AbstractID: 13501 Title: Evaluation of Varian's AAA algorithm by Monte Carlo simulation for lung cancer SBRT

Purpose: This work investigates the accuracy of the Anisotropic Analytical Algorithm (AAA) of Eclipse treatment planning system for linac-based lung cancer stereotactic body radiotherapy (SBRT) using well-benchmarked Monte Carlo (MC) simulations.

Method and Materials:
Comparisons between AAA and Monte Carlo dose calculations were performed for both single-beam dose distributions and four realistic clinical patient plans with planning target volume (PTV) ranging from 7.4 cc to 22.4 cc. Isodose distributions and dose profiles were compared for the single beam calculations while for the patient plans dose volume histograms (DVH) were also compared together with the doses received by the PTV and critical structures (lung, esophagus, spinal cord, left ventricle and carina).

Results:
Comparisons of dose profiles between the AAA and the MC calculations showed minor differences between the two algorithms at the interfaces between the lung and the tumor or other high density tissues (about 4.0% of the maximum dose/2mm along both the lateral and anterior-posterior directions). The mean dose to the PTV calculated by the AAA for all four patients was lager than those calculated by MC simulations, but not larger than 2.5 % of the prescription dose. However, for the patient with the smallest PTV (7.4cc), the maximum PTV dose calculated by the AAA is 3.75% less than that calculated by MC. The mean dose differences between the two algorithms to critical structures are not significant, all less than 0.6% of the prescription dose.

Conclusion:
The AAA algorithm is superior to those simple algorithms that do not account for electron transport although it exhibits minor problems in dealing with tissue interfaces. For SBRT lung cancer planning, the AAA is adequate for the PTV with a better than 3% dose accuracy (possibly except for target volumes less than 10 cc) and even smaller uncertainties to critical structures.