Abstract ID: 16801 Title: A method for dosimetric verification of exit dose using deconvolution of integrated cone beam CT images to obtain incident fluence for dose reconstruction

Purpose: To create a method of determining in vivo patient dosimetry from exit EPID images by iterative determination of scatter and primary components of exit patient fluence.

Methods: Exit fluence was simulated using a monoenergetic photon beam on an existent machine model in the BEAMnrc monte carlo computation engine. The exit fluence was used as input to a program designed to accept a CT dataset (e.g. from treatment cone beam CT) and exit fluence (e.g. output of an EPID after deconvolving the detector function) and return the fluence at entrance to the phantom. The program uses a superposition convolution algorithm to predict, and iteratively remove, the patient scatter component of the fluence at the detector. The result is then back-projected through the phantom to generate an input phantom fluence. After suitable variance reduction in subsequent runs, the computed input fluence is accepted as the true fluence and used to compute dose to the phantom.

Results: Initial results indicate that the algorithm described is capable of determining the dose to the patient by using exit simulated fluence.

Conclusions: It has been demonstrated by others that EPID images may be deconvolved from the detector function to create a map of machine fluence at the plane of the detector. It has also been demonstrated by other researchers that a superposition-convolution algorithm, when used with computed fluence, may be used to compute accurate dosimetry in a patient phantom (e.g. the CCC algorithm). This work demonstrates that combining these two algorithms and an iterative deconvolution approach can provide a method of determining in vivo dosimetry using only an EPID and a treatment time cone beam CT.