

AbstractID: 14055 Title: A Comparison of the Effect of Intra-fraction Motion on Tomotherapy and IMRT Delivery Systems

**Purpose:** To illustrate the variation in dose distribution caused by a moving target volume that can be expected from a Tomotherapy treatment plan and a conventional step and shoot intensity modulated radiation therapy (IMRT) plan.

**Method and Materials:** A two-dimensional Motionsim platform was used with Mapcheck2 to obtain the measurements. Tumor motion with a superior-inferior amplitude of 1cm and lateral amplitude of 0.2cm was used. Similar IMRT treatment plans were created for a volume vertically centered on the diode array using Tomotherapy and CMS Xio, respectively. A planned dose of 2Gy per fraction was delivered onto both a stationary Mapcheck2 diode array, as well as on the array when the tumor motion was simulated. The process was then repeated using a 9 beam step and shoot IMRT plan on a conventional Linac.

**Results:** When compared to the plan with a stationary target, the motion file introduced single fraction dose variation at the superior and inferior borders of the field of up to 20%. This was the case for both the helical Tomotherapy and co-planar IMRT scenarios. Detectors inferior of the target volume received more dose than planned, while superior detectors received up to 20% less dose than planned. The penumbra for these resulting hot/cold spots for the Tomotherapy plan was larger than for the IMRT plan.

**Conclusion:** The results reiterate the need for tumor motion management when IMRT is used during treatment. Motion effects may even be more pronounced for helical tomotherapy treatments than for conventional IMRT.