AbstractID: 9425 Title: Monte Carlo calculations of secondary electron spectra for various mixtures of gold and water mimicking tumors loaded with gold nanoparticles

Purpose: To determine the change in secondary electron spectrum due to gold nanoparticles present in a tumor under a treatment scenario of *gold nanoparticle-aided radiation therapy* (*GNRT*).

Method and Materials: The Monte Carlo code, EGSnrc, was modified to obtain the spectrum of secondary electrons. Simulations were performed with a water phantom containing a small gold-loaded region at various gold concentration levels (0.1-3%). The atom of origin and energy of each Compton and photo-electron was tracked, yielding the secondary electron spectrum of gold and water for each simulation.

Results: The presence of gold caused a significant increase in the number of photoelectrons generated. With 0.1%, 1%, and 3% gold in the region of interest, the total energy transferred to electrons through the photoelectric and Compton processes increased by 1.5%, 15%, and 49%, respectively.

Conclusion: The spectra generated in this study are helpful for a better understanding of the physical mechanisms responsible for dose enhancement within a gold-loaded tumor during *GNRT*. They can also be used as inputs for detailed history Monte Carlo calculations to perform a nanodosimetric estimation of tumor dose enhancement in the vicinity of a gold nanoparticle.