AbstractID: 9006 Title: Feasibility study on artifact reduction using dual energy digital tomosynthesis

Purpose: We propose a simulation study to examine the feasibility of incorporating dual energy (DE) subtraction with digital tomosynthesis (DTS) to help reduce DTS reconstruction artifacts. **Method and Materials:** We have previously investigated the incorporation of DTS into radiation therapy for patient localization and found the initial results promising. Due to the limited sampling of the Fourier space, high contrast signals, such as bone, tend to bleed into other slices of the reconstruction. These artifacts could be misconstrued or reduce the conspicuity of low-contrast signals, especially in the lungs. For this simulation study, an advanced 4D NURBS based Cardiac-Torso (NCAT) phantom, which includes a detailed whole-body anatomy of organs including the lungs, airway tree, heart, and vessels, was used. When combined with advanced models of the imaging process, the NCAT phantom can produce realistic imaging data. For this study, a unique x-ray projection algorithm developed specifically for the NCAT phantom was used to generate limited angle projection data for DTS reconstruction. 81 images were acquired over a 40 degree arc. The breathing cycle was set to simulate breath-hold imaging. Data sets were generated using spectra of 80 and 120 kVp. For this study, dual energy subtraction (DES) was performed on these two sets of limited angle images to remove the overlying bony anatomy. The resulting images were then reconstructed using a modified filtered back projection technique. This DE-DTS volume was then visually compared to a standard DTS reconstruction of the 120 kVp data set. **Results:** The removal of the overlying bony anatomy of the chest in the DE-DTS images helps to reduce the high contrast artifacts present in the standard DTS reconstruction. **Conclusions:** This feasibility study demonstrates that DE-DTS imaging may provide increased visualization of low contrast regions in the chest by reducing high contrast DTS reconstruction artifacts.