# AbstractID: 7064 Title: Efficiency of a multi-layer MLC in step-&-shoot IMRT delivery

**Purpose:** The current height (and corresponding transmission) of multileaf collimator (MLC) leaves may be suboptimal for the efficient delivery of IMRT. In this study, we have examined the degree to which the efficiency of step-&-shoot IMRT delivery can be improved with a multi-layer MLC design.

**Materials and Methods:** The multi-layer MLC design tested in this study is based on the concept of dividing the leaves into multiple layers of equal thickness along the planes perpendicular to central axis. The combined leaf height and transmission would match that of current MLC designs. We modified our in-house leaf-sequencing program (CIMO) to accommodate the multi-layer MLC. CIMO uses a simulated annealing to minimize discrepancies between the optimized and sequenced fluence maps. We assume each layer of leaves can move independently and the leaves within the same layer follow the current constraints imposed by each type of MLC. Using various number of apertures, we performed leaf sequencing studies for both Varian and Elekta MLCs using a total of 20 optimized fluence maps extracted from Pinnacle[3]. The 1-norm error obtained between the sequenced and optimized fluence maps using different number of MLC layers were then compared.

**Results:** Fewer aperture shapes per beam are required to achieve the same level of 1-norm error for the sequenced fluence maps when a multi-layer MLC was used. On average, using a 2-layer MLC can reduce the number of apertures by 28% for both Varian and Elekta MLCs. This value increases to 50% when a 3-layers MLC is used. If the same number of apertures is used, increasing the number of MLC layers to 3 can reduce the 1-norm error, on average, by 42%.

**Conclusions:** The multi-layer MLC can dramatically increase the delivery efficiency for step-&-shoot IMRT. Future dose verification using Monte-Carlo simulation will also be performed.