AbstractID: 8502 Title: The Accuracy and Stability of the Calypso System for Prostate Localization and Motion Tracking

Purpose: To investigate the long-term accuracy and stability of a real-time electromagnetic tracking system ("Calypso System", Calypso Medical Tech. Inc, Seattle, WA) that has been used for localization and motion monitoring for prostate IMRT.

Materials and Methods: Two Calypso Systems have been installed in our center and were calibrated bimonthly. A quality-assurance (QA) phantom provided by the manufacture has been used to check the localization accuracy every day. The phantom was set up under the guidance of the room laser and checked with the beam crosshair. The measured isocenter offsets in three directions were recorded for different calibration periods (the time period between two calibrations). The mean value and the standard deviation of the offset for every calibration period were analyzed statistically. The systematic error and the random error for prostate localization were calculated and compared with the acceptance tests when the systems were first installed.

Results: Phantom localization data for 9 calibration periods in one year were used for the calculation of the localization accuracy and stability. The mean offsets in lateral, longitudinal and vertical directions are 0.08mm towards right, 0.24mm toward inferior and 0.71mm toward posterior. The standard deviations in these three directions are 0.34mm, 0.49mm and 0.47mm for the systematic error and 0.67mm, 0.9mm and 1.29mm for the random error, respectively. The results agreed with the acceptance tests in which the average setup and tracking accuracy was 0.95mm and the maximum error was 1.5mm when only two transponders were used.

Conclusions: The localization uncertainty using the Calypso System is less than 1mm based on the phantom measurements and it was confirmed through the acceptance tests. The system is accurate and stable for prostate patient localization and motion tracking based on long term phantom calibration measurements.