AbstractID: 11750 Title: Experimental investigation of moving average algorithm for tracking organ motion

Purpose: To investigate the geometric and dosimetric properties of the moving average tracking algorithm compared with real time tracking and static beam. **Method and Materials:** Patient motion traces from the Cyberknife Synchrony^{TM} were categorized into 3 types of motion: a regular motion with/without baseline drift and irregular motion. Each motion trace was reproduced with the help of a 4D motion platform. Time averaged mean position of the phantom was used to control dMLC position in the perpendicular direction to the leaf travel. Geometric accuracy, delivery efficiency and dose distribution were evaluated for static, IMRT step-and-shoot and sliding window plan using simulated and patient motion traces. The geometric accuracy was calculated from the displacement between the target center and the beam center using a real-time beam's-eye-view videos with a circular aperture. For dosimetric measurements, PTW ion chamber array (model 729) was sandwiched between 2 cm thickness of solid water phantoms and irradiated for one field. Dosimetric impact was quantified via gamma index with a 3% dose-3mm criterion. **Results:** The difference of RMS geometric error (mm) between the real-time tracking and moving average tracking was about 3 mm which was similar to errors caused by random motion. The percentages of failing points in the gamma analysis for moving average tracking were reduced by above half of the percent difference between no compensation and real-time tracking. Delivery efficiencies for moving average tracking were above 97% comparable to static delivery case. **Conclusions:** Mean position tracking was useful for compensating a baseline drift to improve a geometric and delivery accuracy with high delivery efficiency.