AbstractID: 6933 Title: Measurement of the MTF of a flat panel detector in variable resolution x-ray detection mode

Purpose:
To quantify the spatial resolution of a flat panel detector (FPD) in the variable resolution x-ray (VRX) detection mode and to understand the dependence of this resolution on the VRX angle, x-ray energy, and detector in-plane orientation.

Method and Materials:
The detector presampling modulation transfer function (MTF) of a FPD was measured in the VRX detection mode, in which the detector was angulated to match its field of view to the size of an object being imaged and thus to improve the spatial resolution. The edge spread function was obtained by exposing a slightly tilted tungsten edge that was attached directly onto the surface of the detector. The x-ray beam was generated by a micro-focal x-ray tube. The VRX angle, the angle between the central x-ray and the detector plane, was varied by rotating the detector about the vertical axis. The MTF was measured at various VRX angles and beam energies as well as in two orthogonal orientations of the detector. This MTF was divided by the correction MTF resulting from the edge thickness.

Results:
In the horizontal orientation, the presampling MTF was measured at 10 VRX angles (90°-10°). There was no significant variation in the MTF at angles above 40°, but conspicuous improvements were observed at angles below 40°. The MTF in the vertical orientation did not vary much at various VRX angles (90°-20°). The MTF at 20° and 45° was measured at several x-ray tube voltages (40-80 kVp), and no distinct dependence on the voltage was observed.

Conclusion:
The study indicates that the presampling detector MTF in the horizontal detector orientation can be improved at VRX angles smaller than 40°. The MTF in the vertical orientation remains relatively constant at angles from 90° to 20°. Little dependence of the MTF on the x-ray tube voltage was found.