AbstractID: 14184 Title: An Automated Tool for Determining Output Factor For Electron CutOuts

An Automated Tool for Determining Output Factor For Electron CutOuts

Purpose: To provide streamlined methods for quickly and accurately determining the output factor for irregularly shaped electron cutouts. Measurement on a linear accelerator of output factor for electron cutouts is a time consuming physics task. Existing methods that calculate output factor for shaped apertures are approximations based on cutout length and width, or require a printed version of a cutout shape for either manual measurement or scanning and digitizing.

Methods and Materials: An integrated spreadsheet and database provides several options for output factor determination: a measured value or an approximation based on cutout length and width may be used, an image based database containing previously measured cutouts can be searched, or the electron cutout shape contour can be imported electronically from the Philips Pinnacle[3] treatment planning system, and the output factor calculated without further user interaction. For the last option, a weighted sector-integration based algorithm is used that employs polar coordinates and does not require either the calculation of the intersection of equispaced vectors with the block contour or the repeated rotation of the contour.

A set of measurements taken for a variety of energies, electron cone sizes, and circular cut out diameters is used to generate a standard output factor table for the sector integration approach.

Results: The output factor calculations were tested on a set of cutouts for electron boost treatments. Comparison of measured and calculated output factors are presented.

Conclusion: In a busy clinic environment, measurement of output factors for electron cutouts is time burden on physics staff, so automated methods of calculation that involve a minimum of staff time while preserving accuracy have proved valuable in our clinics.