AbstractID: 1805 Title: Inverse Plan Optimization for Passively Scattered Proton Beam Radiotherapy

The traditional forward planning approach used for passively scattered particle beam radiotherapy presents challenges to the treatment planner when constructing multiple field plans where abutting beam edges result in the formation of hot/cold spots in the target volume. Delivery of a fixed modulation spread-out Bragg peak (SOBP) dose distribution (where the modulation is set to the maximum extent of the target volume along the beam propagation axis) often forces the planner to subdivide the treatment volume into segments that can be treated individually by different fields. In order to maintain a uniform dose distribution the planner must carefully describe the subdivision so that the dose contribution from abutting fields does not introduce significant dose variation across the treatment volume. In this work we introduce an inverse planning solution where the total contribution from all beams may be optimized simultaneously. For uniformly modulated SOBP delivery, uniformity in match line dose can be achieved by modifying the patient specific range compensators defining the position of the sharp distal dose edge from abutting fields. For beam delivery systems where variable range modulation is easily achieved, dose homogeneity, target conformality and normal tissue sparing may be improved by varying the weights of each range shifted Bragg peak covering the target volume.