Characterization of the New MicroSilicon X Diode Detector

S. Stathakis[1], C. Kabat[1], P. Mavroidis[2], N. Papanikolaou[1]
[1]Department of Radiation Oncology, The University of Texas Health Science Center at San Antonio, Texas
[2]Department of Radiation Onology, University of North Carolina at Chapel Hill, North Carolina

Mays Cancer Center
UT Health San Antonio MD Anderson Cancer Center

INTRODUCTION

As technology changes, the ability of physicists in radiation oncology to take more accurate and precise measurements increases. One key technology being the manufacturing of diode detectors that offer higher sensitivities and have uniquely manufactured sensitive volumes. Utilizing these advancements, the recently released microSilicon X (60022) from PTW claims to offer more exceptional qualities than its predecessor, the Diode P (60016). It is the purpose of this study to characterize the micoSilicon X diode detector and compare it to similar detectors.

AIM

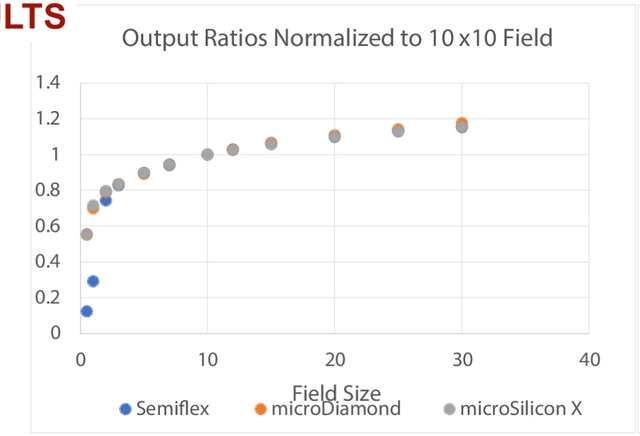
The new microSilicion X diode detector offers yet another option in measuring dose with a higher sensitivity from its predecessor of 19 nC/Gy while still holding the same sensitive volume of 0.03 mm3. However, just like any other new detector, a set of routine tests are required to establish and differences that could have been created due to the changing of diode used and sensitive volume shapes. We aim to evaluate the microSilicon X diode and compare it to its predecessor diodes and chambers.

METHOD

The microSilicon X diode, microDiamond Diode, and Semiflex 3D detectors were all selected to compare against each other. A dose linearity was conducted for the dose range 0.01 to 8.55 Gy. A set of output ratios was measured for each detector for field sizes ranging from 1 x 1 cm^2 to 40 x 40 cm^2. Also, percentage depth dose curves were taken and referenced with values obtained from a Roos chamber, and the effective point of measurement was established. Each chamber had profiles obtained for field sizes ranging from 2 x 2 cm^2 to 20 x 20 cm^2.

PTW microSilicon X Diode Detector

RESULTS



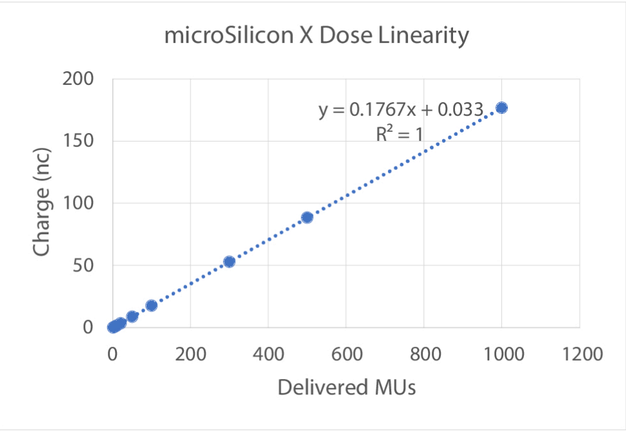
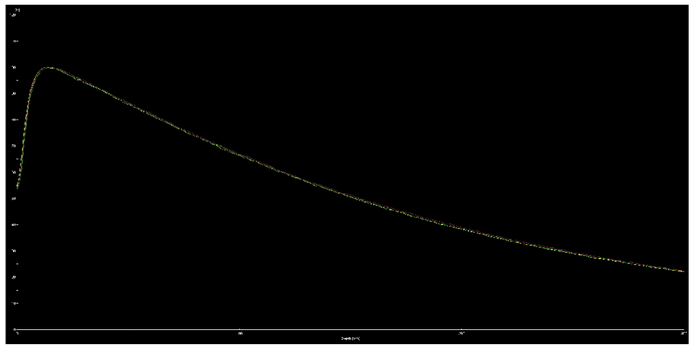


Figure 1 (left): Shows the Output Ratios for the Semiflex, microDiamond, and microSilicon X normalized for a 10 x 10 field. Figure 2 (right): Is the dose linearity line obtained for MU's delivered from 1 to 1000 for the microSilicon X diode detector.



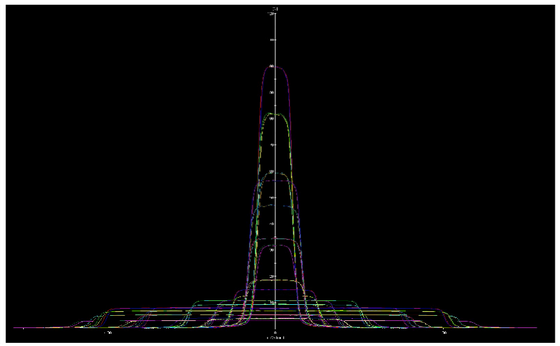


Figure 3 (left): PDDs obtained for the Semiflex, microDiamond, and microSilicon X and overlayed onto each other. Figure 4 (right): The full set of profiles obtained for the microDiamond for field sizes 2x2, 3x3, 5x5, 7x7, 10x10, 15x15, 20x20 at depths of dmax, 5 cm, 10 cm, and 20 cm depths.

CONCLUSION

As shown in Figure 1, the output ratios were found to be matching similarly to what is expected of a microDiamond. While the Semiflex had similar values for larger fields, the values fell away for much smaller field sizes. In evaluating the chambers for dose linearity, as shown in Figure 2, the microSilicon, microDiamond, and Semiflex all obtained R2 values of 1. Figures 3 provides a visual of how the PDDs for a 10 x 10 cm2 field and profile distributions looked similar for the micoSilicon diode detector against the microdiamond and Semiflex.

Contact: stathakis@uthscsa.edu