

AbstractID: 7148 Title: Dependence of IMRT fluence pattern on DMLC positional tolerance and root-mean-square values (RMS)

There are two types of leaf positioning errors in DMLC-based IMRT delivery. The first is a systematic leaf positional error and the second is a random error to each leaf position. The random error becomes larger with aging of motors and increases with leaf speed. The random errors can be decreased by limiting the value of tolerance in DMLC controller. However, decreasing the leaf tolerance results in considerable increase in delivery time. Therefore the choice for tolerance value is a balance between delivery practicality and accuracy. For instance, MSKCC suggests using tolerance of 2 mm for Varian 52-leaf-DMLC.

In this work, we propose a method of quantifying difference between an ideal fluence map and an average fluence map over multiple fractions as function of leaf root-mean-square (RMS) errors. The average fluence map results from delivery of many DMLC fields with random errors modeled by a uniform distribution in the range of  $[-tol, +tol]$  around ideal positions. The relationship is parameterized in terms of RMS. This relationship allows to estimate local error as a function of leaf position and index. The average fluence maps can be used in the IMRT system to assess average (for many fractions) dose errors. Fraction-to-fraction errors will oscillate around these average errors.