A fast model for the prediction of the PDD/TPR of irregular shaped fields from just a few physical parameters.

Phantom scattered dose is an essential component of the total dose delivered to tissue during high energy X-ray radiation treatment. Accounting for this component accurately and efficiently in the dose calculation is a necessity. In the search for an optimal set of IMRT parameters, speed of calculation is highly desirable, especially for search algorithms for which oft-repeated calculations are required. In this study, we propose a method of simple summation of the phantom-scatter contributions from a set of individual triangles that constitute an irregular field. The calculation of phantom scatter is based on a two-parameter model that is applicable to regions where electron equilibrium is established. The advantage of this approach is the considerable reduction of calculation time compared to that needed for a full-fledged scatter integration. The calculation accuracy for an irregular field shaped by an MLC is not compromised by the triangulation arising from the straight edges of the MLC leaves. The two parameters for the model, (a, w), can be derived from the basic beam parameter, the averaged attenuation coefficient μ . Eventually, only two parameters for each beam, (μ , η), are needed to predict the PDD (percent depth dose) or the TPR (tissue phantom ratio) with reasonable accuracy for any arbitrarily shaped field, especially by MLC, in the region of electron equilibrium.