

## AbstractID: 5358 Title: Monte Carlo Modelling of the Xofig AXXENT X-Ray Source

**Purpose:** To use the EGSnrc Monte Carlo (MC) code for calculations of photon energy spectra and TG-43 dosimetry parameters for Xofig, Inc's miniature x-ray brachytherapy source. The importance of MC treatment planning for brachytherapy is also investigated.

**Method and Materials:** Calculations of in-air photon energy spectra and the dose distribution around the source in water were performed. The radial dose function, anisotropy function, and the absolute dose rate were calculated and compared with measurements made by Rivard et al (submitted to Medical Physics). Calculations were done to investigate how parameters ignored by TG-43 affect dose delivered to the medium. The effects of realistic breast tissue and a finite irradiated volume were investigated.

**Results:** Calculated in air photon spectra show excellent agreement with measurements in the energy range of ~10-50kV. TG-43 dosimetry parameters agree well with measurements but show a significant dependence on incident electron angles. Comparison of the dose in water to breast tissue show that calculations done in water may overestimate dose to breast tissue. The difference in dose to breast and water varies greatly with distance from the source and differences as large as 18% occur near the source. Calculations done in an infinite medium overestimate dose at the surface by 7% when compared with the case of a source placed 2cm from the surface of a phantom.

**Conclusion:** MC calculations of in-air photon energy spectra and TG-43 dosimetry parameters have been performed and agree well with measurements. Calculations show that by ignoring the effects of realistic tissues and finite irradiated volumes, the TG-43 dosimetry protocol may significantly overestimate dose delivered to a patient. Using MC would improve treatment planning accuracy allowing for better correlation of treatment outcome to dose delivered.