AbstractID: 8901 Title: Dose verification of 2D synchronized DMLC IMRT delivery to a moving target

Purpose: Anatomic change caused by respiratory motion is a major challenge of accurate dose delivery in Intensity Modulated Radiation Therapy (IMRT). Dynamic MLC (DMLC) tracking delivery has been studied by a few groups to mitigate the motion effect. In this work, some clinically practical issues related to the 2D synchronized DMLC IMRT delivery were investigated. **Method and Materials:** An IMRT treatment plan was generated for one specific phase of 4D CT data. Two-dimensional superimposing method was applied to modify the original leaf sequence by adding the average tumor trajectory (ATT) onto the leaf sequences in beam's eye view plane. The modified leaf sequences were delivered using a Varian 2100CD linac with Millennium 120-leaf DMLC. Dynamic log files were analyzed to check the machine beam hold-off and simulate the fluence map in the coordinate system of the moving targets. Comparison between the delivered fluence map and the expected fluence map was done. **Results:** Without the motion correction, the delivered fluence map is largely different from the planed fluence map. With the motion corrected leaf sequences, such difference was significantly reduced: the maximum point-to-point dose difference decreased by 40%; and the number of dose mismatching points decreased by 5 times. When the leaf speed exceeds DMLC specifications and machine tolerance is tight, there will be beam hold-offs, which will cause errors in the delivered dose distributions. **Conclusion:** The dose error in delivery of 2D synchronized DMLC IMRT was studied. The dose map comparison shows that the dose error delivered with a motion corrected leaf sequence can be significantly reduced. Since the actual delivered dose is affected by DMLC mechanic limits, leaf velocities of the modified leaf sequences should be less than MLC maximum speed to guarantee the synchronization during delivery.