AbstractID: 3445 Title: Correlation Between in vivo Electron Diodes Response and Nominal Surface Dose for Broad Electron Beams

Purpose: To establish correlation between in vivo diodes response and nominal surface dose Ds for broad electron beams, thus simplifying the calibration process for electron diodes.

Method and Materials: The nominal surface dose Ds defined by TG25 was extracted from electron PDD data that were measured by cylindrical ion chamber (RK chamber, Scanditronix-Wellhofer) on a Varian 2100C Linac at 100 cm SSD. Cone factors were measured using ion chamber (Capintec PR-06) at d_{max} .

A QED p-type electron diode with Model 1131 dosimeter (Sun Nuclear Corp.) was calibrated to the dose at d_{max} for 9 MeV electron beam at 100 cm SSD using 10×10 cone. Diode readings using this calibration factor were then obtained with 10×10 cone and 15×15 cone for 6, 9, 12, 16 and 20 MeV electron beams delivering 200 MUs. The same diode was then re-calibrated to the dose at d_{max} for 12 MeV electron beam. The above measurements were repeated with 10×10 cone and 25×25 cone to reconfirm our hypothesis.

Results: The diode readings were first divided by cone factors, and then the corrected readings were plotted against nominal skin dose. For diodes calibrated by 9 MeV electrons, the correlation coefficient R-squared value were 0.9954 and 0.9796 for 10x10 cone and 15x15 cone respectively. For diodes calibrated by 12 MeV electrons, the R-squared value were 0.9967 and 0.9980 for 10x10 cone and 25x25 cone respectively.

Conclusions: The correlation between in vivo p-type diode response and nominal surface dose Ds for broad electron beams has been empirically established and confirmed. The diode response corrected by cone factor demonstrated a clear correlation with nominal surface dose Ds. This correlation can significantly simplify the electron diode calibration process. It can also be potentially used to monitor relative skin dose along with d_{max} dose at the same time.