AbstractID: 10948 Title: Small field dosimetry for electron beams

Purpose: This study examines the accuracy of dose calculation for electron beam in small circular fields for Varian accelerators using an empirical method based on dose per incident fluence.

Method and Materials: Fractional Depth doses (FDD) at SSD = 100 cm for open beam and small circular cutouts (r = 0.5, 1.0, 1.5, 2.0, 3.0, 4.0, 5.0 and 5.6cm) are renormalized to surface. The resulting depth dose is then normalized to the broad beam FDD to determine a fractional FDD, FDDf for.all electron energies (4, 6, 9, 12, 16, and 20MeV). The head scatter factor (*H*), defined as the ratio of electron energy fluence at point of interest to open cone at otherwise the same geometry, is measured using a diode in air without buildup cap as a function of cutout radius for all electron energies and cone sizes (6, 10, 15, 20 and 25cm^2). The phantom scatter factor, *PSF=BF/H*, defined as the ratio of blocking factor in water at reference depth and is measured as a function of radius, electron energy, and SSD (100, 120 and 140cm).

Results: It is found that *H* is a single function of renormalized radius, r_N = r*100/(SSD+d) and is independent of SSD for a given electron energy and cone size. Normally, the radius dependence of *H* is a function of both the SSD and cone size. The extrapolated value of PSF from percent depth dose (PDD) renormalized to the surface is remarkably close to the measured *PSF* data, to within 2%.. The calculated *FDDf* has a bowl-shaped dependence on the depth with the height increasing with increasing electron energy.

Conclusion: By normalizing the Fractional depth dose (FDD) to the surface, most characteristics of small field electron dosimetry can be simplified and adequately described by H, a quantity describing the incident electron energy fluence.