

Characterization of Dosimetric Penumbra of Square Fields produced by a Multi-Leaf Collimation System for High Energy Photon Beams

Dosimetric penumbra (80% –20%) for MLC- and jaw-shaped fields for a 2100CD linac was evaluated for square fields ranging from 5 x 5 to 20 x 20 cm². Our data show that in all cases the smallest penumbra is observed for the field side produced by the lower jaws, next in sequence are the leaf sides of the MLC, upper jaws and the rounded leaf ends. The difference between the smallest and largest penumbra is about 1 mm. In general, the penumbra on the leaf side of the MLC is slightly larger (0.2 mm on the leaf side) than that on the lower jaw which is parallel to the leaf motion. On the other hand, the penumbra on the rounded leaf end is considerably larger (1.0 mm on average) than that produced by the upper jaw. In all cases, the penumbra is larger on the leaf end than the leaf side, on average by 1.2 mm. The penumbra was field-size dependent; increasing by about 0.8 mm from 5 x 5 to 10 x 10 cm², then remaining constant for larger fields upto 20 x 20 cm². The penumbra was on average 1 mm larger for 10 MV x-rays compared to 6 MV x-rays. The penumbra was on average 1.3 mm larger at a depth of 10 cm compared to that at d_{max} .