AbstractID: 10949 Title: A proto-type design of a real tissue phantom for the validation of deformation algorithm and 4D dose calculations

Purpose: The purpose of this work is to design a biologically realistic, real-tissue phantom for use in validation of non-compressible deformation algorithms and 4D dose calculations.

Method and Materials: A phantom motion-controller capable of driving both sinusoidal and non-periodic patient-based breathing patterns via a piston drive mechanism was applied to porcine liver tissue. It was programmed to generate diaphragmatic-like motion that would result in internal motion/deformation that would be similar to 4D CT recorded motion of implanted liver markers in patients. The similarity of marker motion pattern in the liver phantom compared to implanted markers in real patient was evaluated by 4D CT. The consistency of phantom motion over time was assessed.

Results: Reproducibility of markers motion was consistent over a period of 90 minutes. Internal fiducial motion/deformation was seen to be similar to that of patient internal fiducial motion, and was reproducible up to elongations of 3 cm.

Conclusion: The phantom motion is biologically realistic, and faithfully simulates real patient liver motion and deformation. The induced liver tissue motion is reproducible up to elongations of 3 cm and over time periods of up to 90 minutes.