AbstractID: 1213 Title: Optimal field splitting for large intensity-modulated fields

The multileaf travel range limitations on some linear accelerators require the splitting of a large intensity-modulated field into two or more adjacent abutting intensity-modulated subfields. The abutting subfields are then delivered as separate treatment fields. It is imperative that the cumulative intensity map of the subfields is exactly the same as the intensity map of the large field generated by the dose optimization algorithm, while satisfying hardware constraints of the delivery system. The field split can be stated as the following interesting problem: given a fluence matrix which exceeds the largest field size limitation of the delivery system, find two or three subfields, each of which satisfies the field size limitation constraint, that combine to give the original fluence map, and with the additional constraint that the sum of the delivered MUs of the subfields be optimal. In this most general formalism, the subfields can overlap and the field split does not have to be in a straight line. In this work, we developed algorithms that deal with the special case of field split in a straight line with optimal MU efficiency while satisfying the hardware constraints. We provide rigorous mathematical proofs that the proposed algorithms for field splitting are optimal in MU efficiency. Compared to a simple field splitting that cuts through the center of a fluence map, our algorithms showed an average decrease in total MU of about 13%.