AbstractID: 8889 Title: Instrumentation noise equivalent exposure (INEE) for routine quality assurance: INEE measurements on a clinical flat panel detector

Purpose: To measure the instrumentation-noise equivalent exposure (INEE) of a clinical digital imaging system under various modes of operation**. Method and Materials**: The INEE is defined as the exposure at which the quantum-noise equals the instrumentation-noise and is measured from the plot of pixel gray-level-value variance versus detector entrance exposure. The intercept of such a plot represents the instrumentation-noise in gray-level values and the slope provides the conversion factor from these arbitrary units to equivalent exposure. Sequences of 90 flat-field images in DA and DSA modes were acquired at 1 frame-per-second using a Varian PaxScan 2020 flat panel detector, both with image processing enabled and disabled. Image receptor input exposure was measured using an ionization chamber and effects of uncertainties in exposure calibration on the resulting INEE were investigated. **Results**: The INEE was observed to vary depending on the mode used and was measured to be 0.9±0.2 and 44±6μR in DA and DSA modes, respectively, with image processing disabled. Exposure calibration error will result in additional proportionate INEE error. With image processing enabled the variance was highly nonlinear with exposure in DA mode indicating a need to have access to linear, unprocessed data. The difference in integration capacitance between DA and DSA modes, 0.5 and 4 pF respectively, helps explain the change in the INEE between these modes. **Conclusion**: INEE measurements were done on a clinical digital image receptor and were found to be dependent on the operational mode used. The importance of disabling image processing during INEE measurement was demonstrated. Due to the ease in gathering and analyzing the necessary data, we found the INEE to be a useful quality assurance tool for assessing a system's instrumentation-noise in terms of a clinically relevant measure of exposure. (**Support**: NIH Grants R01-NS43924, R01-EB002873, Toshiba Medical Systems Corporation)