

Abstract ID: 9684 Title: Monte Carlo (MCNP5) Dose Calculation for Eye Plaque Therapy

Purpose: To model the geometry of eye plaque therapy using MCNP5 and study the dose distribution at specific points in the eye. Effects of tissue heterogeneity and coverage for small tumors (<10 mm) which have poor clinical outcomes are concentrated.

Method and Materials: Geometry of the eye plaque for eye plaque therapy is modeled using MCNP5. The dose at the tumor base and apex has been calculated and compared against published data. For this work, a simple geometry of the eye plaque has been studied. The eye diameter, tumor base diameter, plaque diameter, plaque thickness and depth are chosen to be in compliance with the COMS standards. This model uses 14 radioactive ¹²⁵I seeds. The source energy distribution for this problem defines only the photon energies and not the beta energies as they are absorbed by the titanium capsule in the ¹²⁵I seed.

Results: Dose at the tumor apex was calculated using *F8 and F6 tallies in MCNP5. Results show that F6 tally gives more accurate results than *F8 for this problem. So, F6 tally was used further in this research. Dose at tumor base and depth dose profile were studied for this problem using F6 tally. 54540 source particles were simulated using MCNP5 and the resulting particle trace was obtained.

Conclusion: The geometry of the eye plaque has been modeled using MCNP5 and the dose distribution at specific points of interest has been studied. The MCNP5 results were found to be agreeable with the published data for several treatment techniques. The effects of tissue/tumor heterogeneity have been studied and the reason for poor tumor control/toxicity outcomes for small tumors is found using Monte Carlo dose calculation due to lack of coverage which could not be realized with 2D/3D planning.