

AbstractID: 10760 Title: Acceptance Testing and Quality-Assurance Protocols for the 4D Calypso® Tracking System and Q-Fix®/Calypso® Couchtop

Purpose: To develop quality-assurance (QA) protocols for the Calypso® 4D Localization System including acceptance testing, commissioning, daily QA, monthly QA, and annual QA.

Method and Materials: The following acceptance testing/commissioning/QA protocols were developed following the implementation of the Calypso System at our institution. Both the Calypso System itself and a new Q-fix/Calypso couch-top were tested. The Calypso System tests consisted of (1) transponder imaging and treatment planning, (2) localization and tracking accuracy, (3) accuracy of motion measurements, (4) operational range of the array and system integration, (5) on-board x-ray imaging when using the array, (6) safety and collision checks, (7) automatic couch repositioning accuracy and functionality, (8) clinical application protocols and workflow. The Q-fix/Calypso® couch-top tests included mechanical tests (accuracy of motion along the three axes, angle indicator accuracy, isocentricity, and sag) as well as measurements of the attenuation through the new couch top and rails.

Results:

Localization/Tracking Accuracy: The Calypso-measured displacements agreed with the known displacements within 1mm.

Motion: The Calypso System measured the period and amplitude of the longitudinal sinusoidal motion within 0.1s and 0.1cm.

Operational Range: We measured the operational range of the Calypso® array to be 14cm lateral, 15.8cm longitudinal, and 28.7cm vertical.

Imaging: kV imaging clearly delineates the transponders. The presence of the array introduces significant noise into the CBCT scan, but still allows for localization of the transponders.

Safety Checks: The appropriate warning messages were generated when the test patient plans were used.

Automatic Couch Repositioning: The ACR correctly repositioned the phantom within 0.05cm of a known 3D shift.

Q-Fix/Calypso® Couch-top: Recalibrating the vertical couch position was required (3mm change). The maximum couch attenuation was 3.6%, and rail attenuation was 9.9%.

Conclusion:

The Calypso® 4D Localization System was successfully implemented. Collection of baseline accuracy is important to ensure the continuing functionality of the system.