AbstractID: 7539 Title: Does the dose outside a primary barrier follow the inverse square law?

In a recent publication, McGinley showed, through a series of measurements on various linacs, that the dose outside a primary barrier does not fall off with the inverse of the square of the distance between the target and the measurement point. Instead, he showed that the effective source position is somewhere between the target and the barrier. This effect has been investigated using the Monte Carlo (MC) technique. An 18 MV x-ray beam, 50 cm in diameter at isocenter, was directed towards a primary barrier at an isocenter to wall distance of 3.66 m. The thickness of the wall, 2.43 m, was sufficient to reduce the dose equivalent outside the barrier to 2 mrem/wk, based on 100% occupancy and ¼ use factor. The relative dose was determined at distances from the outside barrier varying between 0 m and 3.9 m. As a test of the MC, the variation of relative dose with distance was also determined under two other conditions: (i) no shielding and (ii) shielding sufficient for a secondary barrier of thickness 1.16 m. As expected, case (i) showed inverse square dependence with respect to the target distance. However, for both the primary and secondary shielding, the effective source point was not the target, but some point in between. For the primary and secondary barrier, this point was close to the inside shielding wall. The same MC was used to look at the radial distribution of the photons penetrating the barrier as a function of distance from the barrier.