Abstract ID: 16627 Title: Development of a simple method for measuring the DQE of an x-ray imaging system with unspecified characteristic response

Purpose:To develop a method of measuring the detective quantum efficiency (DQE) of an x-ray imaging system with unspecified characteristic response for use in a hospital quality assurance program.

Methods:Measurement of the DQE of radiographic systems in a hospital setting is made difficult by the fact that many systems have a non-linear or unspecified characteristic response curve. This makes it difficult to determine the detector signal as a function of a number of incident x-ray quanta as required to linearize the system response. We solve this problem with what we call a “neutral attenuator” method that uses a copper stepwedge to attenuate the beam and incorporate a theoretical correction for spectral beam hardening effects. Using a standardized spectrum (IEC 61267 RQA-5, 7.1mm hvl), a copper stepwedge consisting of 5 steps with transmissions ranging from 0.94 to 0.01 was placed in the beam to determine the characteristic curve. The method was validated by comparing a conventional (IEC 62220-1) DQE assessment with the DQE obtained using our method based on both raw (linear) and processed (non-linear) image data from a General Electric Revolution Xrd Q/i detector.

Results:The DQE obtained using the conventional method had a zero-frequency value of 0.49 with an estimated uncertainty of 0.03. Our new method generated a value of 0.50 using raw image data and 0.47 using processed image data.

Conclusions:A simple method has been developed to determine the DQE of an x-ray system that can be used on both linear image data and non-linear image data. While not IEC 62220-1 compliant, it is simple enough to be incorporated into a hospital quality assurance program.