AbstractID: 6488 Title: Clinical Implementation of a Sector-Integration Method for Calculating Electron Output Factors

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

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 for five electron energies at two depths (dmax and R90). A polynomial fit to the data yielded the cutout factor as a function of aperture radius for each energy-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: The spreadsheet was tested using 10 electron cutouts from actual patient treatments. For each cutout, the cutout factor was measured for all five energies at both depths. The spreadsheet was used to estimate the cutout factor for each cutout at each energy and depth. We determined that 16 sectors were sufficient for a quality result. 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 clinical situations, 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):