AbstractID: 3124 Title: Comparison of IMRT plans with tissue heterogeneity corrections using the Pinnacle³ and CORVUS treatment planning systems.

Purpose: To study and compare the results of IMRT plans with tissue heterogeneity corrections using the Pinnacle[3] and CORVUS treatment planning systems (TPS).

Materials & Methods: A 30 cm x 30 cm x 15 cm solid water phantom embedded with a 7.5 cm styrofoam slab simulating air was scanned on Siemens Emotion Duo and the image set was transferred to both TPS for dose computation and analysis. A few clinical cases planned on the CORVUS were also transferred to Pinnacle[3] and computed with heterogeneity corrections.

Results: The dose profile along the central axis of a 23MV beam inside phantom was generated on both TPS and was compared with the Battista et al[1] data from TG65. It is noted that a gradual build-up effect after the in homogeneity region in the case of Pinnacle[3] but it is not noticed in the case of CORVUS. In the case of clinical lung plan, CORVUS overestimated the dose homogeneity and uniformity in the target when compared to Pinnacle[3] TPS. When re-optimized and re-computed on Pinnacle[3] TPS, the target coverage on DVH was better than CORVUS. Discrepancies of 33% (relative to the prescribed target dose) in the target region were found in CORVUS TPS calculations.

Conclusion: The FSPB algorithm as implemented in CORVUS results in significant under- or over-estimation of the dose in some cases involving heterogeneities such as the air-tissue, and lung-tissue. Comparatively, the convolution algorithm in Pinnacle[3] is far superior and takes into account the electronic disequilibrium due to tissue heterogeneity. This is in agreement with earlier published literature using Monte Carlo computations.

1. J. J. Battista and M. B. Sharpe110, “True three-dimensional dose computations for megavoltage x-ray therapy: a role for the superposition principle,” *Australas. Phys. Eng. Sci. Med.* 15:159–78 (1992)