

AbstractID: 12947 Title: Characterization of cross scatter in dual source CBCT

Purpose: A dual-source CBCT imaging system provides an efficient means to perform 3D and 4D imaging, but the addition of the second imaging chain produces additional scattered photons or cross scatter. The purpose of this study is to characterize cross scatter and its effects on uniformity and contrast in dual-source CBCT imaging system.

Method and Materials: An x-ray imaging system has been developed consisting of two tube/detector pairs mounted orthogonally; each chain includes a 40x30 cm amorphous silicon flat panel detector with anti-scatter grid. A timing system was developed to offset the exposures of each imaging chain relative to the detector cycle which remained synchronous for both imagers. Cross scatter is directly measured by only firing the orthogonal tube. The magnitude of cross scatter is expressed as the cross scatter fraction (CSF) which is the ratio of the signal attributed to cross scatter to the total detected signal. Contrast measurements were made using the Catphan® 504 and uniformity was measured with the Catphan® 504 as well as in anthropomorphic head and pelvis phantoms.

Results: In all cases cross scatter produced a severe cupping artifact in the reconstructions. For the Catphan® the CSF reached 30% at the center of the projections and in excess of 60% for the pelvic phantom. The presence of cross scatter also reduced the contrast in reconstructions by up to 10%. The cross scatter distribution was also observed to have a strong gradient decreasing away from the orthogonal x-ray tube by as much as 60%.

Conclusion: Cross scatter is a degrading factor of both contrast and ct number uniformity in dual source CBCT.

Conflict of Interest: This research is supported in part by Varian Medical Systems