

AbstractID: 4797 Title: Commissioning and QA of Cone Beam CT for Image Guided Radiation Therapy

Purpose: To report the results of commissioning tests and the development of a quality assurance program for the commercial version (i.e., non-research model) Elekta Synergy Cone Beam CT (CBCT) system.

Methods and Materials: Our institution was one of the first sites in the US to install a commercial version of the Elekta Synergy Cone Beam CT system. A commissioning procedure was developed consisting of six parts: (1) System safety, (2) Geometric accuracy (i.e., agreement of MV and kV beam isocenters), (3) Image quality, (4) Algorithm accuracy, (5) Dose to patient, and (6) Quality assurance procedures.

Results: The system passed all safety tests and agreement of MV/kV isocenters was found to be within 1 mm. Using a precisely moved skull phantom, reconstruction and alignment algorithm was found to be accurate within 1mm and 1 degree in each dimension. For 12 measurement points spanning a $9 \times 9 \times 15 \text{cm}^3$ volume in a RANDO phantom, average agreement in x, y, and z coordinates was 0.010cm, -0.012cm, 0.022cm (SD: 0.021cm, 0.055cm, 0.021cm; Largest deviations: 0.06cm, 0.10cm, 0.05cm, respectively). Larger deviation for the y-component can be partially attributed to CT slice thickness of 1 mm along that direction. Dose to patient depends on machine settings and was found not to exceed 6.3cGy in the highest setting used in our clinic (120kVp, 40mA, 40ms per frame, 360 degree scan, S20 field of view). A more typical dose for a full 360 degree scan is 4cGy.

Conclusions: The procedures discussed in this presentation were applied to the Elekta Synergy CBCT system. They have been useful in identifying difficulties with the CBCT operation operation, including data transfer issues. System safety, geometric accuracy, and image quality checks are recommended to be performed on a monthly basis; algorithm accuracy and dose to patient checks are recommended to be performed annually.