AbstractID: 8665 Title: Investigation of the image quality in phase-sorted 4DCT data

Purpose: Four-dimensional computed tomography (4DCT) integrated into radiation imaging system is a useful tool for precise delineation of tumor volume. While 4DCT provides excellent reconstruction of respiratory motion, sometimes it may introduce further inaccuracies in the target delineation. In this work, we have studied geometrical stability, image quality, and the artifacts introduced in different phases of the phase resorted 4DCT data. **Method and Materials:** The 4DCT images were acquired for a Catphan type CT phantom mounted on a moving platform using Philips Brilliance Big Bore (Philips Medical System, Madison, WI).The platform is capable of generating sinusoidal motion up to 2 cm amplitude at different frequencies. Scans were obtained at various amplitudes and frequencies and the 4DCT data was sorted into 10% phase bins. Geometrical stability was calculated by taking the volume ratio of different CT inserts scanned on moving phantom to their static images. Similarly, the Hounsfield Units (HU) variations were also measured. **Results:** Variation of CT inserts volume from their static volume has been observed to be different at various phases of motion. The biggest volume variation was found to be at 20-30% and 60-70% phases for motion with amplitude up to 2 cm at a frequency of 20 cycles per minute. The CT inserts such as Teflon and air showed up to 50% and 45% increase while low-density polyethylene (LDPE) and Polystryene up to 35% and 25% reduction in volume. The mean value of HU for CT inserts was within ±5% of the static images. **Conclusion:** The biggest volume deviations for both high and low density inserts occurred at phases for which the phantom motion is highest. This shows that the magnitude of partial volume effect depends on the phase of respiration. HU constancy means that the 4DCT data can be used for dose calculation.