Abstract ID: 15337 Title: Extracting Energy Fluence Distributions of X-Rays Produced by Megavoltage Electron Beams Stopping in Thick Targets From Lateral Profiles Measured Using Ionization Chambers

Purpose:
To develop a method of extracting energy fluence distributions of x-rays produced by megavoltage electron beams stopping in thick targets from lateral profiles measured using ionization chambers.

Methods:
High accuracy x-ray lateral profiles measured using various ionization chambers with a set of build-up caps for a number of target materials were recently reported. It was possible to extract energy fluence distributions from these profiles by using Monte Carlo calculations. The conversion factor was calculated as the ratio between the MC calculated energy fluence (using FLURZnrc) and the MC calculated absorbed dose in the air cavity of the ionization chamber (using "cavity") at each position. The "measured" energy fluence lateral distribution was then obtained by multiplying the measured absorbed dose with these coefficients point by point, for each build-up cap. The geometry, beam and material properties were simulated with BEAMnrc. The "cavity" user code was used to score the absorbed dose in the ionization chamber air cavity per incident electron up to angles of 25º. The energy fluence calculations were performed using the EGSnrc user code FLURZnrc.

Results:
The conversion factors for the PMMA build-up caps were different by up to 40 % from those for the hevimet caps. However, when converting to energy fluence, for all targets the agreement between the energy fluence distributions obtained with each of the six build-up caps was better than 1 %. The final energy fluence distribution for a particular target was obtained by averaging the distributions obtained for all six build-up caps.

Conclusions:
The present study showed that it is possible to extract energy fluence distributions from x-ray lateral in-air profiles measured using commonly used Farmer type ionization chambers with various build-up caps. The uncertainty on the distributions was better than 1 %.

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