

AbstractID: 5245 Title: Quality assurance of the On-board imager and Cone-beam computed tomography systems

Purpose: To develop a comprehensive quality assurance (QA) program for the On-Board Imager (OBI) used for patient positioning verification and to present the results of QA tests over extended periods from multiple institutions. Radiographic and cone-beam computed tomography (CBCT) mode have been evaluated.

Methods and Materials: The QA program consists of three parts; (1) safety and functionality (2) geometry and (3) image quality. Safety checks evaluate the functionality of collision interlocks and audible alarms. Functional QA checks the flow of clinical operation during tube warm-up. Geometry QA checks geometrical accuracy and variation of the OBI/CBCT and hardware/software. Image quality QA includes measurements to monitor accuracy and stability of the OBI/CBCT imaging system.

Results: All test items show stable functionality for safety and functional QA on a daily bases. The precision of arm positioning is very high with variation of 1mm and average accuracy of < 1mm over 8 months. The average accuracy of the isocenter and couch shift is < 1mm with variation of 1mm over 11 months. Arm position was performed when the results were > 2 mm. Results of geometry QA have been stable within tolerances through the test periods. All tests for Image quality tests also show consistent results within tolerances.

Conclusion: We have developed a practical yet comprehensive set of QA tests for the OBI system. Data collected for these tests over the extended period show that the OBI system has mechanical reliability and stable image quality. Nevertheless, the tests were useful in detecting performance deficits in the OBI system that needed recalibration. After accumulating enough experience and confidence on stability and accuracy, some institutions have reduced the frequency of QA checks. However, it is important that all tests are performed on a regular basis within a suggested period to establish a guideline.