AbstractID: 8301 Title: Unexpected doserate dependencies of diodes for beam scanning

Purpose:
The doserate dependence in electron beams of four types of scanning diode were investigated – Scanditronix-Wellhöfer EFD and SFD, PTW60012 and Sun Nuclear QED 1113000-1.
Method and Materials:
The detectors were positioned at a fixed source-detector distance in an uncollimated 20 MeV electron beam and the doserate varied by varying the incident beam intensity. There were therefore no changes in field size, scatter contribution *etc*. The dose per pulse was in the range 0-0.1 cGy, which is typical of clinical linacs. Measurements were also made in high gradient electron fields, e.g. depth-dose curves and beam profiles, for a range of electron energies from 6-22 MeV.
Results:
Two of the diodes - the SFD and QED- showed little or no doserate dependence. The EFD showed a variation that just exceeded the manufacturer's specification and the PTW60012 showed a very large effect with a 15% change in sensitivity over the range of doserates investigated. These differences in response were also seen in the comparison of beam profiles and depth-dose curves. The EFD and PTW diodes gave a difference in R_{50} of approximately 1 mm, which is equivalent to a 4% error for 6 MeV. Similar discrepancies were seen for the measurement of field size. Doserate corrections were obtained and corrected dose distributions generally gave agreement between all detectors within the measurement uncertainties.
Conclusion:
These results would indicate that users should not simply rely on manufacturers' specifications and should characterize any new diode for doserate dependence before using the device for beam measurements.