AbstractID: 5282 Title: Convolution/superposition algorithm and high-Z dental materials: dosimetric study in a solid water slab phantom

Purpose To address the accuracy of the dose calculated with convolution/superposition algorithm in the presence of high-Z dental materials.

Methods and Materials Three methods were utilized to access the dose: convolution/superposition algorithm, Fluence Map Monte Carlo (FMMC) method, and radiochromic film. We considered a solid water® slab phantom which had an embedded high-Z material. For dose calculations and measurements we used a 6MV photon beam from a clinically commissioned linear accelerator.

Results We observed a close agreement for the dose measured with radiochromic film and the dose calculated with FMMC algorithm. On the other hand, a large discrepancy was discovered for the dose calculated with the convolution/superposition algorithm compared to the dose obtained with measurement or FMMC algorithm.

The greatest discrepancy was observed downstream from the high-Z cerrobend inhomogeneity where the convolution/superposition algorithm calculated a dose which was higher than the dose measured with radiochromic film by 10-20% depending on the size of and the distance from the inhomogeneity. Clinically this finding shows that the delivered dose would be 10-20% less than the prescribed dose which was calculated with convolution/superposition algorithm.

In the region upstream from all the studied high-Z inhomogeneities the convolution/superposition algorithm was underestimating the delivered dose. The convolution/superposition algorithm was unable to properly estimate the dose enhancement due to the increased backscatter near the inhomogeneity.

Conclusions The convolution/superposition algorithm may significantly overestimate the actual dose in the site of the tumor located downstream from the high-Z dental restorations or prostheses.