Abstract

The edge factors of interleaf edges (side edges between leaf pairs) and intraleaf edges (edges between the two ends of a leaf pair) have been quantitatively measured with ionization chambers and film dosimeters. At a depth of interest (5 cm or 10 cm), the variation of the peak values of dose profiles across the leaf edges at a position (x,y) can be estimated by an exponential function as:

$$OAR(x,y) = \exp\{-(\mu' \bullet d' + \mu \bullet d)(x^2+y^2)/2 /SAD^2\},$$

where μ and d are the effective linear attenuation coefficient and the depth for the leaf (with prime) or tissue (without prime), respectively. The dose profile across a side-edge can be approximated by a Guassian distribution, e.g.

$$P_s(d) \bullet OAR(x,y) \bullet \exp\{-(y-y_L)^2/\sigma_y^2\}$$

where $P_s(d)$ is the peak value at the central axis, y_L is the side-edge location in y-direction, and σ_y^2 is the Gaussian spread size. The dose profile across an end edge is approximated by two components, a sharp peak and a wider spread function, e.g.

$$P_e(d) \bullet OAR(x,y) \bullet [a \bullet \exp\{-(x-x_L)^2/\sigma_{xa}^2\} + b \bullet \exp\{-(x-x_L)^2/\sigma_{xb}^2\}],$$

where a and b are the fractions of the two components, $P_e(d)$ is the peak value at the central axis for the end edge. By measuring the dose profile across an edge at the central axis with all leaves closed, the additional dose contribution from a leaf edge can be analytically expressed. This analytic solution is desired for correction of the edge effect in dynamic IMRT where multi-leaf edges pass through almost all area of the fields.