

AbstractID: 5488 Title: LINAC Dosimetry: Benchmark Data Set Requirements

Purpose: Provide accurate basic acceptance data needed for modeling dose calculation algorithms. Provide accurate dosimetry data for special geometries and heterogeneities that are frequently encountered in IMRT planning systems.

Method and Materials: Develop requirements for the Benchmark Datasets that fully characterize the modern day delivery systems in commercially available 3D treatment planning systems (TPS), consistent with TG-53 report on TPS QA. The hypothesis is that high quality benchmark data can be acquired by comprehensively characterizing single linacs of each make. The RPC database was used to demonstrate that hypothesis.

Results: A measurement template that defines basic data for beam shape, penumbra, and radiation dosimetry characteristics, such as depth dose and scatter factors, has been defined for LINACs from the three major manufacturers: Elekta, Siemens, and Varian. Measurements will be made on a Varian Clinac 21EX, a Siemens Oncor and an Elekta Precise. The x-ray beam energies measured will be 6, 10 and 18 MV. These measurements will be made in a 3D water phantom scanning system, using detectors that will enable high spatial resolution of dose gradients resulting from beam limiters. These detectors will include small volume ion chambers, diodes, and film. In addition, radiation dose in and around various heterogeneities will be measured in a water-equivalent solid phantom that will allow the insertion of heterogeneous components. A comprehensive measurement uncertainty analysis will complement the data. Software has been developed for importing the Benchmark Data into structured database following the TG11 format.

Conclusion: Software to streamline routine TPS QA, using the benchmark data, will be made commercially available, enabling recommendations from TG53.

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