

AbstractID: 9454 Title: A Method for Fast Measurement of MTF for Quality Assurance in Megavoltage Imaging

With improving technology, portal imaging with EPIDs for patient localization is becoming integral to radiotherapy, notwithstanding EPID cost. In research, fundamental imaging parameters such as modulation transfer function (MTF) and detective quantum efficiency (DQE) are measured to characterize image quality as a function of spatial frequency( $f$ ). In the clinic, such measurements being laborious, quality control phantoms (QCP) and accompanying specialized software are used to compute indices of image quality. The use of QCP or test images to evaluate EPID performance, and assign significance to different QCP index values or image perceptions is qualitative at best, and typically lacks essential information such as frequency dependence. DQE measurements are done by measuring MTF and the noise power spectrum (NPS). While measurement of NPS is straightforward (requiring 'in-air' images), MTF is measured by imaging a narrow slit or edge, usually entailing a complicated alignment and set-up. The bar-pattern method can be used to quickly measure MTF, as done in kilovoltage imaging, but a straightforward application can lead to errors in megavoltage imaging. A modified technique using square-wave line-pairs and a large area edge field for normalization is presented, and provides fast MTF measurement. A bar-pattern and a computer program were used to measure MTF( $f$ ) and DQE( $f$ ). This technique was validated using Monte Carlo calculations and EPID measurements, with agreement  $<1\sigma$  of slit method. This method allows fundamental imaging measurements to be performed in the clinic quickly and easily, allowing for routine DQE measurements to evaluate EPIDs and monitor image quality as part of QA.