AbstractID: 5568 Title: 4D DMLC IMRT Delivery to targets moving in two dimensions (in BEV)

Purpose: To deliver proper IMRT to moving tumors using DMLC necessitate proper leaf sequencing technique to take care of the dynamic nature of the target. A complete compensation of motion can be achieved only if the compensation is in both the directions (direction along (*x*) and perpendicular (*y*) to the leaves motion). A technique to accomplish this is proposed.

Method: The motion of the target is divided into two components. Then leaf trajectories to deliver the desired intensity modulated profile is calculated for all leaf pairs (LP) assuming the target is moving in one direction (x direction). Then leaf trajectories of all the leaf pairs are synchronized. Now the motion is compensated in x direction. As the MLC leaf can move only in one direction, the motion compensation in y direction is accomplished by switching the leaf trajectories of each pair appropriately i.e. say if the target is moving upwards in y direction, after a threshold value (value before which motion in y direction is neglected) the leaf trajectory of LPs are switched upwards meaning the leaf trajectory of LP1 is now followed by LP2 and trajectory of LP2 by LP3 and so on. The switching is in the other direction if the target is moving downward. Small dosimetric errors may occur while switching depending upon the time it takes to do the switch and also the threshold value after which switching happens.

Results: An example of 4D-IMRT delivery to an irregular shaped rigid target moving in an elliptical pattern is shown. Other related delivery issues are addressed (dealing with target motion exceeding maximum leaf speed).

Conclusions: This method of compensating the two dimensional tumor motion in BEV with one dimensional moving MLC while delivering IMRT meeting all mechanical practical and constraints is possible and promising for 4D-IGIMRT.