

Purpose: One of the challenges in small field dosimetry is the determination of output factors. The output of small field may be sensitive to the positional accuracy of the collimator jaws and MLC. The positional accuracy and reproducibility of small fields defined by collimating jaws and MLC for different accelerators are investigated.

Methods: The reproducibility of field sizes, ranging from 1x1 to 10x10 cm² was investigated for both 6 and 15 MV on a Varian iX and a Siemens Artiste machines. For the Siemens Artiste, profiles were scanned at 5 cm depth in water with a Stereotactic Photon Diode (SFD). The water surface was at 95 cm SSD. In addition, profiles at off-axis distances of 2 and 5 cm respectively were scanned. For the Varian iX machine, an EPID was used for profile measurements at 0.8 cm water equivalent depth. For each field size, both X and Y jaws were opened up to 20x20 cm² then closed down to the field size to be measured. This was repeated 12 times for each field size. For each measured profile, the field size is estimated by taking the full width of the profile at 50% of maximum value.

Results: The measurement shows very good reproducibility of both MLC and Y jaw. The standard deviation of the variations for each field size is between 0.004 to 0.01 cm over the range of field sizes studied. The maximum offset in the x or y dimension is about 0.5 mm, which may affect the output factor.

Conclusions: The reproducibility of field size is better than 0.5mm for the range of field sizes studied with possible minimum effect on the output factor. The uncertainty of output factor measurement would be mainly due to the choice of detector and focal size of the accelerator.