

AbstractID: 9591 Title: Test of laser position, isocenter congruence between kV imager, cone beam CT and MV beam with a phantom

Purpose: On board imager (OBI) in the form of kV imaging and cone beam CT (CBCT) is gaining wide clinical application. A fast QA method that can be used to evaluate geometric accuracy and congruence with the therapy beams is lacking. We have developed a QA phantom for weekly and monthly QA of the OBI. The purpose of this study is to evaluate the accuracy of the method and its time requirement.

Method and Materials: A phantom containing 10 fiducial markers were designed to check laser position, isocenter congruence between the kV imager, the CBCT and the MV beam in one time setup. Four markers are attached to each side of the 15-cm plastic cube, one marker is located in the center of the 8 markers and the last one is located to next to the center marker. The phantom is aligned with laser and 2 sets of MV-kV, 2D-2D matching images are acquired, followed by the CBCT acquisition with same setup. Then the centers of the laser, the kV imager, the CBCT can be calculated from a formula from simple geometric relation.

Results: Total QA time including setup, image acquisition, and evaluation was not more than 20 min. The phantom can detect less than 0.5 mm variations and misalignments. The most time consuming step is image enhancement of the MV images, a process necessary to find the fiducial markers. Further improvements in the material and design of the fiducial markers to eliminate this step and significantly reduce the QA time are possible. .

Discussion and Conclusion: The phantom is appropriate for both acceptance tests the routine QA of the OBI system. Comprehensive QA for OBI systems can be performed if inserts for assessing image quality, such as different density materials and spatial resolution inserts are incorporated into the phantom.