

AbstractID: 2097 Title: Evaluation of clinical portal image quality based on detective quantum efficiency (DQE) measurements using a fast measurement of modulation transfer function (MTF)

With increasing use of electronic portal imaging systems in a clinical radiotherapy setting, frequent assessment of clinical portal image quality is important to ensure optimal image quality. A technique to measure fundamental imaging parameters (modulation transfer function (MTF) and detective quantum efficiency (DQE)) to evaluate portal image quality is presented here. The technique utilizes a bar-pattern for fast measurement of MTF. The bar-pattern MTF was validated with the conventional slit technique. DQE is computed by combining the MTF with the noise power spectrum (NPS) obtained from open-field exposures using a MATLAB program. The bar-pattern measurements were performed on a variety of commercial portal imagers that include video-camera systems (Siemens BEAMVIEW^{PLUS} and Elekta iView), flat-panels (Elekta iViewGT and Varian PortalVision AS500), and Kodak X-OmatV portal film. This technique is superior to conventional quality assurance (QA) methods that involve anthropomorphic and mechanical contrast phantoms to obtain indices that commonly depend on imaging conditions. These can be relative in nature or user/display contrast dependent, and do not allow for an easy comparison of different EPIDs. Such QA indices cannot be compared to fundamental imaging parameters, which are considered mandatory in imaging research, that are typically published in literature. By using fundamental measurements for routine QA, image quality can be assessed quantitatively at a more fundamental level, and compared to comparable EPIDs reported in literature. The MTF and DQE measured for the above clinical systems were found to be in good agreement with published results.