

AbstractID: 13622 Title: Development of a Sector-Integration Method for Calculating Cutout Factors for Large Electron Fields

Purpose: The purpose of this research project was to design a spreadsheet program which will calculate the cutout factor for an arbitrary electron cutout shape for a 15x15cm electron applicator.

Method and Materials: Fourteen electron cutouts were made from cerrobend using a 15X15 cm applicator with a centered circular hole of diameter 2 cm to 15 cm. Cutout factors were measured for five electron energy levels and at two depths. Graphs comparing cutout factors to circle diameters were created and polynomial equations were applied to fit the curves. A spreadsheet was developed which calculates cutout factors using radii measured from the center of an electron cutout. The spreadsheet calculates a cutout factor for each radius entered and takes an average to produce a final cutout factor. We tested the spreadsheet by using electron cutouts from ten actual patients. Cutout factors were measured for each patient cutout using a Markus-type parallel-plate ion chamber. The patient cutouts were then traced onto polar-coordinate graph paper and different numbers of radii were measured to determine the number of radii needed to accurately calculate the patient cutout factor.

Results: The minimum acceptable number of radii to use was 16. Using 16 radii, the spreadsheet calculated cutout factors which were within 1% of the measured values for all cases. The patient cutout factors, even though for large fields, had values greater than 1.5% from unity in 60% of the cases.

Conclusion: A spreadsheet program has been designed which calculates cutout factors to within 1% error using only 16 radii measured from the center of the cutout. The use of this spreadsheet can improve the efficiency and accuracy of calculating electron cutout measurements. The results suggest that cutout factors should be measured or calculated for all fields, not just small ones.