

AbstractID: 2125 Title: Quantitative comparison of beamlet based and aperture based inverse planning algorithm

Aperture-based inverse planning is to directly optimize the shapes and weights of a pre-selected number of apertures and has the advantage of (i) no need for MLC leaf sequencing; and (ii) requiring less number of segments. Generally, the aperture-based inverse planning is a special case of beamlet-based optimization. However, when the beamlet size is not so small (say, 1cmX1cm), the aperture-based approach is superior in that the leaf ends are not confined to move on a lattice (even though the leaf positions have to be discretized for computational purpose, the increment can be made much smaller and, furthermore, different segments can have their own discretization patterns). Thus it is difficult to draw conclusion with regard to which types of algorithms produces better IMRT plans and what is the tradeoff associated with each of them. In this work, we carry out a series of studies comparing the performances of the two approaches using a phantom case and three clinical cases of different disease sites. For beamlet-based optimization, 1cmXcm beamlet size and 10 intensity levels are used. For aperture-based optimization, a range of number of segments (3 to 25) were investigated. The same beam configuration and modalities were used. The general reference drawn from the study is that, even without considering the advantage in actual plan delivery, aperture-based inverse planning is generally a superior approach when the number of segments per field is greater than ~15. The crossover between the two planning schemes occurs when the number of segments is 8-12.