AbstractID: 5535 Title: LINAC Dosimetry: Benchmark Data Set Uncertainty

Purpose: Determine sources of error in the collection of a Benchmark Data set for LINAC dosimetry and provide methods of error correction that will ensure the highest possible accuracy of the dosimetric data.

Method and Materials: Guided by the measurement requirements for the Benchmark Datasets, the sources of experimental error can be divided into 3 sources: 1) discretization and volume averaging errors; 2) Stochastic errors; and 3) Systematic or artifactual errors. Measurements will be made in a 3D water phantom scanning system and in a water-equivalent solid phantom that will allow the insertion of heterogeneous components.

Results: We present theoretical analyses of the expected errors associated with ion chamber, radiochromic film, and diode measurements and provide specific techniques that will enable high spatial resolution of dose gradients resulting from beam limiters and dose perturbations in and around heterogeneity interfaces, such as air/tissue, lung/tissue, bone/tissue. These techniques include de-convolution of chamber response and a 3D correction matrix of a film scanner.

Conclusion: Theoretical limits of spatial resolution in LINAC dosimetry are achievable and demonstrable using dosimetric tools available today. These tools and methods will be used to collect accurate Benchmark Dosimetry data for future research in Monte Carlo techniques for treatment planning as well as automated software tools that will enable systematic QA of modern treatment planning systems.

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