

Modeling the Extrafocal Source for IMRT Dose Calculation

Accurate calculation of monitor units and dose distributions for intensity modulated radiation therapy requires a precise description of the extrafocal source. An analytical dual source model has been developed to estimate the dose contribution from the focal and extrafocal sources. The extrafocal source is assumed isotropic with the intensity distribution represented by a series of Gaussian functions. The monitor chamber backscatter effect is also taken into account. The model is commissioned by fitting measured head scatter factors. It has been tested extensively for 6 MV and 15 MV photon beams from a Varian Clinac 2300C/D accelerator. For fields defined by the movable jaws, the model can accurately predict the 8% variation in head scatter factors with field size and the 3% variation of the jaw exchange effect (consistent with measured values to within 0.3%), for source-to-surface distances (SSD) from 80 to 120 cm. For fields defined with the multileaf collimator, the agreement between calculation and measurement is within about 0.5% for jaws at the recommended positions. This extrafocal source model can be easily incorporated into the conventional or Monte Carlo dose algorithms to predict monitor units and dose distributions accurately for intensity modulated radiation therapy.