AbstractID: 11173 Title: Development of customized QA program to generate 2D dose map with high resolution for IMRT plans using 120 Leaf dMLC

Purpose: As a part of patient specific QA for IMRT plans, customized program was developed to evaluate accurate dose distribution of IMRT plans using 120 Leaf dMLC. It is designed to make 2D dose map, where mid-leaf ,inter-leaf, rounded leaf end transmission dose, tongue and groove (T&G) effects, scattered dose from dMLC as well as primary beam dose were calculated with high resolution (1 mm).

Method and Materials: Mid-leaf, interleaf transmission dose, scattered dose from dMLC were measured by films with various collimator field sizes at 6 MV X-ray on Varian 21Ex. The transmission dose from T&G was calculated using superposition of single slit-beam kernel extracted from measured open beam profile. The transmission dose from rounded leaf end was calculated along the distance from leaf end. By analyzing MLC sequence file of IMRT plans and measured dosimetric data of dMLC, intensity matrix per segmented MU was produced. 2D kernel profile produced by 1x1 mm^2 pencil beam was derived from measured 10x10 cm^2 profile by iterative method using line search optimization algorithm. Then primary dose map was reconstructed using superposition-convolution method with intensity matrix and kernel profile. Extra dose from dMLC per segmented MU was also added to the primary dose map.

Results: Reconstructed 2D dose map could explain contributions of primary beam dose, and extra doses resulted from the movement of leaves. The transmission dose from rounded leaf end was increased up to 10% to the total dose when leaves had little motion. Mid-leaf or interleaf transmission dose also could contribute average 10% to the total dose.

Conclusion: Our program can explain unwanted dose distribution due to the movement of dMLC. And it could be expected to be an alternative method instead of film dosimetry, or can be used to complement the drawback of 2D-array detector with poor resolution.