

AbstractID: 5657 Title: A procedure for correcting the effect of detector properties on measured profiles of small field MV x-ray beams

Purpose:

Very small fields and segments of area less than one square centimeter are routinely being used for IMRT and stereotactic radiosurgery. Accurate measurement of beam profile is essential for treatment planning. Ion chambers with very small cavity radius, specialized diodes and films are commonly used for these beam data measurement. The purpose of this investigation is both to study the effect of the detector properties on the measured beam profiles of the small field MV x-ray beams and to apply the necessary correction to determine the real profiles.

Method and Materials:

Two ionization chambers with cavity radius of 2 mm and 1 mm, a stereotactic diode and XV film were used to measure the beam profiles of circular fields of stereotactic cones and small square fields defined by collimator jaws and MLC. The penumbra widths of the profiles were compared to study the effect of the physical properties of the detectors, such as, size, energy dependence and dose rate dependence on the measured beam profiles. The profiles measured by the larger ionization chamber were corrected for the detector size effect by using a semi-empirical procedure [1] and was used as the reference profile to derive the detector response function of other detectors with smaller size and better spatial resolution. The detector response functions were then used to correct the measured profiles of small fields.

Results:

The differences in the profiles measured by different detectors were significantly reduced after the profiles were corrected with detector response functions.

Conclusion:

The accuracy of the profile measurement of small therapy beams can be significantly improved when appropriate corrections are applied to take into account the variation of detector response in different regions of the beam.

[1] Kazi, A. et al., Med. Phys. (abstract) 31, 1908 (2004).