AbstractID: 7412 Title: Comparison between Collapsed Cone Convolution and Monte Carlo dose distributions for small lung lesions

Purpose: To quantify the accuracy of a collapsed cone convolution superposition (CCCS) algorithm against Monte Carlo (MC) simulations for small lung lesions subject to electronic disequilibrium.

Method and materials: IMRT plans for several lung patients were created using Pinnacle 7.6 planning system. The lung lesions measured less than 3 cm diameter and less than 27 cm^3 and were treated in our institution with SBRT. The optimized intensity maps for each plan were then used to calculate the dose distributions using the CCCS algorithm. The linear accelerator was modeled using MC code EGSnrc\BEAMnrc and verified against commissioned measured data. Phase space file information was then scored at the plane above the collimating jaws. The intensity maps for each plan and the patient CT data from the treatment planning system were exported to our MC software. All patients were planned using 5 field IMRT on a 120 leaf MLC and Varian 2100C 6 MV beam. The dose distributions were calculated and normalized so that the isocenter receives 45Gy. The isodose distributions, DVH, and ROI statistics were used for comparison between the two methods.

Results: MC results show that the PTV coverage is worse than the Pinnacle CCCS algorithm. The differences in the PTV coverage is about 10% (43Gy covers 90% of PTV on Pinnacle, but only 39Gy covers 90% of PTV on Monte Carlo) The DVH differences in the lungs are not as profound since these organs are a lot larger when compared to the GTV.

Conclusion: There is about a 15% difference in the coverage of the PTV as shown by the DVHs between CCCS algorithm and MC for small lung lesions. The differences arise because of the limitations of the CCCS algorithm to accurately account for electronic disequilibrium.