AbstractID: 5655 Title: Setting apart the intensity delivered to moving target, and intensity delivered to moving organ at risk, in DMLC IG IMRT.

Purpose: To utilize tissue motion in order to benefit radiation therapy delivery. The approach makes possible to deliver the required by plan intensity to the target while sparing sensitive organs beyond what is attainable during delivery to static geometry of the patient body.

Method and Materials: Few parameters can be identified which control the delivery of the intensity maps during DMLC IMRT that do not need to be unambiguously specified in order to paint a given, treatment plan derived, intensity over the target. In particular, the initial moment of DMLC delivery, speeds of the leading leaves of MLC assembly and the intensity rate of the beam can all be varied in some interdependent manner to minimize intensity to organs at risk without compromising the delivery of a given intensity map over the moving target. Formulas that define algorithms achieving these goals are presented. Special attention is given to simplified methods of multi-parameter optimizations for which subsequent parameters are treated independently.

Results: Two examples of optimal sparing of organs at risk are provided for DMLC IGIMRT. In the first case the moment of initiation of radiation delivery as well as the speed of leading leaf is appropriately regulated with the aim of minimizing the cumulative dose delivered to the sensitive organ that performs periodic movement with respect to target. The second example minimizes the delivery to sensitive organ for identically moving target and organ at risk in the case when variation of the beam intensity rate is permitted during exposure.

Conclusion: The method of DMLC IGIMRT allows improving the quality of radiation therapy when patient organs are moving at delivery. The required ingredients are: the a priori information about the motion of the target and organs at risk and the algorithm for the optimization of leaf trajectories for moving targets.