AbstractID: 3742 Title: TG-43U1 Based Dosimetric Characterization of Model 67-6520 Cs-137 Brachytherapy Source

Purpose:
Dosimetric characteristics of a newly designed Cs-137 source (Model 67-6520) by Isotope Product Laboratories were determined using experimental and theoretical methods. These determinations were performed using TG-43U1 for distances larger than the active length of the source and along-away matrix for shorter distances.

Method and Materials:
Radial dose function, dose rate constant, 2D and 1D anisotropy function of the new Cs-137 source were determined following updated AAPM Task Group 43 (TG-43U1) recommendations. The experimental setup used for the determination of these parameters consisted of 1.0 x 1.0 x 1.0 mm^3 and 3.2 x 3.2 x 0.89 mm^3 TLD-100 LiF thermoluminescent dosimeters in Solid Water™ Phantom Material (40 x 40 x 20 cm^3). TLD's were read using a Harshaw model 3500 TLD reader. The experimental results were compared to theoretical data using Monte Carlo simulations in liquid and Solid Water™.
A Monte Carlo N-particle Transport Code (MCNP4C2) was used to calculate the dose rate distribution in Solid Water™ and liquid water. This code is capable of accounting for photoelectric, coherent, Compton and pair production interaction processes. The photon interaction cross section file used in this study was DLC-200 library distributed by the Radiation Shielding Information Computing Center (RSICC). In this study, up to $20x10^6$ photons were used for each simulation. Calculations were set up in the same design format as the TLD experiments.

Results:
The calculated dose rate constant in liquid water and Solid Water™ were found to be 0.961 $cGyh^{-1}U^{-1}$ and 0.962 $cGyh^{-1}U^{-1}$, respectively. In addition, there was good agreement between the measured and calculated dose rate constant, radial dose function and the anisotropy function in Solid Water™.

Conclusion:
The dosimetric characteristics of the IPL 67-6520 Cs-137 source were determined using the TG-43U1 recommendation. The characteristics of the new Cs-137 source are comparable to the other commercially available sources.