AbstractID: 10849 Title: Evaluation of Localization Accuracy of Motion in 4DCT

Purpose:
To develop a method and corresponding analysis tool to accurately evaluate the performance of 4DCT in localizing moving objects and to verify the correlation between motion characterization and the respiratory curve.

Methods:
Several radio opaque markers were affixed to the surface of a Varian Real-time Positioning Management (RPM) infrared reflective block which was mounted on a moving platform. One of the markers was located right between the two infrared reflective markers of the RPM block. The CT images of the moving system were acquired with a GE Discovery STE scanner in cine mode. GE Advantage4D was applied to create phased images by dividing the motion cycle into 10 bins. A software tool was developed to process the phased image sets and an algorithm was developed to find the number of markers and to analyze the most probable location of each marker. The motion amplitude was compared with the respiratory curve as recorded by the RPM system during imaging.

Results:
The multiple markers were identified from the 4DCT image sets simultaneously by the model algorithm. Their phase motion matches the recording of the RPM infrared sensor in both pattern and magnitude. The positioning error of the procedure is <0.5 mm along lateral directions, and 2.5mm along sup-inf direction, which is within the scope of the image acquisition setup.

Conclusion:
Tracking multiple point-like fiducials provides an accurate and efficient means of evaluating the localization performance in 4DCT images. Phantom studies have validated the 4DCT performance in imaging moving object. The method and tool developed in this work can be useful for radiation therapy target margin study and imaging QA alike.