AbstractID: 11699 Title: Investigation of metallic filters on the detectability of soft tissues in cone beam computed tomography using flat panel detector of Acuity Simulator.

Purpose: The purpose of this work is to investigate the image quality with metallic filters partially or completely covering the CBCT detector.

Materials and methods: Aluminum metallic filters of various thicknesses were placed on top of the detector covering them either completely or partially. The influence of these filters on the detectability of soft tissue was evaluated quantitatively. The parameters investigated included signal to noise ratio (SNR), contrast to noise ratio (CNR), image uniformity and CT number accuracy. The studies were carried out using the Catphan phantom imaged in the half fan configuration mode. Assessment was carried using a $36mm^2$ region of interest (ROI). CNR was determined with ROIs within the insert and adjacent to the insert of the low contrast object. SNR was assessed in the uniform water region. CT numbers were measured for air, PMP, LDPE, polystyrene, acrylic, delrin, Teflon and water. All the measurements were carried out at 125kVp and 80mA with slice thickness of 2.5mm.

Results: The SNR for half fan mode improved by 31% for the 0.6mm filter covering the detector uniformly while the 1.5mm filter partially covering the detector (on the non bowtie side) improved SNR by 34%. For the similar setup the CNR improved by 33% and 10% respectively. These improvements could be due to metallic filter selectively absorbing low energy scattered photons. No noticeable improvement in image uniformity was observed. The CT number accuracy was not compromised by the use of filter.

Conclusion: The results of our current investigation suggest use of metallic aluminum filter on flat panel detector can improve the ability to detect low contrast objects. A series of experiments are currently underway to evaluate the effect of different filters under different geometries for both full and half fan image acquisitions.