AbstractID: 7477 Title: Evaluation of commercially available Gadox screens for MV and KV imaging

Purpose: Characterization of a number of commercially available terbium activated gadolinium oxysulfide (Gd_2O_2S:Tb) phosphors with regard to detection efficiency, spatial resolution, and contrast to noise ratio (CNR) were evaluated for different X-ray energies.

Methods and Materials: 16 samples of Gd_2O_2S:Tb scintillators from different vendors attached to an a-Si flat panel detector from Perkin Elmer Optoelectronics (XRD 1621AN). Size of each sample of scintillator screen is 10cm x 10cm and the flat panel detector active area is 41cm x 41cm. Two x-ray energies of 70kV and 6MV were used for screen evaluation. Kyokko PI200 (Kasei Optonix, Japan) and AST Medex Portal (Applied Scintillation Technologies, UK) screens were selected due their highest CNR for MV imaging. To analyze the image quality of MV cone beam CT and to obtain clinical data, a larger size of Kyokko PI200 (41cm x 41cm) was mounted on a Perkin Elmer 1640AN detector for further evaluation.

Results: Detective quantum efficiency (DQE), sensitivity, modulation transfer function (MTF), and noise power spectra (NPS) were evaluated for all screens at 70kV. For 6MV, detection efficiency and spatial frequency were analyzed only. Detection efficiency of AST Medex Portal and Kyokko PI200 are 3.2 and 2.0 times of Lanex fast respectively. CNR and f50 were analyzed for Kyokko PI200 by placing a QC-3V phantom on the surface of detector. The CNR and f50 were 215 and 0.43 lp/mm, respectively. Low contrast and spatial resolution analysis of MV cone beam CT images showed that Kyokko PI200 generates equivalent image quality as Lanex fast with only one half of radiation dose.

Conclusion: We characterized 16 commercially available Gd_2O_2S:Tb scintillators for MV and kV imaging. Compared to Lanex fast, Kyokko PI200 and AST Medex Portal were determined to be good candidates to optimize MV imaging.

Conflict of Interest: Sponsored by Siemens and Perkin Elmer