AbstractID: 3011 Title: Reference Electron Beam Dosimetry Data Set: A Preliminary Analysis

Purpose:
To investigate the feasibility of developing a set of standard percent depth dose (PDD) curves for electron beams to be used when providing quality assurance (QA) checks on machines.

Method and Materials:
A database of PDD data collected on more than 900 machines was used as a source of central axis PDD data. The database consists of curves from Varian (62%), Siemens (26%), Elekta/Philips (8%), Mitsubishi (2%) and GE/CGR (1%) machines. For this study the data was restricted to modern Varian and Siemens machines with data for 5-6 electron energies each. PDD data for each beam was extracted for 10x10 or 15x15 cm cones. The data were fitted to a six-order polynomial to predict PDD from depth of 0.2 cm to approximately 20% of maximum dose providing excellent fits for all data ($R^2 \geq 0.99$). The curves were compared for shape and location on the depth scale for each beam for each machine model. Selected PDD data were validated by TLD QA measurements at 2 depths in a fixed geometry system.

Results:
The curves were stratified by machine model and nominal energy and agreement was found to be ± 1 mm of the mean curve for all depths between 100% and 20% of maximum dose. Average curves developed were found to depend little on manufacturer.

Conclusions:
With the large database of PDD data measured independently by many physicists on many machines the information is available to develop standards for common machine models with a high degree of accuracy. The standards can be used to review PDD data for QA and to provide information on curve shape when data provided by physicists for QA is sparse.