AbstractID: 3755 Title: A collapsed-cone convolution/superposition dose computation algorithm for Sliding Window beams

Purpose: An algorithm was developed to compute the incident energy fluence array used when computing dose for a Sliding Window beam using the collapsed-cone convolution/superposition (CCCS) dose computation algorithm.

Method and Materials: The first step of a CCCS dose computation is the computation of the energy fluence array incident on the patient. The incident energy fluence array computation for a Sliding Window beam is the product of an opening density array (an integration over space-time of the multi-leaf collimator (MLC) leaf trajectories) and an open-field energy fluence array. An opening density represents the fraction of the time a pixel is exposed during treatment (i.e. not covered by the MLC leaves). Models of the MLC leaf end shape, tongue-and-groove and interleaf leakage effects are used by the algorithm. For an MLC with rounded leaf ends, partial transmission based on the leaf end profile model is applied to the areas that are covered by the rounded tip of an MLC leaf. Transmission corresponding to half of the leaf thickness is applied to the areas that are covered by only the tongue or the groove of a leaf. Interleaf leakage is applied to the areas that are covered by the tongue of a leaf and the groove of an adjacent (or opposing adjacent) leaf. Linear accelerator head scatter effects are also taken into account by convolving the head scatter array by the total transmission array (opening density array + leaf transmission array).

Results: The algorithm to compute dose for a Sliding Window was implemented and released in a commercial treatment planning system. Validation results showed point dose measurement accuracy of 4 % or better in the high dose areas.

Conclusions: The Sliding Window CCCS dose computation algorithm meets the AAPM TG 53 dose accuracy criteria (Med Phys, **25**, 1773-1829).