AbstractID: 10186 Title: A Digital tomosynthesis Applications in Radiotherapy Toolkit

Purpose: To develop a toolkit to allow for the creation of cone-beam digital tomosynthesis datasets and their registration to determine patient shifts before treatment delivery.

Method and Materials: The Matlab and visual C++ platforms were utilized to create a user interface that allows for the use of megavoltage portal images to reconstruct digital tomosynthesis datasets via one of three reconstruction algorithms. The software also allows for the use of digitally reconstructed radiographs from a CT dataset to reconstruct a reference tomosynthesis image set for registration purposes. To benchmark the software, a phantom study was created where known shifts were introduced in a phantom's position before portal images were acquired. The portal images were used to reconstruct tomosynthesis-based datasets with one of the three algorithms. These were then compared against the reference image set.

Results: The software allowed for the quick reconstruction of digital tomosynthesis datasets. Once the registration was performed, all the calculated parameters to shift the phantom back to its original position showed close agreement with the actual shifts introduced in the phantom before images were acquired.

Conclusion: Based on the benchmarking experiment performed on this software toolkit, it seems like the program is performing all of its tasks correctly. The small deviations found between the registration results and the actual shifts introduced to the phantom may be due to the subjectivity of the user who performed the registration since it was performed manually.