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