AbstractID: 8738 Title: Implementation of a Sector-Integration Method for Calculating Electron Cutout Factors at Extended Distances

Purpose: To develop a spreadsheet that enables a physicist or dosimetrist to quickly determine electron-beam cutout factors for irregularly-shaped apertures at extended distances.

Method and Materials: Cutouts with circular apertures from 10cm to 1cm diameter were fabricated to fit inside a 10x10cm electron applicator. The cutout factor for each was measured with 9 MeV electrons at two depths (dmax and R90) and five SSD's (100, 102, 105, 110, and 120cm). A polynomial fit to the data yielded the cutout factor as a function of aperture radius for each SSD-depth combination. A spreadsheet was written that estimates the cutout factor for an irregularly-shaped cutout by dividing the cutout into sectors, calculating the cutout factor for each sector, and taking the average.

Results: Changes in the cutout factor as a function of SSD were noted. The spreadsheet was tested using 10 electron cutouts from actual patient treatments. For each cutout, the cutout factor was measured for all five SSD's at both depths. The spreadsheet was used to estimate the cutout factor for each cutout at each SSD and depth. Except for cases where the cutout was especially narrow and concave, the spreadsheet estimated the cutout factor to within 1% of the measured value.

Conclusion: The spreadsheet correctly estimated the cutout factor for most situations, regardless of depth or distance, and took only a few minutes to use. Using this spreadsheet reduces the need for the physicist to measure the cutout factor directly, which can be a considerable time savings. It also removes any need to use less-accurate approximations.

Conflict of Interest (only if applicable):