AbstractID: 9593 Title: Simulated Dose Deposition to Heart and Lungs: A Comparison between 192Ir and X-ray brachytherapy sources

Purpose: To compare the absorbed dose delivered per photon to the lungs, heart wall, and breast by irradiation of a breast tumor via a novel electronic x-ray brachytherapy source to that delivered by a standard ^{192}Ir seed. _Method and Materials_: X-ray spectra for 20-50 keV monoenergetic electrons, in 5 keV increments, were generated using the GEANT4 Monte Carlo code and realistic apparatus geometry. These spectra were then used as simulated point sources located 2 cm beneath the surface of a breast of a female voxelized phantom, generating 10^8 photons. The emission spectra of ^{192}Ir was used to simulate a point source in the same location for comparison. _Results_: An average decrease by a factor of 1.75 in dose to breast was revealed for when compared to ^{192}Ir . Dose to the lungs showed a decrease by factors of 2 x 10^3 and 11 at 20 and 50 keV electron energy, respectively, while the heart wall exhibited a decrease varying by factors of 1.5 x 10^4 to 17.6 for the same energies. _Conclusion_: The lower dose (factor of 1.75 on average)delivered to localized tissue by a x-ray brachytherapy source is more than compensated by a substantial decrease of dose (up to a factor of 1.5 x 10^4) delivered to vital organs adjacent to the treatment area. Due to the softer specta a novel electronic x-ray brachytherapy source spares better the healthy tissues.

Comment [VT1]: either use Ir-192 or 192Ir with 192 in superscript