AbstractID: 9004 Title: Feasibility study on the efficacy of dual energy cine imaging in radiation therapy for lung cancer

Purpose: Modern IMRT plans have necessitated improved image localization techniques. In the lungs, internal target volumes (ITVs) are often generated from 4DCT images; however, the patient must be properly localized daily for this to work effectively. In this simulation study, we investigate the efficacy of dual energy cine (DEC) imaging in radiation therapy (RT). **Method and Materials:** An advanced 4D NURBS (non-uniform rational b-splines) based Cardiac-Torso (NCAT) phantom, which includes a detailed whole-body anatomy of organs including the lungs, airway tree, heart, and vessels, was used for this study. This model allows for the insertion of a lung nodule of any size, shape, contrast, and location. The NCAT phantom also incorporates realistic 4D modeling of periodic cardiac and respiratory motion. The NCAT includes an x-ray projection algorithm that can accurately generate x-ray images in 4D. This algorithm was used to generate cine images of the chest with an embedded lung nodule. Images were generated using spectra of 80 and 120 kV. Dual energy subtraction was performed on these two sets of cine images to remove the overlying bony anatomy. The resulting images were visually examined to determine if the lung nodule motion could be better visualized in the DEC images then in the 120 kV images. **Results:** The removal of the overlying bony anatomy of the chest allowed the DEC images to demonstrate superior visualization of the temporo-spatial motion of the nodule. **Conclusions:** This feasibility study demonstrates that DEC imaging may provide increased visualization of lung nodules for RT treatment. Daily DEC imaging would allow for proper treatment portal placement for thoracic plans using ITVs and IMRT. Additionally, this technique shows much promise to be used in conjunction with dynamic adaptive radiation therapy, where nodule tracking is a necessity.