AbstractID: 12949 Title: Accuracy of the collapsed convolution superposition algorithm without a flattening filter

Purpose: To investigate the accuracy of the collapsed cone convolution superposition (CCCS) algorithm in modeling flattening filter free (FFF) beams. To date, there have been no studies which have explicitly validated the CCCS for FFF which was originally developed for flattened beams.

Method and Materials:
Prowess 4.7(Prowess Inc., Concord, Ca), a treatment planning system which utilizes the convolution superposition algorithm was used for this study. Beam data form the Siemens Artiste linear accelerator (Siemens Medical Solutions, Concord, Ca) equipped with 160 MLC™ and FFF mode was used to commission the treatment planning system. All measurements were carried out using the Blue phantom (Wellhofer Dosimetrie, Schwarzenbach, Germany) which is a 3 dimensional water phantom with positioning accuracy of $\pm$ 0.05 cm, using the CC13 thimble chamber (active volume of 0.13 cm^3)

Calculated profiles at various depths, depth doses, output factors for various field sizes were compared against measured data. Several IMRT patient plans with the FFF beams were generated and then recalculated and delivered on a homogeneous phantom at 5 cm depth. The phantom is equipped with film and ion chamber slots. The measured dose distribution was compared with the calculated dose distribution using the RIT software (Ver. 5.2).

Results: The profiles, depth doses and output factors calculated by the CCCS were within ± 2%/ mm of measured data. The measurement of the phantom plans with a gamma of 3%/ 3mm were greater that 93%.

Conclusion: The CCCS is capable of accurately calculating the dose distribution for an FFF beam.

Conflict of Interest (only if applicable): None