AbstractID: 11670 Title: 3D dose distribution around two low-energy x-ray brachytherapy seeds

Purpose: We present an investigation of the 3D absorbed dose distribution around two low-energy photon (^{125}I and ^{103}Pd) brachytherapy seeds. **Method:** A new version of BANG gel coupled with a small format laser computer tomography scanner has been used. The measurements were performed with a spatial resolution of 100 µm in all dimensions. The radial dose function, g(r), as well as the absorbed dose rate in the plane (2D) parallel to the longitudinal axis of the sources has been obtained at various radial distances. **Results:** At large distances from the source, the absorbed dose delivered is similar to that predicted from published Monte Carlo calculations for both seeds. However for distances close to the source, the differences are quite significant for the ^{103}Pd seed. The largest difference is observed for the absorbed dose delivered by the ^{103}Pd seed. A significant enhancement of the absorbed dose is observed in the radial dose function for distances below 4 mm. This difference between the calculations and the measurement is not only in magnitude but also in the shape of g(r). The shape of the absorbed dose function predicted by published Monte Carlo calculations assumes essentially that the emission outside the seed encapsulation is that of a pure photon emitter. However the observed enhancement suggests the contribution of other radionuclide in the seed with radiation emission types resembling that of a short range interaction such as high energy beta particles or electrons. **Conclusion:** Based on these results, high-energy gamma spectrometry measurements have to be performed in order to determine the possible presence of impurity radionuclides in this seed and their relative contribution to the emergent spectrum of photons and electrons. The observations presented in this work at close distances from the source can only be revealed with a high-spatial resolution dosimetry system.