AbstractID: 14094 Title: Evaluation of the sensitivity of the anisotropic analytical algorithm (AAA) to the commissioning dataset

Purpose: To test the sensitivity of the Eclipse anisotropic analytical algorithm (AAA) to expanded commissioning data that includes small-field data and data corrected for detector size.

Method and Materials: A 0.01 cm^3 ionization chamber was used to measure an extended commissioning data set for a 6 MV photon beam including open field profiles (OFP), percent depth dose (PDD), and output factors for field sizes $\geq$ 1x1 cm^2. OFP were processed using mean-value symmetry and adjusted for detector size effects. OFP were smoothed outside the penumbra region for noise reduction. PDD data were shifted to account for the effective point of measurement and then smoothed. Four unique beam models were commissioned to evaluate the impact of correcting the measured data for detector size as well as small-field data inclusion. We compared the resulting AAA calculated models with the model based on Golden Beam Data (GBD) provided by Varian Medical Systems. Models were compared using a 1 mm calculation grid.

Results: The various models proved to be insensitive to adjustments for detector size effects and also to the inclusion of small-field data. All models, regardless of the penumbra of input profiles, exhibited nearly identical penumbra in the final calculated model. The algorithm narrowed the penumbra for the model commissioned with GBD i.e. with broad penumbra. Conversely, the algorithm broadened the penumbra for the model commissioned with measured data that were smoothed and corrected for volume averaging effects i.e. data with narrow penumbra.

Conclusion: Results suggest that the TPS utilizes a generic model for the penumbra region in calculated models, thus ignoring measured data. The negligible impact of inclusion of small-field data on the TPS's calculated model may be due to the large relative size of the penumbra region for those fields.