AbstractID: 14127 Title: Comparison of correction methods for dose computation using cone-beam CT images

Purpose: The use of CBCT images for dose calculation may result in inaccurate dose values because of inaccuracies in the conversion of CT values to densities. In this study we compare four correction methods of the Hounsfield Units (HUs) for using cone beam CT (CBCT) images for dose calculation.

Materials and Methods: The correction methods for the CBCT HUs are: i) Using the CBCT's uncorrected HUs and the corresponding CBCT density curve, ii) Setting all CBCT voxels to water density, iii) Binning voxels according to their HU into air (HU<300), water (300<HU<1500) and bone (HU>1500), and iv) Mapping the planning CT HUs to the CBCT images via deformable image registration (MIMvista™, Cleveland, OH). The later method combines the HU accuracy of the planning CT and the geometry of the anatomy of the CBCT. The methods are ordered in increasing workload requirements and increasing expected accuracy. One H&N 6MV IMRT plan was computed using the Eclipse™ TPS (Varian, Palo Alto, CA). The evaluation was performed in terms of DVHs, min, max and mean doses.

Results: Both DVHs and dose maps shows that methods (i), (ii) and (iii) are in close agreement (differences <1% for the majority of the points). Method (iv) found to agree in maximum dose within 1.5% for both PTV and critical structures, but disagreement >10% was found for minimum and mean doses.

Conclusions: Although the above methods are different in efficiency and computational workload, in the clinical case they result in insignificant dosimetric differences. Some points to be further studied are the dependence of method (iv) on the possible errors arising from the deformable registration and threshold dependency of method (iii)'s accuracy. Study partially supported by Varian.