

AbstractID: 9357 Title: Effect of Respiratory Gating on Dose Delivery in a Moving Target

Purpose: To evaluate the effect of gating on dose delivery to a moving target.

Method and Materials: A motorized platform with variable speed of 8RPM to 28RPM built to carry a 30x30cm solid water phantom and capable of delivering a 2cm range of motion in both in-out and up-down direction is used for the study. Retrospectively gated (4D) CT simulation is acquired on the Philips Gemini PET/CT imaging system. Acquisitions are made with phantom moving at 8, 15, 28 RPM with in-out motion only and full motion. Waveforms are monitored by the Varian RPM system. Binning is for 10 phases equally spaced between waveform peaks. Based on the most stable range of the cycle phase range of 40%-60% for in-out motion and 30%-50% for full motion was used for gating. Plans using single AP field, sliding window (SW) and step-and-shot (SS) IMRT fields are evaluated using ion chamber and film dosimetry.

Results: For the in-out motion only, the measured absolute dose at the center of the target was within 1% of the planned dose, gated or non-gated. For full motion study, dose varies up to 2.5% for non-gated plans and 1% for gated plans. In all motions, penumbra difference is within 2 mm for gated fields but depending on the phase range difference is significantly larger for non-gated fields. With IMRT fields, good correlation is shown for all gated fields whereas for non-gated cases, dose delivered deviates greatly from plan.

Conclusion: With moving target, dose distribution differs greatly from plan if treatment is not gated. For IMRT fields and field with limited margins 4D treatment with optimized phase range is essential.