

AbstractID: 5162 Title: Assessment of detective quantum efficiency: Inter-comparison of IEC 62220-1 with representative prior methods

Purpose:

To evaluate a new international standard method for the measurement of detective quantum efficiency (DQE) of digital radiography systems in comparison with representative prior methods.

Methods and Materials:

Three DQE evaluation methods were considered: 1) a relatively recent international standard method published by the International Electrotechnical Commission (IEC, 62220-1, 2003) which was evaluated in comparison with previously published methods by 2) Dobbins et al (Med Phys 22:1581-1593, 1995) and 3) Samei et al (Med Phys 30: 608-622, 2003). In addition to an overall comparison of the methods, the impact of the defining factors that comprise each method were evaluated including: beam quality, the presence of beam-limiting devices (apertures or collimators), the NNPS analysis algorithm and processing parameters, and the MTF test device and associated analysis methodology.

Results:

The IEC DQE results at low/mid-frequencies were lower than those obtained using the method of Dobbins et al and Samei et al by 3.3% and 6.5%, respectively. Averaged over 1.5–2.5 mm<sup>-1</sup>, the DQE estimate according to the IEC method was 7.1% lower and ~12.4% higher than that of the other two methods, respectively. The overall DQE methods of Dobbins et al and Samei et al agreed well (within 2.0%) in the low- to mid-frequency range but diverged by up to 10% at higher frequencies. Of the influencing factors on the DQE estimate considered, the most significant impact was seen with the MTF measurement method, followed by the beam-limitation method.

Conclusions:

Comparison of DQE estimates using the new standard technique with results using prior methods demonstrated that measurement method can impact the DQE estimate by as much as 12%. Specifically, the results suggest the use of beam limitation using internal collimation (rather than external apertures) and use of a radio-opaque edge MTF test device for more accurate estimation of the DQE.