

AbstractID: 8472 Title: LDR brachytherapy dosimetry: Monte Carlo code and TG-43 comparisons

Purpose To study the Monte Carlo codes PTRAN_CT and MCNPX2.5 and compare the dosimetry results with the TG-43 formalism for a permanent seed implant of a breast brachytherapy.

Materials&Method The geometry validation of a model 6711 iodine seed was studied calculating the radial dose function in water and the energy spectrum of the seed in air. The results for the calculated spectrum were compared with an experiment carried out with an Amptek XR-100T spectrometer. The calculation times for MCNPX and PTRAN_CT were analyzed by calculating the figure of merit for water phantoms with different voxel numbers. The absolute dose was validated comparing the absolute dose in water with TG-43 and the absolute isodoses obtained from EBT Gafchromic film. The results of a treatment plan for a breast brachytherapy were compared with TG-43 calculations.

Results The discrepancy between the calculated and published radial dose function values is less than 3% for the two MC codes. The comparison of the energy spectrum with the experiment reveals a contribution of the detector diode for the energy inferior to 5 keV. The calculation time comparison between MCNPX and PTRAN_CT shows that PTRAN_CT is 10%-30% faster than MCNPX for a voxel number between 200,000 and 500,000. A good agreement is obtained for the absolute dose calculated by the two MC codes compared to the TG-43 calculation in water and the absolute isodoses measured in the Gafchromic film. The breast cancer patient plan shows that the MC results differ 12.7% in comparison with the TG-43 results.

Conclusion MCNPX and PTRAN_CT simulations agree with the absolute dose in water obtained with TG-43 and experiments. Moreover, the patient dosimetry study reveals the interest to use a MC code where the tissue composition and the interseed attenuation are taken into account.