AbstractID: 10566 Title: Determination of neutron and gamma dose rates in water surrounding a new interstitial Cf-252 brachytherapy source

Purpose: A new generation of high-activity miniature ^{252}Cf sources for interstitial brachytherapy has recently been encapsulated at the Oak Ridge National Laboratory (ORNL). The purpose of this study is to determine the neutron and gamma dose rates in water surrounding the new ^{252}Cf source. **Method & Materials:** The neutron and gamma dose components of the new ^{252}Cf source in water were determined by the measurements of two miniature ion chambers (T1 and M1 of Standard Imaging, Inc.) that have similar gamma responses but very different neutron responses. A Lucite-walled water phantom was built to conduct the experiment. The experimental setup was also modeled by the Monte Carlo transport code MCNP. **Results:** The results show that the measured neutron absorbed dose rates were approximately 25% lower than that predicted by MCNP for all dose positions in water. The measured gamma absorbed dose rates in water, on the contrary, are higher than that predicted by MCNP. The differences between the measured and MCNP-predicted gamma dose rates are most pronounced (~a factor of two) at the distance of 1 cm, and fall to approximately 30% at distances 2 cm and beyond. **Conclusions:** The measured neutron and gamma dose rates do not agree with the dose rates predicted by MCNP. The discrepancies between the two results suggest that the true ^{252}Cf content of the new source is approximately 25% less than the ORNL estimate and that the new source emits significantly more low-energy gamma rays than the large ^{252}Cf sources (e.g. the AT source) used in the previous studies. **Acknowledgement:** This research is supported by Isotron Inc.