AbstractID: 12870 Title: A Software Solution for Independent Dose Calculation of Helical Tomotherapy

Purpose: To translate and write helical tomotherapy treatment information into a non-helical format such that an independent dose calculation method implementing the EGS4/MCSIM software environment is viable.

Method and Materials: In-house software was developed using the MATLAB computing platform to translate helical tomotherapy treatment sinogram files into a non-helical format. Several steps are involved in this process. The patient .xml file is obtained through archived information to identify the procedural sinogram and several other delivery parameters. The sinogram is translated to create 51 fluence maps corresponding to the 51 discrete angles over which a complete tomotherapy rotation is divided, effectively converting a helical delivery into a 51-angle delivery. The in-house software writes an input file referencing these 51 fluence maps that is readable within the Monte Carlo dose calculation user code, EGS4/MCSIM. EGS4/MCSIM calculates dose using this translated data, providing an independent dose verification method. The final step is to evaluate the EGS4/MCSIM calculations against the treatment planning system.

Results: Initial MATLAB programming work has been successful in translating the helical tomotherapy sinogram files. The software is able to decode the sinogram and create the necessary input files for EGS4/MCSIM dose computation. Preliminary sample patients have shown decent agreement, with initial percent differences ranging from -6.0% to 3.5% for point doses. Sampled dose profiles have shown mean percent differences within 3% for both horizontal and vertical orientations.

Conclusion: This work demonstrates the potential for implementing helical delivery modalities into independent dose calculation software. This work shows that it is possible to decode a helical sinogram, use known parameters to create dose maps, and with those maps, write an input file for EGS4/MCSIM. Ongoing work is being performed to refine the dose verification process in the EGS4/MCSIM environment utilizing input files created through the in-house software.

Conflict of Interest: N/A