AbstractID: 9221 Title: Fine-tuning EPID Mono-energetic Kernel in terms of Field-size Dependent Response

Purpose:
To create a series of EPID Monte Carlo dose computation kernels which accounts for observed machine-to-machine variations in EPID response.

Method and Materials:
Field size response of aS500 and aS1000 imagers are measured for several Varian Cl21-series machines that were dosimetrically matched in a water phantom. Deviations in imager response are attributed to differences in back-scattering materials beneath the imaging panels. Mono-energetic convolution kernels with various backscatter thicknesses are simultaneously created by sub-dividing a thick back-scattering slab into multiple sub-slabs and using the EGSnrc LATCH bit to score sub-slab kernel contributions. Energy-binned particle fluence incident upon the detector convolved with the imager-specific kernels are used to compute the EPID image. Imager-specific kernels are determined by matching computed and measured EPID field-size response, using the number of sub-slabs as a free parameter. Final kernels are used for Monte Carlo-based pre-treatment and in-treatment EPID dose computations.

Results:
The EPID imagers on dosimetrically matched accelerators are found to differ. Most, but not all of the deviations appear to be correlated with the imager mounting arm type. The imager-specific kernels matched the field-size response for each imager within 1%, and resulted in dosimetric agreement between measured and computed images for pre-treatment dosimetric verification of IMRT fields.

Conclusions:
Dosimetric differences between portal imagers on matched accelerators can be accounted for by using computation kernels with differing amounts of back-scattering materials. Kernels for multiple different back-scattering thickness can be efficiently calculated. Resultant imager-specific kernels may be useful for efficient pre-treatment and in-treatment Monte Carlo-based EPID dose computations.

Conflict of Interest:
This work was funded in part by Varian Medical Systems.