AbstractID: 5631 Title: Updated Solid Water™ to water conversion factors for 125I and 103Pd brachytherapy sources.

Purpose: The updated TG-43U1 recommends determination of the consensus of low energy brachytherapy source parameters using experimental and Monte Carlo Simulated data. As per this recommendation, the measured parameters in Solid Water™ are converted into water data for clinical application. However, the published conversion factors may have been obtained using Monte Carlo simulations with a cross section files that may have errors for low energy photons, and also for inaccurate chemical composition of the phantom material. In this project impact of different calcium composition in Solid Water™ phantom on dose rate constant, radial dose function of ^{103}Pd and ^{125}I brachytherapy sources have been investigated.

Method and Materials: Conversion factor of Solid water™ to water has been determined using MCNP5 Monte Carlo code. In these simulations two different calcium compositions in Solid Water™ of 2.3% (SW$_a$) and 1.7% (SW$_b$) were utilized. Monte Carlo simulations were performed for ^{125}I sources, with and without silver marker, in order to investigate the impact of characteristic x-rays (emitted by silver marker) on dosimetric parameters. However, the simulation for ^{103}Pd was performed only on one type of the source. Each simulation was run for a total of 20M histories to keep statistical fluctuation less than 0.3%.

Results: For 2.3% calcium content phantom material the calculated conversion factor was found to be 1.027 and 1.045 for ^{125}I and ^{103}Pd sources respectively. However, for 1.7% calcium these values were found to be 0.989 and 0.963, respectively.

Conclusion: The Solid water-to-water conversion factors for ^{125}I and ^{103}Pd sources are found to be 0.989 and 0.963 respectively as compared to the published value of 1.05 and 1.048. In addition, presence of silver marker had no significant impact on conversion factor for I-125 sources. Moreover, conversion for g(r) was also introduced for clinical application of measured data.