

Purpose: Two dosimetric methods of measuring the electron beam spot position of photon beams w.r.t. the Collimator Axis Of Rotation (CAOR) are described.

Methods: Method 1 (SNG test) uses a cylindrical ion chamber (IC) (A1SL) in a phantom mounted on a jig co-rotational with the collimator making the relationship among the chamber, phantom, jaws and CAOR fixed and independent of collimator angle. A jaw parallel to the IC axis is set to zero and the phantom adjusted so the IC signal is 65% of the open field value. cGy/mu is measured every 30 degrees of collimator rotation. The phantom is then translated normal to the IC axis until the signal is 35%. The shift is recorded to calculate sensitivity (%dose/mm). For a radially symmetric spot centred on CAOR, the IC signal is angularly constant. Deviation from constant indicates a displacement from the CAOR and a shape distortion. The displacement and spot shape are calculated using Fourier analysis and penumbra shape (sensitivity). The 2nd method uses a hard wedge instead of the jaw and sensitivity is obtained from wedge profiles. Test measurements were performed on an Elekta 6 MV: the In Plane beam spot position was measured before and after it was moved by changing bending magnet current (Bending Fine).

Results: Independent beam spot measurement (Flexmap Image Registration) showed the initial beam spot, projected back to source, 0.29 mm from CAOR, moving to 0.91 mm (delta=0.62 mm) with steering. The SNG test reported the beam spot moving from 0.13mm to 0.92 mm from CAOR (delta=0.79 mm). The hard wedge test gave an initial position of 0.09 mm off axis and a final position of 0.79 mm (delta=0.7 mm).

Conclusions: The methods described provide a quantitative measure of beam spot position, not requiring the user to independently define the CAOR.

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