

AbstractID: 1274 Title: 6 MV Spectra Determination by Water Transmission Measurements and Use in Calculating Doses in Small and Irregular Fields.

Water transmission measurements with good geometry were made for 6 MV x-rays. The transmission measurement at zero field size was extrapolated from adjacent small field measurements. A simple algorithm derives the primary air kerma, energy fluence and photon fluence spectra as a function of photon energy. Scatter in field sizes greater than zero was estimated by using measured PDDs, and calculated TMR curves from the original PDD measurements. The derived spectrum was validated by calculating PDDs, TMRs and comparing to clinical data. The primary dose at any point is calculated using the derived X-ray kerma spectrum incident upon the phantom as a function of photon energy and exponentially attenuating it. Scatter contribution at that point is added from the value derived from the measured PDD curves for that field size. Agreement was within 1.2% for all fields from 0.5x0.5 to 4.0x4.0 cm. The method lends itself to calculation of doses for materials having different electron densities and tissue inhomogeneities for small and irregular x-ray field sizes in IMRT. The primary dose, greater than 80% of the total dose for most small fields, is readily calculated using the derived spectrum and the scattered dose is readily estimated using conventional methods. The dose calculation accuracy then is a primary function of determining the electron density and tissue inhomogeneity of the irradiated volume. The spectrum derivation and validation method is described in sufficient detail to enable others to readily use it in dosimetry as is required for some new treatment planning computers.