AbstractID: 7112 Title: Characterization of Dose in Heterogeneous Situations: A Comparison of Treatment Planning System and Computer Aided Second Check Dosimetry QA Software Dose Evaluations

Purpose:
To quantify and compare the dosimetric predictions calculated by a treatment planning system, second check dosimetric computer QA software, and ion chamber measurements in heterogeneous situations for 6 and 18 MV photon beams.

Method and Materials:
An assortment of plastic tissue equivalent materials was used to compare the calculated dose predictions between the Pinnacle^3 treatment planning system, the RadCalc® QA computer software, and ion chamber measurements. The dosimetric accuracy of the plastic water, lung, and bone equivalent slab materials was assessed and validated through the use of simple geometries. After planning, doses for each slab arrangement were measured on a Varian 21EX accelerator with a second check performed by the RadCalc® computer software. Percentage differences between the computed and measured doses were then compared and quantified, providing information on the accuracy of the dose predictions.

Results:
Evaluation and comparison between the calculated dose values from the Pinnacle^3, RadCalc®, and measured data indicate that discrepancies exist, even for simple geometric setups. Looking at percentage differences, the Pinnacle^3 system (-3.82% – 4.33%) more accurately calculates the dose in the heterogeneous locations than does the RadCalc® software (-8.30% - 4.15%). Examination of all measured point locations show only about 4% of the Pinnacle^3 system dose calculations, and almost 18% of the RadCalc® software dose calculations, have a percentage difference greater than ±3%.

Conclusion:
This work explores the clinical application and accuracy of using RadCalc® for dosimetric second checks. Even with the use of heterogeneity corrections, it is still not guaranteed that an accurate dose calculation will result when heterogeneous material is present. The CIRS Inc. IMRT Thorax and Pelvic 3D phantoms will be utilized for the continuing investigation of the accuracy of dose calculations performed by Pinnacle^3 and RadCalc® involving additional complex geometries in a more anatomical construct.