AbstractID: 12601 Title: Evaluation of Z-axis resolution for 4D-CT scanning modes

Purpose: 4D-CT datasets can be acquired with either cine axial or ultra-low pitch helical scanning modes. The objective of this experiment was to measure the Z-axis resolution of the axial and helical modes as a means to quantitatively and qualitatively evaluate the impact on image quality.

Method and Materials: The Z-axis resolution (i.e., effective slice thickness) was measured using a slice sensitivity profile (SSP) phantom (Model 76-412, Fluke Biomedical). This phantom contains a 0.2 mm diameter acrylic ball bearing (BB) embedded in low density foam with an x-ray attenuation near air. The axial and helical scans were performed on a Philip's Brilliance Big Bore 16 slice CT using a 16x1.5mm detector collimation. For each scan, the phantom was positioned in the scan plane at incremental distances from the CT isocenter ranging from 0cm to 20cm. For helical scans, the pitch was varied between 0.04 and 0.2. In axial mode, the position of the BB was offset from the center of the detector rings. The offset varied from 0mm. (center) to 12mm. (edge). Anthropomorphic phantoms were also scanned to qualitatively evaluate image artifacts

Results: For helical scan modes, the measured slice thickness averaged 1.8mm +/-0.14 mm for all scans. In axial mode, the measured z-axis resolution varied from 1.5mm at the center of the FOV to 7.5mm near the FOV periphery. Anthropomorphic phantoms had conspicuous image artifacts in axial mode when offset more than 15cm from the isocenter.

Conclusions: Axial and helical 4-D CT acquisition modes can have significantly different Z-axis resolutions**.** For the axial scan mode, the slice thickness is above 2mm at a 5cm offset from isocenter and progressively degrades nearer to the periphery. Conversely, helical scanning will maintain a fairly consistent 1.8mm effective slice thickness for all positions within the scan FOV and for all pitch settings.