AbstractID: 8227 Title: Correction factor in output measurement for small fields

Purpose: Small field dosimetry is challenging due to detector-produced perturbation factor (wall, electrode, stem, gradient, etc) that becomes pronounced in the region of electronic disequilibrium. A correction factor (CF) is required in dosimetric measurements to account for these effects. In this study, the detector response and the effect of detector perturbations for various types of detectors are investigated. The CF for the output factors for different energies is also determined for the various detectors.

Method and Materials: Output factors were measured in water for a range of field size 0.5x0.5 to 10x10 cm^2 for 6 and 15 MV photons from a Varian accelerator. Three diode detectors (PFD, SFD, Mapcheck), an electronic portal imaging device (EPID), MOSFET, EDR2 film, a 0.125 cm^3 ion chamber and a micro-chamber were used. An empirical formula for the CF based on Monte Carlo derived from Francescon, MedPhys,35,504,2008: $CF = \alpha(\beta\text{-}\exp(-\delta S))$ is used to fit the measured data in the respective region of electronic disequilibrium for 6 and 15 MV beams. Here, α, β and δ are the fitting parameters and S is the field size. The CFs are applied to obtain the output factors in the region of lateral disequilibrium.

Results: For 6 MV and 15 MV, the distance of lateral equilibrium is found to be 1 cm and 1.5 cm respectively for 6 and 15 MV beams. For both energies, the CF varies from 0.5-5% in the lateral disequilibrium region. The output factors obtained for all detectors agree to within ±3% for fields $\geq$ 2x2 cm^2 and 3x3 cm^2 respectively for 6 and 15 MV beams.

Conclusion: A field size dependent correction factor for various detectors is provided based on MC study. The lateral equilibrium distance is found to be 1 and 1.5 cm for 6 MV and 15 MV beams, respectively.