

AbstractID: 5165 Title: Commissioning an AC Electromagnetic Localization System for Radiation Therapy

Purpose/Objective:

To establish a commissioning and acceptance test protocol for an AC electromagnetic tracking system for use in target localization and tracking during radiation therapy. (Calypso® 4D Localization System, Calypso Medical, Seattle, WA).

Materials/Methods:

Following installation of infrared cameras and electromagnetic system, compatibility tests were made to ensure the system did not interfere with radiation output, MLCs or IMRT field fluence. The collision space between the linac and the Calypso System was evaluated. System verification included calibration using software and calibration tools, one of which has embedded RF transponders and optical reflectors. End-to-end testing to assess localization accuracy included CT scan of a radiographic phantom with RF transponders, creation of four Calypso Plans, data entry to the Calypso System and execution of treatment sessions. Tracking accuracy was measured using a precision translation table for orthogonal motions ± 5 mm.

Results:

Calypso System did not affect normal clinical operations of radiation output, MLC, or IMRT field segmentation. Overall accuracy on ten systems at five institutions and 40 treatment plans was 0.068 ± 0.027 cm, incorporating contributing errors from the CT scans, identification of transponders in the phantom, and effects of radiation dose delivery. With stable environment, no systematic drift was noticed over 30 minute. Translations of precise increments from -0.50 cm to +0.05cm were accurately tracked with error of 0.00cm, -0.02cm and 0.01cm (lat, long, vert). The system maintained accuracy with monthly optical calibrations. Changes in system readout of ± 0.05 cm (readout quantization) were noticed at certain gantry angles.

Conclusion:

Evaluations demonstrate the AC electromagnetic system with wireless transponders can be integrated into the radiotherapy environment with existing instrumentation and operates within the designed accuracy specification.

Conflict of Interest:

Work supported by Calypso Medical Technologies.