

AbstractID: 9593 Title: Simulated Dose Deposition to Heart and Lungs: A Comparison between  $^{192}\text{Ir}$  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  $^{192}\text{Ir}$  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  $^{192}\text{Ir}$  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  $^{192}\text{Ir}$ . Dose to the lungs showed a decrease by factors of  $2 \times 10^3$  and 11 at 20 and 50 keV electron energy, respectively, while the heart wall exhibited a decrease varying by factors of  $1.5 \times 10^4$  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  $1.5 \times 10^4$ ) delivered to vital organs adjacent to the treatment area. Due to the softer spectra a novel electronic x-ray brachytherapy source spares better the healthy tissues.

**Comment [VT1]:** either use Ir-192 or  $^{192}\text{Ir}$  with 192 in superscript