AbstractID: 5778 Title: The delivery of DMLC IMRT to stationary and moving targets with variable intensity rate beams.

Purpose: Time dependent intensity rate delivery for DMLC IMRT therapy increases the efficiency of IMRT treatments for stationary and moving targets.

Method and Materials: The method of time dependent intensity rate DMLC IMRT relies on algorithms relating leading and following leaf velocities over their subsequent positions over the target with the intensity rate (dose rate) of the linear accelerator. Allowing the choice of leading leaf velocity over subsequent points over the target and the choice of beam intensity rate parameters, provided special mutual relationships between these quantities are preserved, allows to deliver treatment plan derived intensity maps to targets while adjusting the amount of radiation to which organs at risk are exposed. This ability to chose, within limitations that assure delivery of given intensity profile over the target, the leading leaf speed and the beam intensity rate, creates a situation when optimized delivery, optimal in the sense of minimal dose being delivered to organs at risk, can be achieved. Considerable technical simplification of the described above optimized DMLC IMRT delivery problem may be implemented if adjustment of intensity rate is treated independently from other parameters and treated as straightforward scaling of the time axis. This approach separates two parameter (functional) optimization problem into two single parameter optimization problems.

Results: Two simple examples of variable intensity rate DMLC IMRT delivery are calculated. One concentrates on optimization of the time of delivery in case of stationary target. The other one shows the optimization of the time of delivery for moving target.

Conclusion: The method of time dependent intensity rate DMLC IMRT delivery shows considerable potential for improving the efficiency and the quality of IMRT treatments.