AbstractID: 13671 Title: A custom-developed method for accurate dose recalculation of patient plans entered into clinical trials.

Purpose: To compare a custom-developed method for accurate dose recalculation of patient plans entered into clinical trials with results from a common treatment planning system.

Method and Materials: A measurement-driven multiple-source model with the Dose Planning Method (DPM) Monte Carlo (MC) dose calculation algorithm was previously developed, validated, and benchmarked for the Varian 6 MV and 10 MV photon beams. Several patient cases have been recalculated and compared to the calculations from a Pinnacle planning system. Intensity modulated radiation therapy (IMRT) prostate, IMRT abdomen, stereotactic body radiotherapy lung, and IMRT lung patient cases were selected.

Results: Field sizes from 4 cm x 4 cm to 40 cm x 40 cm were validated to within 2% of the maximum dose and 2 mm distance to agreement. At least 95% of the data tested met the validation criteria. Benchmark treatments planned using anthropomorphic phantoms were tested to within 3% of the target dose and 2 mm distance to agreement. At least 85% of the data tested met the benchmark criteria. Disagreement in the patient plan evaluation tended to occur at heterogeneity interfaces where electronic disequilibrium occurred, and in the beam penumbra, where scattered radiation was more prominent. The ratios of planning system calculation to MC calculation for the mean dose of the gross and planning target volumes for the patient plans ranged from 0.984 to 1.016.

Conclusion: These results show that this MC software code generates answers similar to the Pinnacle system for IMRT and SBRT treatment plans. Differences are consistent with the superior physics modeling inherent in the Monte Carlo code. We believe the method will be useful for recalculating dose distributions for patients entered into clinical trials.

Work supported by PHS CA010953, CA081647, and R01 CA85181 awarded by NCI, DHHS

Conflict of Interest (only if applicable): NA