AbstractID: 13761 Title: Feasibility Study on Four-dimensional Dose Reconstruction of Radiation Delivery

Purpose: When an intensity modulated radiation beam is used to a moving target, the two time variables due to miss-synchronization can cause unpredicted dose delivery. Exit dosimetry possesses information on delivered radiation to the target. Using a continuous scan (cine) mode of electronic portal imaging device (EPID), our goal is to use the temporal images related to the target motion and the beam, and perform dose reconstruction. **Method:** To evaluate this hypothesis, firstly, cine mode acquisition was compared with integration mode acquisition on EPID (IAS3 and As 1000). We have delivered open and clinical beams using 6MV at 300MU/min to EPID. Secondly, in-phantom film and exit EPID dosimetry for the two modes was performed on a moving platform using a forwardly-advancing beam that generates a pyramid dose shape. Beam delivery was gated for ten steps of 10% phase duration. Film was left for ten deliveries, but EPID images were acquired ten times on integration mode which effectively simulates cine acquisition. While a documented integration mode was used, the cine acquisition can be used clinically. In-phantom dose was reconstructed from the EPID images of each phase and the reconstructed dose was summed and compared with the in-phantom film dose. For dose reconstruction, we used our Monte Carlo response-based algorithm documented previously. **Results:** The sum of the cine acquisition agreed with (1%) the integrated acquisition during step-and-shoot delivery. The discrepancy was variable with delivered MUs and number of segments due to beam instability at start of acquisition and reading loss for cine mode during MLC movement. For sliding-window delivery, the cine agreed with the other (0.5%). The reconstructed dose agreed with the measurement within 1.4% at the isocenter. Further evaluation with more results will be presented. **Conclusion:** Feasibility of 4D dose reconstruction was demonstrated. In part supported by Varian Medical Systems.