Purpose: To investigate the dosimetric consequences of Hounsfield unit(HU)-corrected dose calculations between Average Intensity Projection(AveIP) and Maximum Intensity Projections(MIP) 4D reconstructed CT studysets with respect to target coverage and dose to critical structures.

Methods:Treatment plans for 10 inoperable non-small cell lung cancer patients originally calculated on AveIP studysets were recalculated on MIP studysets with matching monitor units. Cases were selected to represent various treatment techniques: SBRT, IMRT and complex 3D. CMS XIO V4.51 was used with superposition convolution dose algorithm and set to pixel by pixel density correction. Lung volumes were redrawn manually with auto-thresholding on nine of the ten cases to assess changes in lung volumes between studysets. DVHs were reviewed. Additionally, a sampling of HU at 9 systematic points was acquired for both the MIP/AveIP studysets.

Results: Despite visible differences in isodose displays, recalculation using MIP did not significantly affect mean PTV-V100(87.5 v. 88.8%, p=0.250) but decreased mean cordD1%(2172 v. 2217 cGy, p=0.006), mean lungV20(19.8 v. 20.1%, p=0.032), mean lungV5(49.4 v. 50.1%, p=0.009) and mean lung dose(1219.8 v. 1240.8 cGy, p=0.001). Recontouring lung volumes on MIP studysets decreased the total lung volume in all cases(mean 2786 v. 3188 cc, $p<0.001$) and increased mean lungV20(19.54 v. 18.80%, p=0.031), mean lungV5(47.91 v. 46.79%, p=0.154), and mean lung dose(1184.8 v. 1148.0 cGy, p=0.014). PTVs were excluded from lung volumes in this study. Both studysets' HU sample values fall on the non-variable portion of the CT to ED conversion file.

Conclusions: This preliminary study suggests that there is no relevant dosimetric difference for utilizing AveIP or MIP studysets for density corrected dose calculations. Implications are that calculations could be performed on MIP or AveIP reconstructed scans, permitting physician discretion/preference. Further research is necessary to investigate if these results are uniformly applicable to all tumor locations and planning techniques.