

AbstractID: 12933 Title: JDQE: A User-friendly ImageJ Plugin for DQE Calculation

Purpose: The detective quantum efficiency (DQE) is useful for physical characterization of digital x-ray detectors. ImageJ is an open source application for image manipulation and processing. We developed JDQE, a user-friendly ImageJ plugin to perform MTF, NPS and DQE calculations.

Method and Materials: We developed the original code in Matlab and successfully used it to characterize several digital sensors. We used MATLAB Builder JA to produce Java classes which contain the encrypted MATLAB code and the Java classes that wrap the MATLAB functionality. This provides an interface between the Matlab functions and ImageJ. JDQE requires Windows 2000 or higher, Java SDK 1.6 or Java SE Runtime version 6 and ImageJ version 1.41o or higher and the Matlab Compiler Runtime (MCR).

JDQE features MTF calculation from edge images. Several methods for extracting a one-dimensional NPS from a two-dimensional NPS are provided, including the method specified by IEC 62210-1 and 62210-1-2. For DQE calculation, the user can select one of the standard beam qualities specified in IEC 61267 and 62210-1-2 and enter the air kerma, or enter fluence values manually. JDQE produces plots of the MTF, NPS and DQE and all the results can be exported to text files.

We validated JDQE using data from several x-ray sensors, including a 5 x 5 cm CMOS mammography detector (Hamamtsu Corp). We compared the results to those produced by the original Matlab code and to results reported in the literature for similar sensors.

Results: Results from JDQE match those of the Matlab code and are in broad agreement with results reported in the literature for similar sensors.

Conclusion: JDQE successfully computes the MTF, NPS and DQE under a variety of beam conditions and using several standard techniques, including the methodology specified by the IEC.