

AbstractID: 9302 Title: Evaluation of radiochromic film within a heterogeneous phantom

Purpose:

Photon dose calculation algorithms in treatment planning systems (TPS) have reduced dose modeling accuracy in and around heterogeneity interfaces. Monte Carlo (MC) based TPS offers a possible solution to this problem. However, the inherent uncertainty in MC simulations requires results to be validated through experimental measurement.

Methods and Materials:

Slabs of Virtual Water (VW) were arranged to create a 25cm cube with a 5x5x5cm center core of various inserts: VW, urethane, aluminum, or steel. EBT Gafchromic film was placed through the center of each insert. A set of three films was used rather than a single film in an effort to decrease measurement noise. The phantom and film plane was irradiated with an orthogonal beam of 6MV photons. The films were scanned with an Epson V700 using published protocols, and a custom densitometer. The results were compared to Monte Carlo (PENELOPE code) simulations with a cutoff energy of 100eV.

Results:

With the VW insert, the dose to each film was the same. This was also the case for the urethane film set. However, for the aluminum and steel inserts, variations in absorbed dose within the 3 films of up to 12% were observed. These findings were validated using MC.

Conclusion:

We created a heterogeneous phantom of VW with various inserts. Films within the inserts of VW and urethane received consistent doses within their sets. Films within the inserts of aluminum and steel received varying doses which were also observed in MC simulations. This variation was attributed to low energy backscatter from the high density insert, and will be difficult to predict using MC simulations with reported photon and electron cutoff energies.

Conflict of Interest:

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